

## ABSTRACT

Title of Document: MAKING THE MOST OF EXTRA TIME: THE  
ROLE OF CLASSROOM FACTORS AND  
FAMILY SOCIOECONOMIC STATUS ON  
FULL-DAY KINDERGARTNERS' READING  
ACHIEVEMENT AND ACADEMIC  
ENGAGEMENT

Amy H. Rathbun, Doctor of Philosophy, 2007

Directed By: Dr. Robert Croninger  
Department of Education Policy Studies

This dissertation used nationally representative data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) to explore relationships between full-day kindergarten classroom factors, family socioeconomic status (SES), and public school children's gains in reading achievement and academic engagement over their first formal year of schooling. Specifically, the study focused on two aspects of kindergarten classroom factors that could maximize the additional time provided by full-day programs: instructional resources (i.e., class size and instructional aides) and instructional practices (i.e., time allocation across subject areas, grouping strategies, and instructional skills and activities). Two-level hierarchical linear modeling (HLM) analyses (i.e., full-day kindergartners nested within public schools) were conducted to investigate the effects of school-averaged classroom factors on children's reading and academic engagement gains over the

kindergarten year, as well as possible effects of school- averaged classroom factors on the relationship between children's SES and the aforementioned outcomes.

The study identified multiple classroom factors associated with overall differences in full-day kindergartners' average reading gains. Specifically, results suggested that increases in reading instructional time, decreases in class size, and a balance in the frequency of discrete literacy skills and comprehension-based skills could help to accelerate reading gains during the kindergarten year. This study did not find evidence to support concerns that full-day kindergarten programs might harm children's academic engagement because of an overemphasis on academics. Instead, full-day kindergartners' academic engagement tended to remain constant across the kindergarten year and did not vary in relation to most instructional practices. Results indicated that full-day kindergartners demonstrated increased academic engagement in schools that had instructional aides working at least one hour per day with kindergartners.

This study also found that the effects of family SES did not vary between schools, so average classroom resources and practices did not influence differentially the reading achievement gains or the academic engagement gains of students from different SES backgrounds. In sum, this dissertation helps to provide some of the first evidence on how full-day kindergarten programs might structure instructional resources and time-related instructional practices in ways that increase children's reading achievement and academic engagement.

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By

Amy Hanley Rathbun

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Advisory Committee:

Dr. Robert Croninger, Chair, Associate Professor

Dr. Betty Malen, Professor

Dr. Jennifer K. Rice, Associate Professor

Dr. Gregory Hancock, Dean's Representative, Professor

Dr. Natasha J. Cabrera, Assistant Professor

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# **Dedication**

To Keith, Jason, and Leanna

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## **Chapter 1: Introduction**

Quality early childhood educational programs have the potential to improve young children's learning and to prepare them for formal schooling. 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 to provide opportunities for children to acquire the early academic skills taught in kindergarten. The benefits of additional time in full-day kindergarten settings may be further enhanced if school systems provide teachers with resources that reduce the student-teacher ratio in the classroom.

Full-day kindergarten has become more prevalent over time, with enrollment growing from 11 percent in 1969 to 63 percent in 2002 (Ackerman, Barnett, and Robin, 2005; Kauerz, 2005). As of April 2005, nine states mandated full-day kindergarten and many other local and state education agencies have debated whether to implement it in their own systems, especially in schools and districts with a high percentage of students from disadvantaged home backgrounds. As policymakers consider full-day kindergarten policy proposals, they look for evidence on the potential impacts of such programs on kindergartners' development.

Most research on full-day kindergarten effectiveness focuses on comparing academic and, to a lesser degree, socio-emotional outcomes of full- and part-day kindergartens, rather than on examining the specific aspects of full-day kindergarten

programs that may enhance children's development. Compared with the performance of children in part-day kindergarten programs, most studies find that children in full-day kindergarten make greater progress in reading over the kindergarten year (Baskett, Bryant, White, and Rhoads, 2005; Elicker and Mathur, 1997; Entwisle, Alexander, Cadigan, and Pallas, 1987; Fusaro, 1997; Puleo, 1988; Walston and West, 2004). On the other hand, evidence on the behavioral consequences of attending full-day kindergarten is mixed. Some research finds that full-day kindergartners are less likely than part-day kindergartners to exhibit positive learning behaviors, such as task persistence and listening attention (Hildebrand, 1997; Xue and Meisels, 2004). In contrast, other studies find that full-day kindergartners are more likely than part-day kindergartners to exhibit positive learning behaviors (Cryan, Sheehan, Wiechel, and Bandy-Hedden, 1992; Elicker and Mathur, 1997) or that kindergartners' learning behaviors are similar in part- and full-day programs (Entwisle et al., 1987; Finn and Panno, 2004).

Researchers and policymakers often suggest full-day kindergarten as one policy solution to closing the initial achievement gaps often found between children of different socioeconomic levels and racial/ethnic backgrounds (Kauerz, 2005; Villegas, 2005). However, findings from the small number of studies that compare full-day and part-day kindergarten outcomes for children from different family backgrounds are inconclusive. Some results show Black and Hispanic children and children from homes with low parental education benefiting more from full-day kindergarten than White children and those from homes with higher parental education levels (Entwisle et al., 1987; Yan and Lin, 2005). However, other studies

find that benefits of full-day kindergarten are similar for children from different sociodemographic backgrounds (Walston and West, 2004).

The additional time for instruction provided by full-day kindergarten policies only sets the stage for how time can be used to increase children's academic and socio-emotional development and to prepare them as they transition into first grade (Karweit, 1988). As the trend toward full-day kindergarten implementation continues, policymakers need evidence on the instructional resources and teaching practices that can make the most of the additional time available in full-day settings to yield positive developmental outcomes for children from different socioeconomic backgrounds.

### *Purpose of the Study*

This dissertation is distinct from prior full-day kindergarten research in that it does not compare full-day and part-day child outcomes but instead focuses specifically on how different allocations of full-day kindergarten classroom factors (i.e., instructional resources and practices) are associated with two key developmental outcomes of kindergarten: children's early reading achievement and academic engagement. 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 reading skills and knowledge in kindergarten are strong predictors of their later 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's academic engagement, operationalized as their attentiveness, task persistence, eagerness to learn, independence, flexibility, and organization in school, also is correlated positively with later academic achievement (Finn and Pannozzo, 2004; Guthrie, Wigfield, Barbosa, Perencevich, Taboada, Davis, Scafiddi, and Tonks, 2004; Ladd, Burch, and Buhs, 1999; Reynolds, 1991; Valeski and Stipek, 2001). The National Education Goals Panel (1997) recommended that children's academic engagement should be considered in conjunction with reading achievement outcomes because academic engagement describes how children approach the learning process through orientations such as their curiosity about tasks, their initiative, their attentiveness, and their task persistence. The importance of both outcomes is clear as Entwisle and Alexander (1998) note, "Relatively small differences at [the transition to first grade] in children's performance and adjustment to school not only persist but enlarge in subsequent years (pg. 356)."

While some studies have explored relationships between kindergarten reading instruction and children's early reading achievement, further work is needed to examine these relationships specifically within the policy context of full-day kindergarten. At the same time, the lack of conclusive evidence on relationships between full-day kindergarten attendance and behavioral outcomes points to the importance of examining how kindergartners' academic engagement might be impacted positively or negatively by full-day kindergarten classroom factors. While additional classroom time and specific instructional environments may translate to more academic learning opportunities for children, concerns exist about whether the pressure to raise achievement through full-day kindergarten programs may undermine

young children's affect toward learning (Elicker and Mathur, 1997; Valeski and Stipek, 2001).

This dissertation addresses gaps in the research literature by conducting analyses on a large, nationally representative sample of public school, full-day kindergarten children who participated in the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K). Specifically, the study explores how full-day kindergarten teachers' allocation of instructional time during the school day and their access to instructional resources that reduce the student-teacher ratio might help to achieve three important educational goals: 1) increasing children's early reading achievement; 2) enhancing children's academic engagement; and 3) improving equity in reading achievement and academic engagement gains for children from different socioeconomic (SES) backgrounds.

*Conceptual Framework: Disaggregating the "Full-Day Kindergarten" Policy  
Variable to Explore Instructional Time Allocation*

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. However, less is known about how schools and teachers can use the additional scheduled time available in full-day programs to increase early developmental outcomes and to prepare children for first grade and later schooling. Studies tend to analyze relationships between full-day kindergarten attendance and child outcomes by using kindergarten program type (i.e., full- or part-day) as a single, dichotomous variable in analyses. The global kindergarten type measure is included in research models to examine whether

additional in-school time is associated with differences in children's development over the kindergarten year. This technique in essence aggregates all full-day kindergarten programs into a single category as though the programs are identical in nature, even though research demonstrates that kindergarten classrooms vary in the way reading instruction is organized and delivered 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.

Instead of aggregating full-day and part-day kindergarten classrooms into two mutually exclusive categories based solely on the number of hours that children attend school and comparing the two groups to assess whether full-day programs result in more positive outcomes than part-day programs, this dissertation 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 child outcomes. The results of this approach will inform researchers, policymakers, and educators about full-day kindergarten instructional aspects that are linked with more positive outcomes and more equitable distributions of outcomes in children's reading achievement and academic engagement.

Although various measures of instructional time tend to be related positively to children's learning, measures of the amount of time allocated to different subject areas and teaching practices are associated more strongly with learning outcomes than global measures of scheduled 'in-school' time (Berliner, 1990; Cotton, 1989; Frederick and Walberg, 1980). Studies that use a single kindergarten program type variable to assess whether full-day kindergarten is more beneficial than part-day kindergarten are essentially exploring whether additional scheduled time in the school day leads to more positive outcomes. By examining only full-day kindergarten programs and by disaggregating the kindergarten setting into time-related components, this dissertation focuses on a more refined measure of allocated instructional time to explore how classroom resources and teaching practices can be structured within the scheduled time of full-day programs to improve children's early reading skills and increase their academic engagement. Classroom time allocation, such as the pacing of instruction and duration of time spent in various subject areas or in unstructured play, is an important instructional factor to explore because it is one of the few resources that individual teachers can control (Karweit and Slavin, 1981).

Conceptions about appropriate kindergarten time allocation to 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 National Association for the Education of Young Children (NAEYC) and many 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. In contrast, developmental experts identify "inappropriate" teaching practices as those that spend most of the school day on teacher-directed instruction, including extensive time in whole-group instruction, frequent use of worksheets and rote learning exercises, and little emphasis on hands-on or child-selected activities. Many of the recommendations for developmentally appropriate kindergarten programs 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. Under this perspective, kindergarten programs are designed with the intent of preparing 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, phonics, 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,

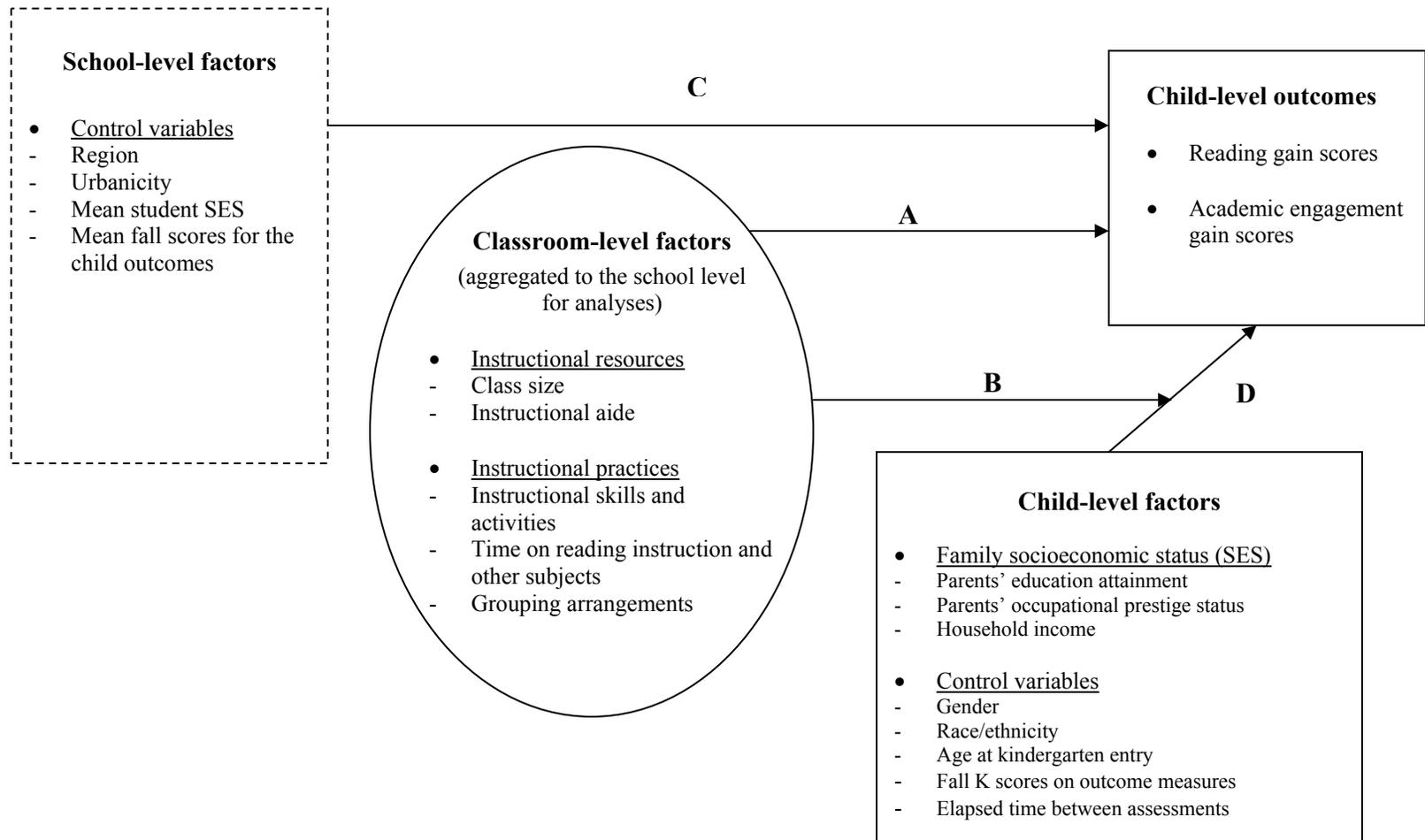
the academically-directed philosophy toward teaching reading instruction has been formalized with the passage of the No Child Left Behind Act of 2002.

The study is conducted within the framework of school effects research, which explores how aspects of classrooms and schools influence children's educational outcomes. School effects research recognizes that children's learning occurs in a multilevel framework in which children are nested within classrooms, which are, in turn, nested within schools (Bryk and Raudenbush, 1992; Lee, 2000; Odden, Borman, and Fermanich, 2004; Raudenbush and Bryk, 2002). The framework hypothesizes that improvements in learning can occur at three levels of the education system: the student, the classroom, and the school. For instance, child outcomes may vary within a particular school as a result of child- and family-level characteristics (e.g., age, gender, family socioeconomic status) yet they also may vary systematically across classrooms or schools as a result of classroom or school characteristics (e.g., instructional time allocation, classroom resources, percent of students eligible for free lunch receipt). Much of the school effects research investigates how school and classroom characteristics can impact student development and influence social differentiation of educational outcomes (Lee, Loeb, and Lubeck, 1998), which are the primary goals of the dissertation.

Figure 1 provides a conceptual display of the hypothesized relationships between full-day kindergarten classroom factors and children's reading achievement and academic engagement outcomes that are studied in this dissertation. Consistent with a school effects framework, the figure demonstrates the potential linkages between child, classroom, and school factors and children's learning and academic

engagement at the end of kindergarten. The key relationships of interest in this study are the associations between classroom factors (i.e., instructional resources and teachers' instructional practices), measured at the classroom level and aggregated to the school level, and children's gains in reading achievement and academic engagement over the kindergarten year, measured at the child level. This association is labeled as arrow A in Figure 1. In addition, this study examines whether the associations between children's family SES and their reading and academic engagement gains are moderated by full-day kindergarten classroom factors, in other words, whether some classroom factors may result in more equitable learning distributions across SES backgrounds (arrow B). Other parts of the conceptual figure model the potential influences of other child and school characteristics (arrows C and D, respectively) on child learning and academic engagement. These child and school variables are included as control variables in the analyses. More details about the specific variables in the conceptual display are discussed in *Chapter 3: Methodology*.

**Figure 1. Conceptual framework for relationship between full-day kindergarten instructional resources, instructional practices, family socioeconomic background, and full-day kindergartners’ reading achievement and academic engagement**



## *Research Questions*

The overarching research interest in this dissertation is to examine how the additional time available in full-day kindergarten can be structured to improve children's early reading achievement and academic engagement. Four research questions are addressed in the study. The variables of interest in all of the research questions are the disaggregated components of a full-day kindergarten classroom setting, specifically instructional resources and teachers' allocation of time across instructional practices. The questions focus on two educational outcomes of interest: children's gains in their reading achievement and their academic engagement over the kindergarten year. The research questions aim to identify full-day kindergarten classroom factors that are effective in improving learning outcomes for all children and in reducing inequities in outcomes across schools for children from different SES backgrounds. Below is a more detailed description of each research question.

- 1. What influence do different full-day kindergarten classroom factors (i.e., instructional resources and teachers' instructional practices) have on children's reading achievement? Do these factors help to explain variations between schools in average reading achievement in kindergarten?*

Many components of kindergarten instructional environments may be affected by the additional time afforded in full-day programs. Certain instructional resources that reduce the child-teacher ratio within classrooms may help to extend the additional time full-day kindergarten teachers have to work with their students to improve learning. In addition, the extra hours of in-school time provide an opportunity for teachers to use a

variety of grouping arrangements and instructional practices more frequently than is possible in a part-day kindergarten class. Teachers have more time in the day to devote to instruction in different subject areas as well as more time to reinforce basic skills curriculum or introduce children to more advanced curriculum topics. The first research question explores relationships between instructional resources, practices, and reading achievement to identify the full-day classroom factors that are associated with children's gains in reading achievement over the kindergarten year.

*2. Do these full-day kindergarten classroom factors differentially influence the reading achievement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average reading achievement of children from different socioeconomic backgrounds?*

Although certain full-day kindergarten classroom factors may increase children's reading achievement overall, certain factors may be more beneficial for some subpopulations of students than others. Factors that are more beneficial for children from higher-SES households than those from lower-SES households will lead to inequitable learning outcomes at the end of kindergarten that, in essence, widen the reading achievement gap between children from lower-SES and higher-SES backgrounds. On the other hand, factors that are more beneficial for children from lower-SES households may help to reduce the kindergarten reading achievement gap. The second research question explores whether schools vary in their relationships between family SES and gains in reading achievement, and if so, identifies classroom factors linked with more equitable distributions of reading achievement gains.

3. *What influence do full-day kindergarten classroom factors have on children's academic engagement? Do these factors help to explain variations between schools in average academic engagement in kindergarten?*

As noted earlier in this chapter, children's academic engagement is an important outcome to consider in full-day kindergarten research because of its positive relationship with later academic achievement. Academic engagement is defined, in this paper as well as in other research, as children's attentiveness, task persistence, eagerness to learn, independence, flexibility, and organization in school (Finn and Panno, 2004; Ladd, Birch, and Buhs, 1999; Valeski and Stipek, 2001). Classroom factors that influence children's reading achievement also may affect their academic engagement, either negatively or positively. For instance, if children become fatigued after spending excessive amounts of time on a particular subject or become frustrated by curriculum that is too difficult, they may become less engaged in learning experiences over the kindergarten year. On the other hand, more time in small group settings, more opportunities to participate in extended project work, or smaller class sizes may help to maintain or even enhance children's academic engagement. This research question aims to identify full-day kindergarten classroom factors that sustain or increase children's academic engagement over the school year.

4. *Do these full-day kindergarten classroom factors differentially influence the academic engagement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average academic engagement of children from different socioeconomic backgrounds?*

Similar to research question two, the final research question explores whether schools vary in their relationships between family SES and academic engagement. For example, the benefit of smaller class size on children's academic engagement may be greater for children from low-SES backgrounds than for children from higher-SES backgrounds. This final research question seeks to identify factors that result in equitable distributions of academic engagement outcomes across SES levels.

#### *Importance of the Study*

As state and local education agencies move forward with plans to implement full-day kindergarten policies, they need empirically-based research on the classroom factors that are conducive to improving children's reading skills and at the same time are not detrimental to children's academic engagement. Research must move beyond comparing full-day and part-day kindergarten program effectiveness and instead focus on identifying effective use of instructional time within full-day kindergarten settings. This dissertation concentrates on instructional time use; one of the most important resources available to schools. Specifically, the study provides evidence on how kindergarten teachers can take advantage of the additional time provided by full-day programs by using instructional resources and practices in ways that prepare children for first grade and later school success. Findings from this study also can provide useful guidance to researchers about avenues for future study on full-day kindergarten effectiveness.

By exploring multiple outcomes of full-day kindergarten, this study investigates a key policy concern of whether greater emphasis on factors that increase reading achievement in kindergarten may have a negative effect on children's future schooling by hindering their academic engagement. Furthermore, this study provides insight on whether some full-day kindergarten classroom factors may be associated with more equitable learning outcomes for children from different SES backgrounds. In essence, this dissertation aims to identify full-day kindergarten classroom factors that simultaneously improve children's reading achievement and academic engagement and reduce inequities in these two outcomes for children from different SES backgrounds.

### *Overview of the Dissertation Organization*

The remaining chapters of the dissertation include a review of relevant literature, an explanation of the research methodology used, a presentation of the study findings, and an interpretation of results. Chapter 2 discusses key goals of kindergarten, summarizes prior discussions and research on full-day kindergarten, compares different aspects of instructional time, and highlights theory and research findings on classroom factors that may improve full-day kindergarten outcomes. Chapter 3 describes the data source, the data collection instruments and variables included in the study, and the methodology used to conduct the analyses. Chapter 4 presents findings from the different statistical analyses used to explore each of the research questions. Chapter 5 concludes by linking the dissertation findings to the original research questions, recognizing study limitations, identifying policy recommendations, and providing guidance for future research on effective full-day kindergarten programs.

## Chapter 2: Literature Review

This chapter begins by reviewing research on three key goals of kindergarten programs: 1) increasing children's early reading skills development, 2) encouraging children's academic engagement in school, and 3) reducing inequities in children's early skills attributed to their SES background. The second section describes recent policy discussions about full-day kindergarten implementation. Section three synthesizes prior research on full-day versus part-day kindergarten effectiveness, which has focused on whether increases in overall instructional time are linked to increases in kindergarten outcomes. Section four disaggregates the general notion of instructional time into multiple components to justify a shift from focusing on overall *quantity* of instructional time in kindergarten to focusing on the *allocation* of instructional time. Section five identifies several time-related classroom factors that may be linked with children's reading achievement and academic engagement and summarizes theory and research on their effectiveness in the early grades. The chapter concludes with a discussion of the limitations of prior research on full-day kindergarten effectiveness and the potential contributions of this dissertation.

### *Key Goals of Kindergarten Programs: Early Reading Development, Academic Engagement, and Equity in Learning Outcomes*

Children's beginning school experiences have an important impact on their long-term success. The early grades are a critical period for young children because of the changes in children's social environments and in their individual capabilities (Entwisle, 1995; Entwisle and Alexander, 1998). As children move from home and preschool

learning environments to formal schooling they are introduced to a set of conventions that may be unfamiliar to some children, such as an orientation toward achievement and an expectation that children will work independently and on task (Entwisle, 1995; Snow, Burns, and Griffin, 1998). At the same time, children's language skills are rapidly increasing, so they are better able to learn about important everyday activities, such as telling time and reading signs, which help them function in society.

Children's adjustment to school in the early grades has a strong impact on the amount they learn later in school because the basic academic skills and the learning attitudes and behaviors acquired in kindergarten and the early grades provide a foundation for later learning (Entwisle, 1995; Entwisle and Alexander, 1998; LaParo and Pianta, 2000; Snow, Burns, and Griffin, 1998). Unfortunately, children from lower socioeconomic status (SES) home backgrounds tend to start school with fewer of the skills needed to be successful in school; and, over time, they continue to fall behind their more socially advantaged classmates (Arnold and Doctoroff, 2003; Rathbun and West, 2004). Thus, early childhood researchers and education organizations identify three important goals of kindergarten programs: 1) increasing children's early reading development, 2) encouraging children's academic engagement, and 3) reducing inequities in early reading and academic engagement skills that may be attributed to children's SES background.

### *Early Reading Development*

A top priority of kindergarten programs is to prepare children to learn to read. A 1998 joint position statement by the International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC) noted, "One of the

best predictors of whether a child will function competently in school and go on to contribute actively in our increasingly literate society is the level to which the child progresses in reading and writing (pg. 30).” Children with stronger reading skills at the end of kindergarten tend to be more successful in acquiring new reading skills in later grades because the material taught in elementary school is typically sequential in nature (Siefert, 1993). Early childhood experts view reading acquisition as a developmental continuum that begins with the acquisition of pre-reading skills such as using symbols and pictures, print, and play to communicate meaning; progresses to the early reading skills of processing letter-sound relationships and knowledge of the alphabetic system; and continues on to development of the more advanced skills of consolidating information into patterns that facilitate fluency in reading (Neuman, 2002).

Researchers consistently find that children’s reading skills in kindergarten are positively related to their reading achievement in the later grades (Butler, Marsh, Sheppard, and Sheppard, 1985; Entwisle and Alexander, 1998; La Paro and Pianta, 2002). 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).

This dissertation focuses on relationships between kindergarten classroom factors (i.e., instructional resources and teaching practices) and full-day kindergartners’ reading gains over the school year. A review of prior research on the specific classroom factors explored in the dissertation appears later in this chapter.

### *Academic Engagement*

A second important goal of kindergarten is to foster young children's academic engagement, which is operationalized in this study and other research as children's attentiveness, task persistence, eagerness to learn, independence, flexibility, and organization in school (Finn and PannoZZo, 2004; Guthrie et al., 2004; Ladd, Burch, and Buhs, 1999; Reynolds, 1991; Valeski and Stipek, 2001). Other terms used by the academic community to describe similar learning behaviors include "approaches to learning," "self-regulatory behavior," or "dispositions toward learning." In 1991, the National Education Goals Panel (NEGP) recommended that children's "approaches to learning" be considered as one of five important dimensions of school readiness, together with the four other dimensions of physical well being and motor development, social and emotional development, language development, and cognition and general knowledge. The panel defined approaches to learning as, "the inclinations, dispositions, or styles rather than skills that reflect the myriad ways that children become involved in learning and develop their inclinations to pursue it (NEGP, 1997)." The panel's description of children's "approaches to learning" is similar to the dissertation definition of academic engagement, in that the NEGP identified curiosity, creativity, independence, cooperativeness, and task persistence as approaches to learning that enhance early learning and development. Many of the academic engagement behaviors identified by NEGP and other researchers are included in the academic engagement measure explored in this dissertation.

The goal of improving children's academic engagement is not mutually exclusive of the goal of developing reading competency; rather, the two may interact either to

improve or to hinder children's later school outcomes (Takanishi and Bogard, 2007). Children who exhibit positive academic engagement in school spend more of the instructional period engaged in learning than children who are frequently distracted or uninterested in classroom tasks. Finn and Voelkl (1993) suggest that children's achievement depends on two factors of participation: 1) willingness to engage in classroom tasks and demands by attending and following directions and 2) willingness to take initiative in the classroom by asking questions and working independently. Children who are not academically engaged in classroom activities typically benefit less from instruction and have lower levels of achievement because they do not participate in experiences that foster skill development (Finn and Pannozzo, 2004; Ladd, Birch, and Buhs, 1999). Promoting academic engagement at an early age is essential because children's enthusiasm for learning tends to diminish as they grow older (Entwisle and Alexander, 1998).

Researchers find that children who are academically engaged in the learning process have stronger academic skills, on average, in the primary and later grades (Entwisle and Alexander, 1998; Finn and Voelkl, 1993; Finn and Pannozzo, 2004; Ladd, Burch, and Buhs, 1999; Reynolds, 1991; Takanishi and Bogard, 2007; Valeski and Stipek, 2001). The relationship between children's academic engagement and their achievement may be recursive in nature, in that children who enter school with stronger cognitive skills are more likely than those with weaker skills to demonstrate positive learning behaviors such as paying attention and working independently (Ladd, Birch, and Buhs, 1999).

Limited research exists on classroom factors that may enhance children's academic engagement. Prior studies have tended to focus on whether children's perceptions of their competence, their attitudes about school, their internal motivation, and their relationships with their teachers and peers are associated with their academic engagement (Ladd, Birch, and Buhs, 1999; Valeski and Stipek, 2001; Wigfield, Eccles, and Rodriguez, 1998). While some researchers have studied the effects of classroom factors on student attitudes about school and student motivation (Rosenholtz and Simpson, 1984; Valeski and Stipek, 2001; Wigfield, Eccles, and Rodriguez, 1998), direct relationships between classroom factors and levels of academic engagement have not been measured. Thus, this dissertation explores a relatively non-studied aspect of academic engagement by measuring its association with time-related classroom factors.

Although the education community recognizes the importance of maintaining and enhancing children's academic engagement, it is difficult to collect precise measurements of such learning behaviors. One limitation for most research on academic engagement in the early grades is that engagement tends to be measured indirectly through teacher report, rather than through direct observation or child self-report. Teachers' preconceived expectations about children's academic engagement with respect to gender, race/ethnicity, social class, academic skills, or other factors may bias the ratings teachers assign to some groups of children in their classroom. For instance, Alexander, Entwisle, and Thompson (1987) found that teacher perceptions of children's social maturity (e.g., enthusiasm for learning, creativity, ability to control temper) were influenced by the teacher's social status as well as the social status and race/ethnicity of the student. Teachers from high-SES backgrounds were more likely to assign lower maturity grades

to lower-SES and ethnic minority children than to other children. In another study, White teachers tended to report higher levels of student difficulty with following instructions than did minority teachers (Rimm-Kaufman, Pianta, and Cox, 2000).

Teacher ratings of children's academic engagement also may be influenced by their knowledge of children's academic achievement, a tendency known as the 'halo effect' (Dompnier and Pansu, 2006). A 'halo' effect is present when teacher judgment on students' performance in one discipline is influenced by their performance in another discipline. For example, teachers may assign higher academic engagement scores to kindergartners with stronger reading and mathematics skills even if those children do not differ from children with fewer academic skills in terms of their academic engagement. The studies above support earlier findings from a meta-analysis of 77 studies on relationships between child/family characteristics and teacher expectations, which found that children's physical attractiveness, conduct, student record information, race, and social class were associated with teacher expectancies about student performance (Dusek and Joseph, 1983).

Studies that rely on teacher-reported measures of academic engagement must acknowledge the potential for report bias, investigate whether bias may be present, and look for ways to reduce it. It is also important to recognize that most data collection measures for children's academic engagement may provide crude indicators of these learning behaviors because they cannot ascertain whether the skills on which children are observed and rated actually demonstrate that the children are engaged in the learning process. Nevertheless, proxy measures of academic engagement are worth studying because they can provide initial evidence on the potential influences of classroom factors.

### *Socioeconomic Background and Learning Outcomes*

Researchers have identified several characteristics of children's families and homes that tend to be associated systematically with school-related outcomes. Indicators of family social disadvantage include poverty, low parental education, single-parent household, large family size, non-English home language, minority racial/ethnic group identity, lack of home ownership, and family dysfunction or illness (Croninger and Lee, 2001; Moore, 2006a, 2006b; Pallas, Natriello, and McDill, 1989; Rathbun, West, and Walston, 2005; Zill and West, 2001).

Researchers have suggested reasons why children from socially disadvantaged backgrounds enter school with fewer academic and learning behavior skills than their peers from more advantaged backgrounds (Arnold and Doctoroff, 2003; Farkas, 2003; Rothstein, 2004; Snow, Burns, and Griffin, 1998). Prior to entering school, children from socially disadvantaged households are more likely than other children to have inadequate nutrition, untreated medical conditions, and more harsh and violent environments (Farkas, 2003). These children typically have less access to books and educational toys in their homes, and less access to quality preschool settings (Arnold and Doctoroff, 2003). In the early years, they typically have little conversation with adults, which can result in less opportunity to develop vocabulary or to practice using language to express complex ideas and to learn phonological skills (Farkas, 2003; Snow, Burns, and Griffin, 1998). As children from low-income homes enter school, they are less likely than other children to exhibit learning behaviors valued by schools, such as the ability to sit still, pay attention, and do class work independently (Farkas, 2003). As a result, socially disadvantaged children begin kindergarten lacking the skills and knowledge often identified as measures

of “school readiness;” skills that their more advantaged classmates may have developed during the preschool years.

Frequently, children with one family risk factor also have other risk factors present. In a summary of research studies that used poverty, single-parent household, large family size, low parental education, and inability to own a home as risk factors, 26 percent of children had one risk present, 29 percent had two to three risks present, and 7 percent had four or five risks present (Moore, 2006a). Research using ECLS-K data and four risk factor indicators (i.e., mother did not complete high school, receipt of food stamps or welfare payments, single-parent household, non-English primary home language) found that 31 percent of children had one risk factor present and 16 percent had two to four risk factors present (Zill and West, 2001). Family risk factors are more prevalent in Black, Hispanic, and Asian households than White households. For instance, Zill and West (2001) found that almost three-quarters of Black and Hispanic households and 61 percent of Asian households have at least one risk factor, compared with 29 percent of White households. Over time, children with multiple family risk factors are more likely than children with fewer risk factors to experience school-related problems, such as low achievement, grade retention, school suspension or expulsion, more behavior problems, less engagement in schoolwork, and more health problems (Moore, 2006a; Pallas, Natriello, and McDill, 1989; Zill and West, 2001).

Research indicates that children’s early reading skills differ significantly in relation to their social backgrounds (Arnold and Doctoroff, 2003; Lee and Burkam, 2002; Snow, Burns, and Griffin, 1998; West, Germino Hausken, and Denton, 2000; Zill and West, 2001). Although children with one or more risk factors vary in the skills and

knowledge they bring to school, reading difficulties in the early grades are more common for poor children, non-White children, and children from homes where the primary language is not English (Lee and Burkam, 2002; Snow, Burns, and Griffin, 1998; West, Germino Hausken, and Denton, 2000). For instance, research from the ECLS-K found that only 44 percent of children with multiple family risk factors (i.e., mother did not graduate high school, family receiving food stamps/welfare payments, single-parent household, or non-English primary home language) were proficient in identifying letters of the alphabet at the start of kindergarten, compared with 57 percent of children with a single family risk factor and 75 percent of children with none of the family risk factors (Zill and West, 2001). Over time, gaps in children's reading skills grow wider between children in homes with more social risk factors and those with fewer or no social risk factors (Rathbun and West, 2004; Rathbun, West, and Walston, 2005). As Arnold and Doctoroff (2003) note, "Socioeconomic status (SES) is a powerful predictor of children's academic trajectories, and the influence of SES on children's academic skills begins very early (pg. 520)."

Similar to the patterns found for reading achievement, patterns of children's academic engagement in the early years are related to their family's social background. At kindergarten entry, teachers tended to rate children from families with one or more risk factors (e.g., low maternal education, low income) as less likely than their classmates with fewer risk factors to be eager to learn, pay attention well, or persist in completing classroom tasks (Zill and West, 2001). In a separate study, kindergartners from lower family SES backgrounds (measured by parental occupation, income, educational attainment, and race/ethnicity) had lower teacher ratings on their ability to comply with

classroom rules and to display independent, self-directed behavior in the classroom (Ladd, Birch, and Buhs, 1999). As noted in the prior section on academic engagement, conclusions based solely on teacher reports must be considered with caution in light of potential teacher bias toward children from different sociodemographic backgrounds. More detail about this research limitation is presented in Chapter 5.

This study does not attempt to explain why children from lower family SES backgrounds enter kindergarten with lower scores in reading and academic engagement, nor does it focus on describing the magnitude of differences across SES backgrounds. Rather, the dissertation aims to identify instructional resources and teaching practices that may be associated with more equitable gains in reading achievement and academic engagement for children from varying SES backgrounds.

#### *Policy Discussions About Full-Day Kindergarten*

Given the significant relationships between children's early reading skills, their academic engagement, their family SES, and their later school success, policymakers, researchers, and educators are eager to identify solutions that increase children's early learning and reduce social disparities in learning. Full-day kindergarten is one such policy recommendation, which increasing numbers of school districts have adopted over recent decades.

Growth in the prevalence of full-day kindergarten, from 11 percent of kindergartners enrolled in 1969 to 63 percent enrolled in 2002, is attributed to various economic, social, and educational factors (Ackerman, Barnett, and Robin, 2005; Kaurz, 2005). Increases in the percentage of children from single-parent households and from households with two working parents are important factors contributing to the call for

full-day programs because childcare arrangements are less costly and less complicated for these types of families when children are enrolled in kindergarten for the full school day (Gullo, 2000; Morrow, Strickland, and Woo, 1999).

Early education policies such as full-day kindergarten often are recommended as interventions to compensate for socioeconomic disadvantages that may lead children to be at risk of later school failure (National Research Council, 1999). Research indicates that children enter kindergarten with many different levels of achievement and that children from disadvantaged backgrounds (e.g., living in poverty, having a mother who did not complete high school) begin school, on average, with fewer academic skills than their more advantaged classmates (Lee and Burkam, 2002; West, Denton, and Germino Hausken, 2000). Proponents of full-day kindergarten argue that such programs help improve all children's development and that the benefits may be even greater for children from disadvantaged backgrounds because full-day kindergarten exposes them to experiences they may not have had access to prior to kindergarten (Entwisle et al., 1987; Farkas, 2003).

Advocates for full-day kindergarten also suggest that teachers of full-day programs have more time available to get to know their students and to individualize their instruction and that children have more time to acquire the early academic skills taught in kindergarten (Ackerman, Barnett, and Robin, 2005; Morrow, Strickland and Woo, 1998). In some cases, school systems have switched to full-day kindergarten to provide sufficient time for children to complete curriculum that has become increasingly rigorous (Shepard and Smith, 1988). However, opponents of full-day kindergarten claim that its benefits may not outweigh the higher cost of implementation associated with additional

teachers, classroom facilities, and instructional materials (Ackerman, Barnett, and Robin, 2005). Some also question whether a full day of instruction could increase stress levels and fatigue in young children or could cause them to miss out on valuable home experiences (Elicker and Mathur, 1997).

### *Prior Research on the Benefits of Full-Day Kindergarten*

As full-day kindergarten policies become more common, several researchers have compared the academic and behavioral outcomes of children in full-day programs to those in part-day programs to assess whether the longer instructional day may improve children's early development. Empirical studies on full-day kindergarten outcomes differ in terms of their research designs, sample sizes and compositions, types of outcome measures, time intervals between assessments (e.g., kindergarten year, kindergarten through third grade), and the inclusion (or exclusion) of child, family, classroom, and school contextual variables that may also be related to children's development. This section summarizes patterns of outcomes associated with full-day kindergarten attendance, examines inconsistencies in results across studies, and offers some hypotheses for the differences. Research findings are presented separately for children's early reading achievement and their academic engagement. Within each of the two outcome domains, findings for children overall as well as for children from different SES backgrounds are discussed.

### *Full-day vs. Part-day Kindergarten Reading Outcomes*

Most research shows that by the end of kindergarten children in full-day programs have higher reading scores or greater gains in reading than children in part-day programs.

This finding persists across studies that vary in terms of the types of samples included, the research designs and analytic techniques employed, and the contextual variables included.

Several studies using nationally representative data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) reported that full-day kindergartners made greater progress than part-day kindergartners in reading during the first year of school, even after taking into account characteristics such as children's gender and race/ethnicity, families' poverty status, parental education, and primary home language (Cannon, Jackowitz, and Painter, 2005; Kaplan, 2002; Walston, West, and Rathbun, 2005; Yan and Lin, 2005), and classroom instructional aspects such as grouping arrangements, curricular focus, use of instructional aides, and amount of time devoted to reading instruction (Milesi and Gamoran, 2003; Walston and West, 2004; Xue and Meisels, 2004). Many of these studies employed multi-level modeling procedures to adjust statistically for the concern that children nested within schools tend to have similar in-school experiences and family and community background characteristics.

Smaller-scale studies conducted in urban school districts that enroll higher than average concentrations of minority and economically disadvantaged students also found that at the end of kindergarten full-day programs were associated with higher reading achievement than part-day programs. A series of urban school studies in Canada reported that full-day kindergartners consistently made greater progress than part-day kindergartners on the Letter Identification, Concepts about Print, and Hearing and Recording Sounds in Words reading tests from the Clay Reading Inventory (da Costa and Bell, 2004; 2001; 2000). In other urban district studies, full-day kindergartners scored

higher than part-day kindergartners on the Peabody Recall Listening Comprehension test and the Clay Reading Inventories at the end of kindergarten (Morrow, Strickland, and Woo, 1999) and the California Achievement Test (CAT) reading subtest in fall of first grade (Entwisle et al., 1987). Most of the urban school district studies used ANCOVA procedures to compare reading outcomes and to control for children's reading scores in the beginning of kindergarten.

Studies conducted in suburban and rural settings tended to report results consistent with those of the nationally representative samples and the urban school district settings. For example, after accounting for children's initial developmental scores, full-day kindergartners in a rural-suburban school district with 43 percent free/reduced lunch eligibility had higher report card grades than part-day kindergartners in literacy skills, letter/sound identification, and story sequence (Baskett et al., 2005). In another study that randomly assigned children to full- or part-day kindergartens within one middle-class school, children in full-day kindergarten had higher report card grades in literacy at the end of the school year (Elicker and Mathur, 1997). Other studies that included children from a wider range of SES backgrounds found that at the end of the year full-day kindergartners outperformed part-day kindergartners on the Test of Early Reading Ability (TERA-2) (Hildebrand, 1997), the Metropolitan Readiness Test (MRT) reading subtest (Cryan et al., 1992; Sheehan, Cryan, Wiechel, and Bandy, 1991), and the Early School Assessment reading tests (Hough and Bryde, 1996).

While most study findings suggest that full-day kindergarten is related positively to reading achievement during children's first year of school, some researchers have not found significant differences in reading outcomes based on the type of kindergarten

program children attended (i.e., full- or part-day). A study using teacher-level analysis on a sample of mid-west school districts detected no significant differences in children's spring kindergarten scores on the Wide Range Achievement Test (WRAT), the Chicago Reading Test, or the Woodcock Reading Comprehension Paragraphs assessments, although the authors noted that full-day kindergartners had higher comprehension scores than part-day kindergartners (Meyer et al., 1993). Findings from this study may differ from the majority of other studies on short-term full-day kindergarten outcomes in part because the full-day kindergarten sample consisted of a more diverse group of students than the part-day kindergarten sample; yet, analyses of kindergarten program type differences did not control for this difference in the sample composition. Furthermore, the authors indicated that the part-day kindergartners in one of the districts received almost six times the number of minutes of reading instruction as the full-day kindergartners; and, the full-day kindergartners spent most of their day in non-instructional activities while the part-day kindergartners spent most of their day in reading instruction and teacher-assigned centers. Thus, differences in the sample compositions and instructional practices of the full-day and part-day kindergartens in this study might explain why the results on full-day kindergarten effectiveness conflict with those of the majority of studies.

A second study, which randomly assigned children from a mix of Chapter I and affluent schools to full-day or part-day kindergarten, did not find significant program-type differences in spring kindergarten scores on the CAT reading subtest once children's gender was taken into account (Holmes and McConnell, 1990). The study did not describe whether the full- and part-day kindergarten settings differed on sample

characteristics or instructional experiences; as a result, it is difficult to ascertain why the results conflict with most other research.

A third study also reported no significant program type differences in children's scores on the Peabody Picture Vocabulary Test (PPVT) administered at the end of kindergarten (McConnell and Tesch, 1986). Findings from this study may differ from the majority of other studies because the full-day kindergarten sample used in this study had about twice the proportion of poor and minority students as the part-day sample; yet, the analysis comparing full-day and part-day kindergarten outcomes did not appear to take sample differences or children's initial reading achievement into account.

A subset of the studies on reading outcomes explored whether full-day kindergarten programs were more or less beneficial for children from certain sociodemographic backgrounds. One urban schools study noted that the overall benefit of full-day kindergarten on children's reading achievement at first-grade entry was stronger for Black than for White children (Entwisle et al., 1987). Research using nationally representative ECLS-K data and *t*-test comparisons indicated that reading benefits of full-day kindergarten programs were stronger for Black and Hispanic children and for those whose parents had low educational attainment (Yan and Lin, 2005). However, when a separate study entered these variables into a regression analysis along with a larger set of contextual variables, including family composition and poverty status, full-day kindergarten reading benefits at the end of kindergarten did not vary significantly in relation to any of the child and family variables included in the model (Walston and West, 2004).

In sum, evidence from prior research suggests that full-day kindergartners have higher achievement scores or make greater progress in reading than part-day kindergartners by the end of the first year of school. Results from a recent meta-analysis of full-day kindergarten reading achievement outcomes support this conclusion, in that full-day kindergartners' tended to outperform part-day kindergartners in reading at the end of the school year by about one-fifth of a standard deviation (Rathbun, 2006). On the other hand, research is inconclusive as to whether full-day kindergarten may have differential benefits for children from various sociodemographic backgrounds.

#### *Full-day vs. Part-day Kindergarten Academic Engagement*

Research on full-day kindergarten outcomes can provide useful evidence on the potential impacts of such programs on children's academic engagement. No consistent patterns emerge from prior studies as to whether full-day kindergartners demonstrate weaker or stronger academic engagement behaviors relative to part-day kindergartners at the end of the kindergarten year. One important difference to note between research on reading achievement and research on academic engagement is that the analyses of children's behavioral skills at the end of kindergarten typically have not included measures of these same skills at kindergarten entry. The lack of 'pre-test' information on children's academic engagement limits the generalizations that can be made about learning behavior outcomes measured at the end of kindergarten because it is not possible to determine whether full-day kindergartners differed, systematically, in some way from part-day kindergartners on such skills when they entered school. A second difference between the research on reading achievement and academic engagement is that researchers have not explored whether full-day kindergarten attendance might have

differential impacts on engagement for children from different SES levels; so, little evidence is available on whether full-day kindergarten attendance may improve or hinder the academic engagement of some subpopulations of children more than others.

Two recent studies on children's academic engagement used teacher ratings from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) Social Rating Scale (SRS) to assess children's learning behaviors. The SRS is an adaptation of the Social Skills Rating System (SSRS) standardized assessment (Gresham and Elliott, 1990). One study reported that although teachers of part-day kindergarten classrooms tended to rate the overall behavior of their classes more positively than teachers of full-day classrooms, teacher ratings on individual children's academic engagement (e.g., enthusiasm, persistence) did not differ significantly by kindergarten program type (Finn and Panno, 2004). In contrast, the second study found that, at the end of the school year, full-day kindergartners exhibited less academic engagement than part-day kindergartners (Xue and Meisels, 2004). Differences in findings from the two studies may be due to the inclusion of the fall kindergarten academic engagement scores in the analysis conducted by Xue and Meisels (2004). In addition, each study used different sets of family and classroom variables in the analysis so differences in results may be attributed in part to variations in the analytic models.

In smaller-scale research, two studies used the Hahnemann Elementary School Behavior Rating Scale (HESB) to assess children's learning behaviors, including their academic engagement. One study on a middle-SES population showed that part-day kindergartners scored more positively than full-day kindergartners on several skills thought to facilitate learning, including originality, independent learning, involvement,

and attentiveness (Hildebrand, 1997). In contrast, results from a second study on a statewide sample found that full-day kindergartners scored more positively than part-day kindergartners on the HESB scales of originality, independent learning, involvement in classroom activities, and intellectual dependency (Cryan et al., 1992). Differences in results across the studies may be due in part to variation in the samples being assessed because Hildebrand (1997) compared learning behaviors between one full-day class and one part-day class while Cryan and colleagues (1992) compared outcomes for a statewide sample.

Studies using report card data and other teacher ratings also reported mixed results on the relationship between kindergarten program type and children's academic engagement. An urban school district study detected no significant differences in full- and part-day kindergartners' behavioral skills on teacher ratings of children's personal maturity or conduct (e.g., enthusiasm for learning, creativity, ability to control temper) (Entwisle et al., 1987). A second study using a two-cohort experimental design in a middle-SES school district with mostly White students observed full-day kindergartners in both cohorts as being more actively involved in tasks and more excited and interested in activities than part-day kindergartners but weaker in listening and paying attention (Elicker and Mathur, 1997). However, results from report card grades across cohorts in the study were mixed. In the first cohort, part-day kindergartners had higher report card grades than full-day kindergartners in work habits while the full-day kindergartners in the second cohort had higher report card grades in general learning (e.g., curiosity, attention span, and creativity). It is difficult to determine if the behaviors of full-day kindergartners varied systematically from one cohort to the next in this study or if differences in

outcomes were due instead to changes in the grading system because the report card domains changed between cohorts.

In sum, research on the consequences of full-day kindergarten on children's early academic engagement yields inconsistent results. Some studies find that full-day kindergartners display more positive learning behaviors than part-day kindergartners; others find no differences or fewer positive learning behaviors for full-day students. A recent meta-analysis on four studies of full-day kindergarten social/behavioral outcomes showed no significant differences in social/behavioral outcomes between children from full- and part-day kindergarten programs (Rathbun, 2006). The inconsistency of findings across studies coupled with the lack of research on whether full-day kindergarten may have differential impacts on academic engagement for children from varying SES backgrounds demonstrates the importance of future research in this area.

#### *The Multifaceted Nature of Instructional Time in Full-Day Kindergarten Research*

Most studies that evaluate the effectiveness of full-day kindergarten do so by comparing full-day and part-day kindergarten outcomes. Such a research approach focuses on how increases in the overall quantity of instructional time affect children's early development. Perhaps the more important factor influencing kindergarten outcomes and the one more difficult to address in quantitative research is how the additional time provided by full-day kindergarten can be structured to improve outcomes for all children and to promote more equitable distributions of outcomes for children from various SES backgrounds. This dissertation diverges from prior research on the quantity of overall kindergarten instructional to focus instead on the allocation of instructional time in full-day kindergarten programs.

Instructional time is a multi-faceted concept that can be divided into aspects that are under the control of schools, teachers, and students (Berliner, 1990; Cotton, 1989). The overarching unit of instructional time, sometimes labeled as *scheduled time*, is the total amount of time that students spend in school. It serves as an upper bound for the amount of time teachers have to provide instruction and the amount of time students have to engage in learning at school. State education agencies are generally responsible for mandating the length of the school year, while local education agencies are responsible for setting policy on the length of the school day (Karweit and Slavin, 1981).

A range of educational policies, such as compensatory preschool programs, year-round schooling, extended school days or school years, summer learning programs, and even homework assignments, focus on increasing the amount of scheduled time that students are in school or exposed to learning activities. The premise for these policies is that additional instructional time will result in additional student learning. While research syntheses on preschool programs (Barnett, 1995; Entwisle, 1995; Gilliam and Zigler, 2000), summer learning programs (Cooper, Charlton, Valentine, and Muhlenbruck, 2000) and homework (Walberg, Paschal, and Weinstein, 1985; Cooper, 1989) tend to support the notion that increased instructional time leads to increased academic outcomes, research is inconclusive on the educational impact of extended school days and extended school years (Karweit, 1985; Walberg, Niemiec, and Frederick, 1994). Full-day kindergarten is another example of a policy that increases the number of hours that students are exposed to a formal learning environment. Thus, the large number of studies that compare the academic outcomes of full-day and part-day kindergartners are in

essence exploring the question of whether the additional scheduled time provided by full-day programs will lead to increased learning during the kindergarten year.

Within the scheduled time of the school day, teachers and schools decide how to *allocate time* to provide instruction to students (Karweit and Slavin, 1981; Walberg, Niemiec, and Frederick, 1994). Allocated instructional time, sometimes labeled as opportunity to learn, is a measure of how teachers and schools distribute time across instruction in different subject areas, in different grouping arrangements, and on different curriculum and instructional activities. The notion of opportunity to learn in school suggests that although children have the chance to learn some concepts informally (e.g., through home experiences, television, or interactions with others) other curriculum concepts usually are learned primarily in school. Allocated instructional time is typically an overestimate of the actual time spent on instruction because the *transition time* between activities and the *wait time* students experience before receiving instructional assistance both reduce the actual amount of instructional time spent on a given activity (Berliner, 1990).

The amount of allocated time for a given instructional activity serves as an upper bound for *engaged time*, defined as the amount of time that students are focusing on the materials or instruction that the teacher is presenting (Berliner, 1990). Students' individual aptitudes, interests, and learning behaviors, among other factors, affect the amount of time they spend engaged in a particular lesson (Karweit and Slavin, 1981).

Research on relationships between the different components of instructional time indicate that although *scheduled time*, *allocated instructional time*, and *engaged time* all tend to be positively associated with student achievement, the relationship between time

and learning is strongest for student *engaged time* (Berliner, 1990; Cotton, 1989; Frederick and Walberg, 1980). Relationships between *allocated instructional time* and achievement are stronger than those between *scheduled time* and achievement. Some studies find no connection between additional hours of school time and achievement. Furthermore, studies on relationships between time and children's skill levels suggest that increases in all instructional time components have a more positive impact on lower-performing students versus higher-performing students possibly because lower-performing students benefit from the additional opportunity to learn skills that higher-performing students may have mastered prior to kindergarten (Brown and Saks, 1986).

Each type of instructional time variable is useful for particular research intents. While *engaged time* may be the strongest predictor of student achievement, policy analysts typically find the variable of *allocated instructional time* to be more useful to study because it is under the control of schools and teachers and can be manipulated by policymakers (Berliner, 1990; Karweit, 1985; Karweit and Slavin, 1981). Furthermore, measures of *scheduled time* and *allocated instructional time* are easier to collect in large-scale survey research than *engaged time* because the latter measure requires quantifying the amount of time that individual students are paying attention to classroom instruction and materials.

Within the context of full-day kindergarten, researchers can examine the benefits of such programs either with respect to the increased amount of scheduled time they provide over part-day programs, or alternatively with respect to how full-day classroom settings allocate instructional time. The additional scheduled time available in full-day kindergarten settings sets an upper bound on the amount of time teachers have to work

with students; but, it does not dictate how time will be used for instruction. Research that compares full-day and part-day kindergarten settings confirms that full-day kindergarten programs can be qualitatively different in terms of the way instruction is provided. For instance, some studies note that compared to part-day kindergarten teachers, full-day teachers spend a greater proportion of instructional time in small-group and individualized instruction (Elicker and Mathur, 1997; Hough and Bryde, 1996) and a greater proportion of reading instructional time introducing storybook activities, such as telling stories, reading to children, and having children read independently (Morrow, Strickland, and Woo, 1999). In addition, full-day and part-day kindergarten classrooms sometimes differ in terms of the resources that are available to them, such as smaller class sizes or the presence of instructional aides for full-day programs (da Costa, 2004; 2001). Thus, research on the benefits of full-day kindergarten must extend beyond simply measuring whether children make greater academic gains in full-day versus part-day programs and begin to explore how different allocations of instructional time in full-day programs might influence early learning.

Research on the effects of schooling demonstrates that what teachers do in the classroom can have substantial impacts on children's learning (Odden, Borman, and Fermanich, 2004); however, few studies have been able to identify the specific classroom factors that are responsible for the measured effects. The next section summarizes research on a wide range of time-related kindergarten classroom factors that early childhood education experts, researchers, and policy makers propose may improve children's early reading development and academic engagement.

*Full-Day Kindergarten Classroom Factors and Children's Reading Achievement and Academic Engagement*

Several time-related aspects of full-day kindergarten classroom settings might influence children's early reading achievement and their academic engagement. This section summarizes theory and empirical research for two types of classroom factors that can be influenced by the additional time available in full-day kindergarten: classroom instructional resources and teachers' instructional practices.

*Instructional Resources*

Full-day kindergarten programs have a range of classroom resources that may influence children's reading achievement and academic engagement, including classroom size, instructional aides or volunteers, classroom physical characteristics, and the presence of a variety of instructional materials such as computers, books, puzzles, and audio-visual equipment. This dissertation focuses on the potential impact of two resources – class size and instructional aides – that help increase the amount of time teachers have available to work with their students by reducing the student-teacher ratio. The study focuses on these two resources because researchers and policymakers frequently identify them as key resources for improving the quality and quantity of teaching.

*Class size.* Education policymakers often recommend class size reduction efforts as a solution to improving student achievement. Class size is hypothesized to impact achievement in that teachers of smaller classes will allocate time differently, cover more curriculum topics, or modify their teaching practices so that instruction more closely

matches their students' existing skills and knowledge (Ehrenberg, Brewer, Gamoran, and Douglas, 2001; Milesi and Gamoran, 2003; Smith, Molnar, and Zahorik, 2003).

Presumably, smaller classes provide teachers with more time to devote to individual students during small-group and individualized instruction. Furthermore, children may learn more and be more academically engaged in smaller classes because closer teacher supervision may result in fewer student disruptions .

Although class size limits the potential quality and quantity of teacher-child interactions, smaller classes do not ensure that teachers will modify their teaching practices to enhance student learning (Snow, Burns, and Griffin, 1998). Educators rarely change their teaching styles when the class size is reduced (Ehrenberg et al., 2001). Furthermore, class size reduction efforts are costly because they require increases in the number of teachers, classrooms, and classroom materials. Class size reduction must be accompanied by professional development and planning that support positive changes in instructional curriculum and strategies. Decisions about class size reduction policies also must acknowledge trade-offs in terms of costs typically allocated to other school resources.

While education researchers and economists debate the benefits of broadscale class size reduction efforts relative to the high costs of implementation, most seem to agree on the benefits of targeted class size reduction policies for select subpopulations of students (Ehrenberg et al., 2001; Hanushek, 2002; Krueger, 2002; Rice, 2002). Targeting class size reduction efforts to schools with high populations of children from minority and low-income families may be a more efficient intervention than broadscale reductions

for improving student outcomes. Targeted reeducation also may be an effective mechanism for increasing the equity of students' educational opportunities (Rice, 2002).

Early reviews of research on relationships between class size and academic achievement showed that children in kindergarten through third grade had higher achievement scores, on average, when enrolled in classes with fewer than 20 students and that the benefits were strongest for children from lower-income households (Glass and Smith, 1978; Robinson, 1990). A large randomized experiment on class size conducted from 1985 to 1989 in Tennessee, the Project Student Teacher Achievement Ratio (STAR), compared achievement outcomes for children randomly assigned in kindergarten through third grade to either small classes (13-17 students), full-size classes (22 – 26 students), or full-size classes with an instructional aide. Summaries of research using Project STAR data found that in kindergarten through third grade, children in the small classes had higher achievement and were more engaged in learning than those in the full-sized classrooms (Ehrenberg et al., 2001; Finn, Gerber, and Boyd-Zaharias, 2005). Furthermore, the benefits of small classes were greater for minority children, those living in inner cities, and those from lower-income households than for other children.

Results from a Wisconsin class size reeducation effort, the Student Achievement Guarantee in Education (SAGE) begun in 1996, were similar to those of the STAR project. In the SAGE study, low-income schools in the sample reduced class sizes to a maximum of 15, extended the length of the school day, increased the rigor of the curriculum, and implemented professional development (Smith, Molnar, and Zahorik, 2003). Compared with control schools, the SAGE school students, especially African American students, scored higher in reading and language arts between first and third

grade. However, the combination of reduced class sizes in the SAGE along with other interventions, such as the increased in-school time, make it difficult to determine whether the increases in achievement were a result of smaller class size, other interventions, or a mix of factors.

California also implemented a state-wide voluntary class-size reduction (CSR) policy in 1996 that reduced class sizes to a maximum of 20 students in kindergarten through third grade. An evaluation study of the California CSR program noted small gains in achievement for third and fourth grades but no differences in benefits relative to children's minority status, family income level, or home language (Stecher, Bohrnstedt, Kirst, McRobbie, and Williams, 2001). Teachers in the study reported spending more time in small-group and individualized instruction in reading and less time on disciplinary issues than teachers with larger class sizes; however, instructional activities and curriculum coverage were similar across different class size arrangements. Furthermore, the average teacher qualifications (i.e., education level, experience, and credentials) declined as the CSR program was implemented, especially in schools serving minority, low-income, and non-English families. The decline in average teacher quality in the CSR program complicates researchers' abilities to ascertain the effect of class size reduction efforts.

More recent work using national survey data from the ECLS-K presented mixed findings on the academic benefits of class size reduction efforts. One study that compared overall reading achievement outcomes for kindergartners in small (17 or fewer students), medium (18 to 23 students), and large classes (24 or more students) found no direct effects of class size arrangements on children's reading achievement (Milesi and

Gamoran, 2003). However, a separate study on ECLS-K data reported that children in classes with 25 or more kindergartners made smaller reading gains over the school year than children in classes that had 18 to 24 students (Walston and West, 2004). In summary, research on class size yields inconsistent results and no definitive evidence on the impact of class size arrangements on full-day kindergarten outcomes. Furthermore, few studies have explored relationships between class size and kindergartners' academic engagement. Thus, more research is needed on relationships between class size and children's reading achievement and their academic engagement to assess whether smaller classes are associated with more positive full-day kindergarten outcomes.

*Classroom instructional aides.* Classroom instructional aides can serve as an important resource in full-day kindergarten programs if they allow for more adult-child interaction during the learning process. Instructional aides can assist the teacher by working directly with individual or small groups of children while the teacher provides instruction to other children in the classroom or by providing administrative support so that teachers can focus on providing instruction (Gerber, Finn, Achilles, and Boyd-Zaharias, 2001; Karweit, 1988; Pianta et al., 2002; Walston and West, 2004). Advocates for instructional aides suggest that aides may be successful in fostering children's prosocial behavior, in positively affecting student engagement, and in affecting student achievement (Gerber et al. 2001). However, many of these suggestions are based on perceived benefits rather than empirical evidence.

The dissertation literature review identified few studies that explored the potential influences of instructional aides on kindergartners' achievement and no studies on the

potential influences of aides on kindergartners' academic engagement. Gerber and colleagues (2001) note that prior research on the effect of teacher aides is sparse, and many of the existing studies have methodological shortcomings.

The few studies that used more sophisticated methodological techniques found mixed results on the potential influences of instructional aides. The Project STAR randomized experiment detected no significant differences in children's achievement during a single school year from kindergarten through third grade for children in full-size classrooms with and without instructional aides (Ehrenberg et al., 2001; Finn, Gerber, and Boyd-Zoharias, 2005; Gerber et al., 2001). However, Gerber and colleagues (2001) found that children who were enrolled for multiple years in classrooms with instructional aides made greater progress in reading than children in similar-size classrooms that did not have an instructional aide. In another study based on the ECLS-K dataset, Black children in full-day kindergarten programs made greater reading gains during the school year when the class had an instructional aide assisting for at least one hour a day (Walston and West, 2004).

### *Instructional Practices*

Prior research on relationships between teachers' instructional practices and achievement has focused primarily on the upper elementary and secondary school grades (Guarino, Hamilton, Lockwood, and Rathbun, 2006). Given the growing recognition of the importance of early literacy development, education research must extend work on instructional approaches to include kindergarten settings. Studies should examine how teachers can use time effectively in a variety of activities, how they can vary time spent in different grouping arrangements, and how they can support students to keep them on

task (Stallings, 1980). Academic researchers, policymakers, and educators have emphasized various goals of kindergarten, including socialization; reading, writing, and mathematics achievement; readiness for first grade; and stimulation of creativity and independence (Bryant, Clifford, and Peisner, 1991; Spodek, 1988). Differences in kindergarten goals can lead to wide variation in instructional practices across schools. Changing goals also can lead to variation in practices over time. As a result, school systems may have a difficult time selecting the appropriate curriculum and teaching techniques for full-day kindergarten programs.

Research aimed at identifying quality reading instructional techniques can take two forms: 1) studies that describe teaching practices used by teachers who have been identified as ‘effective’ or ‘high quality’ and 2) studies that compare outcomes for children who are exposed to different types of teaching practices. The first form, based on ‘expert theory’, assumes that effective teachers have a stronger awareness and understanding of the elements of reading instruction because their extensive classroom experience enables them to test out what techniques do and do not work in the classroom (Pressley, Rankin, and Yokoi, 1996). While such studies help to identify practices deemed effective by teachers who receive high marks from their schools or districts, the findings do not provide direct evidence on the differential impact of such activities on children’s learning or academic engagement. The second form of research, which examines relationships between the use of specific instructional activities and student outcomes, provides more detailed findings on the relative benefits of different activities. Fenstermacher and Richardson’s 2005 article on the different aspects of “quality” teaching discusses the importance of considering both forms of research. They argue that

quality teaching requires not only “good teaching,” defined as instructional practice that accords with standards for subject matter content and instructional method, but also “successful teaching,” defined as practice that enables students to learn instructional content to an acceptable level of proficiency. The authors suggest that policy initiatives aimed at improving the quality of teaching could address either or both of these factors of student learning. This dissertation uses the second form of research that links teaching practices to child outcomes to identify successful teaching practices that increase children’s reading achievement and maintain or enhance their academic engagement.

Research on full-day kindergarten instruction must analyze both the content (i.e., what is taught) as well as the process (i.e., how it is taught) of teaching (Spodek, 1988). Educators are more effective when they recognize what their students are capable of learning and how students come to learn what they know. The content of kindergarten programs can be measured by the curriculum topics covered during the school year, while the process of kindergarten programs can be measured by the instructional activities and grouping strategies used to convey the curricular content. This section summarizes theory and research on four aspects of instructional practices: time allocation across instructional subjects, instructional grouping arrangements, reading curriculum focus, and reading instructional activities. The goal of this dissertation is not to identify whether some reading practices or perspectives are superior to others in terms of children’s reading development, but rather to explore how multiple time-related instructional practices are simultaneously associated with reading and academic engagement gains in full-day kindergarten programs.

*Time allocation across subjects.* Emphasis on the amount of in-school time spent on core instructional subjects (i.e., English/reading/language arts, mathematics, science, and social studies) increased in the 1980's and 1990's with the release of *A Nation at Risk* and the establishment of the National Education Goals Panel, and more recently with the passage of the *No Child Left Behind* (NCLB) Act. Between 1987-88 and 1993-94, the amount of time teachers spent in school with students in first through fourth grades did increase; however, the amount of instructional time spent in core subjects did not change substantially (Perie, Baker, and Bobbit, 1997). On average, public school teachers working in first through fourth grade classrooms in 1993-94 spent about 22 hours per week, or two-thirds of the school day, on core subjects, with almost half of the time spent on English, reading, and/or language arts. More recent research on instructional time allocation, collected in 1997 through teacher time-use diaries, noted similar time allocation to the core subject areas (i.e., 65 percent of the school day) for children in first through fifth grade (Roth, Brooks-Gunn, Linver, and Hofferth, 2003). In addition, the time diary study indicated that about 12 percent of the school day was allocated to enrichment activities (i.e., music, art, physical education, or religion classes). Neither study provided information on time allocation across subjects in kindergarten.

As schools work to meet the demands of high-stakes testing, if teachers do not integrate curriculum across subject areas schools may begin to reduce time in enrichment subjects such as art, music, and physical education so that more time can be spent on the core subjects of mathematics, science, English, language arts, and social studies (Coates, 2003; Pellegrini and Bohn, 2005; Roth et al., 2003; Wilkins, Graham, Parker, Westfall, Fraser, and Tembo, 2003). On the other hand, art, music, and physical education teachers

may reinforce aspects of the academic curriculum and tap into children's different learning styles by integrating academic concepts into their enrichment lessons. Advocates for enrichment instruction express concern about reductions in enrichment subject time because they stress that non-core subjects are necessary for young children's development and may be positively related with academic achievement (Crncec, Wilson, and Prior, 2006; Summerfield, 1998).

As noted previously, research tends to support the claim that the amount of time allocated to instruction in different subject areas is positively related to student learning and achievement in those particular subject areas (Berliner, 1990; Coates, 2003; Cotton, 1989; Guarino et al., 2006). For instance, kindergartners who received reading instruction for at least 90 minutes per day made greater progress in early reading skills than those who received less reading instruction (Guarino et al., 2006; Walston and West, 2004). Coates (2003) found that in third grade, children's reading grades were positively related not only by the amount of English instruction they received but also by the amount of math and social studies instruction they received. He also noted that the effectiveness of the amount of instructional time devoted to particular subjects was reduced as the class size increased; so, the benefits of increased instructional time were greater for small classes than for large classes.

A handful of studies examined relationships between the amount of time devoted to non-academic content areas (e.g., arts, music, and physical education) and children's reading achievement and academic engagement. A large study in Virginia compared the average amount of time devoted to art, music, and physical education in kindergarten through third grade with the mean third-grade passing rates on the Standards of Learning

(SOL) state assessment (Wilkins et al., 2003). The study did not find a significant relationship between the amount of time devoted to the three non-academic content areas and SOL passing rates, which the authors interpreted as an indication that reductions in art, reading, and physical education time were unrelated to higher passing rates on the state assessments. A recent meta-analysis examining relationships between music instruction and non-music outcomes found some evidence that music instruction was positively associated with spatiotemporal ability, but uncovered little evidence to support a linkage with children's reading or arithmetic achievement (Crnec, Wilson, and Prior, 2006). A more general review of arts education conducted by the Education Commission of the States (ECS) suggested a positive relationship between children's involvement in the arts and their school behaviors, attitudes, and performance and noted that in some studies arts instruction 'leveled the playing field' for children from socially disadvantaged backgrounds (ECS, 2004). In terms of physical education, a research review stated that structured physical activities were associated with increased academic performance, self-concept, mental health, energy expenditure, and development of motor skills needed to enjoy physical activities (Summerfield, 1998). Unfortunately, many of these research reviews did not provide detailed information on the studies they used to draw conclusions. The lack of empirical studies on relationships between non-academic instructional time and kindergartners' reading achievement and academic engagement points to the need for more research in this area to explore whether changes in time allocation might improve student outcomes.

*Instructional grouping strategies.* Teachers can use a variety of grouping arrangements, such as teacher directed whole-class, small-group, and individualized instruction, as well as child-selected activities to provide instruction in kindergarten classrooms. Whole-class activities emphasize uniformity over diversity of instruction (Lou, Abrami, Spence, Poulson, Chambers, and d'Apollonia, 1996). During whole-class instruction, teachers provide their students with the same learning experience by teaching the full group the same curriculum objective using the same instructional method.

In contrast, small-group instruction emphasizes diversity over uniformity of instruction. Small-group arrangements can be created in a variety of ways, including self-selection, random assignment, or teacher assignment based on students' skill and achievement levels. Heterogeneous small group arrangements may foster learning when higher performing students develop their explanatory skills by providing peer tutoring for the lower-performing students in their group (Lou et al., 1996). On the other hand, when students in small groups have a wide range of skills and abilities, group members may rely on the highest-performing student(s) to do most of the work, a strategy that results in less group interaction and less academic engagement for some members of the group.

In contrast to heterogeneous grouping, teachers may use within-class ability or achievement grouping to place students into smaller groups stratified by achievement, skill, or ability levels (Entwisle, 1995; Karweit, 1988; Lou et al., 1996; McCoach, O'Connell, and Levitt, 2006; Slavin, 1987). Compared with whole-class instruction, achievement grouping allows teachers to reduce heterogeneity and target instruction to match students' current level of knowledge and skills. Children's reading achievement group placement can determine the amount and type of instruction they receive; it can

influence the group process through the amount of disruptions and interruptions; and it can affect teachers' and parents' views of children (Entwisle, 1995; Slavin, 1987).

Opponents of achievement grouping express concerns that teachers may develop lower expectations for children in low achievement groups, that children in low achievement groups will fall further behind their higher-achieving classmates and never catch up academically, and that children's self-esteem will be adversely impacted (McCoach, O'Connell, and Levitt, 2006).

In addition to whole-class and small-group instruction, teachers may provide individualized instruction to children or may allow them time to select their own classroom activities. During teacher-directed individual activities, teachers can work one-on-one with children to present new material or provide remedial assistance (Morrow, Strickland, and Woo, 1999). Alternatively, teachers can provide children with time to self-select classroom activities, such as learning or play centers. Developmental, whole-language based classrooms tend to encourage child-selected activities based on the premise that they empower children to direct their own learning and choose activities in which they are interested (Xue and Meisels, 2004).

The use of different grouping strategies involves trade-offs in how instructional time is used in the classroom. As Karweit (1988) explains, "Individualized methods sacrifice instructional time for management time; whole-class methods trade appropriateness of instruction for coverage and pace (pg. 128)." Compared with teachers who use primarily whole-group instructional methods, teachers who use primarily one-on-one instructional techniques need to spend more time planning the curriculum and activities they will use with each student as well as more time planning activities for the

other students who are not meeting with the teacher so that students stay engaged in practicing skills. In addition, the teacher spends less direct instructional time with each student in order to have time to meet with each student in the classroom. However, the instruction provided in a one-on-one situation can be aligned more closely with students' current knowledge and learning style. Teachers who divide the classroom into smaller groups also must spend less time with each group than they would if whole-class instruction was used; and, they need to assign more independent seatwork for children not participating in the group (Slavin, 1987). In contrast, teachers who predominantly use whole-class instruction will move more quickly through the curriculum but may not be appropriately addressing the needs of individual students.

Research suggests a positive relationship between the use of within-class achievement grouping and children's achievement with the caveat that the effect differs across achievement levels. As recently as 1987, few researchers had studied the effects of reading achievement grouping or achievement grouping in the primary grades although evidence from mathematics achievement grouping research suggested that children of varying achievement levels all benefited from within-class grouping arrangements (Slavin, 1987). A later meta-analysis that compared homogeneous and heterogeneous grouping strategies found that lower-achieving children performed best in heterogeneous groups, middle-achieving children performed best in homogeneous groups, and higher-achieving children performed well in either type of group (Lou et al., 1996). The meta-analysis also reported larger effects of within-class achievement grouping practices for math and science than for reading or language arts.

Recent research using data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) examined relationships between grouping strategies and children's reading achievement. Kindergarten teachers report allocating about 38 percent of kindergarten instructional time to teacher-directed whole-class instruction, 27 percent to teacher-directed small-group instruction, 15 percent to teacher-directed individual activities, and 20 percent to child-selected activities (Walston and West, 2004). About one-quarter of full-day kindergarten classrooms used achievement grouping in reading on a daily basis, 35 percent on a weekly basis, and 38 percent on less than a weekly basis. Analyses of ECLS-K data on relationships between within-class achievement grouping strategies and children's early reading achievement had mixed results. One ECLS-K based study found a positive relationship between teachers' use of achievement grouping and children's gains in reading skills over the kindergarten year (McCoach, O'Connell, and Levitt, 2006) while a second study found no significant relationship between within-class achievement grouping in reading and reading gains during kindergarten (Walston and West, 2004). Results from the two ECLS-K studies may differ based on the way the achievement-grouping variable was incorporated into the analysis. Walston and West (2004) used an indicator variable of reading achievement grouping that identified whether teachers used achievement groups at least weekly and for more than 15 minutes per day to compare reading gains, whereas McCoach (2006) and colleagues used a continuous measure of the frequency of reading achievement grouping to compare reading gains.

*Curriculum focus in reading instruction.* Kindergarten teachers expose children to a range of literacy and language curriculum that establishes the building blocks for their reading development. Early childhood experts recommend that children learn about content such as the alphabetic principle, letter - sound correspondence, phonemic segmentation of sounds in words, vocabulary, concepts of words, rhyming patterns, decoding skills, writing skills, and relationships between oral and written language (NAEYC, 1998; Morrow, Strickland, and Woo, 1999; Neuman, 2002; Snow, Burns, and Griffin, 1998). Children also should learn the structural elements and organization of print (e.g., words, punctuation) and become familiar with the forms and formats of books and other print resources. In addition, reading experts recommend that teachers provide instruction in text comprehension that includes skills of retelling stories, responding to questions about story content, and identifying elements of story structure (Morrow, Strickland, and Woo, 1999).

Researchers find positive relationships between children's exposure to reading curriculum and their reading achievement. A summary of research on effective reading instruction indicated that instruction on phonemic awareness, word study, and decoding skills in kindergarten was positively associated with children's reading development (Neuman, 2002). Snow and colleagues' 1998 synthesis of research on reading instructional practices stated that children who received instructional training in letter knowledge and phonological awareness (i.e., knowledge that words are composed of smaller speech elements) learned to read more quickly than those without such training. More recently, a study using ECLS-K data showed that children's gains in reading achievement over the kindergarten year were positively related to the frequency that

teachers provided instruction on letter-sound skills (e.g., alphabet and letter recognition, rhyming words, letter-sound matching) and reading and writing skills (e.g., vocabulary, composing and writing sentences, reading multi-syllable words, composing stories with a beginning, middle, and end, and using capitalization and punctuation) (Guarino et al., 2006). On the other hand, the frequency of instruction in comprehension strategies (e.g., identifying main parts of stories, making predictions based on text, understanding common prepositions) was not significantly related to reading gains in kindergarten.

*Instructional activities.* Since the 1960's, early childhood educators have debated the merits of two perspectives on early reading instruction: an emphasis on 'breaking the code' (i.e., a phonics-based approach based on systematic instruction on letter-sound relationships) versus an emphasis on 'meaning' (i.e., a whole-word or whole-language approach to reading instruction based on a literature-rich environment with isolated reading skills taught in context) (Chall 1967; 1996; Pearson 2004; Xue and Meisels, 2004). Phonics-based instruction focuses on providing formal instruction that emphasizes sound-symbol correspondence in an effort to help children 'break the code' to reading (Sacks, and Mergendoller, 1996; Xue and Meisels, 2004). It often includes explicit instruction in phonemic awareness, letter recognition, attention to the sounds of words, blending of sounds, practice in reading and writing words, and knowledge of comprehension strategies (Pressley, Rankin, and Yokoi, 1996). In contrast, whole-language instruction focuses on having children learn at their own developmental pace through social interaction in language rich environments and through exposure to quality literature (Sacks and Mergendoller, 1997; Xue and Meisels, 2004). In this approach, any

skill instruction occurs within the context of natural reading, and only as needed by individual students (Pressley, Rankin, and Yokoi, 1996).

The continuing ‘reading wars’ over phonics-based versus whole-language instructional perspectives in which policy advocates for each side firmly support their particular stance and do not want to yield any ground to their opponents’ positions have resulted in pendulum swings over time between the two instructional approaches. In some cases, where research is limited, advocates make claims about the merits of instructional approaches on the basis of ideological beliefs rather than empirical evidence (Jeynes and Littell, 2000; Pearson, 2004).

Although some proponents for phonics- and whole-language based reading instructional approaches continue to argue as if the two perspectives are mutually exclusive, recently many reading experts have suggested instead that the two approaches may serve complimentary purposes and that they are often used in combination in most classrooms. Studies on reading instructional approaches tend to support a mixed approach of balancing instruction that includes both systematic code instruction along with meaningful reading and writing activities (Guarino et al., 2006; NAEYC, 1998; Pressley, Rankin, and Yokoi, 1996; Snow, Burns, and Griffin, 1998; Xue and Meisels, 2004). Researchers note two reasons why it is difficult to consider classrooms as being strictly ‘phonics-based’ or ‘whole-language based’ in their approaches to reading instruction and why it is difficult to compare the effectiveness of the two instructional perspectives (Sacks and Mergendoller, 1997). First, the meanings of the two instructional approaches are not well defined, in that it is difficult to specify a distinctive set of instructional practices that characterize each of them. Second, it is difficult for to make pure contrasts

between phonics-based and whole-language based classrooms because teachers tend to be eclectic in their instructional approaches because they use teaching practices that may span both instructional philosophies.

The ‘reading wars’ are embedded within larger debates about the nature of kindergarten instructional environments that are often characterized as being either ‘developmental’ or ‘academically directed’ in nature (Spodek, 1988). Labels used by researchers and education experts to describe classroom practices and settings similar to those in developmental classrooms include “developmentally appropriate practices (DAP),” “child-initiated classrooms,” or “reform based classrooms.” Academically directed classrooms are labeled in education research as “didactic kindergartens” or sometimes “developmentally inappropriate practices (DIP) kindergartens.” For this dissertation, the terms “developmental” and “academically directed” will be used to designate the two instructional philosophies. The debate over appropriate kindergarten instructional environments centers around the tension educators may experience over whether to let children “bloom naturally” at their own pace in a developmentally-based classroom or to provide teacher-directed academic “training” to prepare kindergartners with the skills they need to be successful students. This dissertation includes instructional practices that are associated with each of the reading instructional philosophies to ascertain whether certain types of practices are related positively to children’s reading achievement and academic engagement.

Researchers describe developmental classrooms, characterized by a consistent use of diverse, child-initiated activities, as being organized for individualized learning experiences according to children’s individual, developmental, and cultural

characteristics (Huffman and Speer, 2000). Teachers of developmental classrooms typically emphasize whole-language reading instructional methods over phonics-based methods. Such settings provide choice and an assorted set of activities for children to explore in a play-like setting (Stipek, Fieler, Daniels, and Milburn, 1995). Developmental classrooms allow children freedom to initiate tasks that may enable them to complete projects without pressure to conform to a particular model. In such settings, early childhood experts suggest that young children will choose more challenging tasks and rely less on adults for approval. However, some studies suggest that children from lower SES backgrounds or those with fewer pre-reading skills at kindergarten entry may learn more from discrete, phonics-based skills instruction than from whole-language approaches because they do not enter school with as much knowledge about written language as their peers (Jeynes and Littell, 2000).

In contrast to developmental kindergartens, academically directed classrooms are characterized as settings that emphasize basic skills and use highly-structured, direct teaching approaches with extensive time devoted to whole-group instruction (Huffman and Speer, 2000; NAEYC, 1998). Examples of academically-directed classroom activities include the use of workbooks and worksheets and practice on isolated skills (Burts et al., 1992). Academically directed classrooms typically use phonics-based instruction rather than whole-language instruction to teach young children to read. Such classrooms also focus on the amount of academic time allocated to differentiated subject areas (Stipek et al., 1995). Advocates of academically directed classroom settings suggest that the basic skills training provided in academically directed classrooms may help young children experience success in school, which can build their self-confidence and

promote their interest and motivation for further learning (Stipek et al., 1995). Opponents of academically directed instruction suggest that such an approach may inhibit intellectual development directly by focusing on rote learning of simple concepts instead of helping children gain a real understanding of material and develop problem solving skills. Such environments also may decrease children's motivation and bring about negative feelings about school (Valeski and Stipek, 2001).

As noted earlier in this section, early childhood experts suggest that a range of potentially effective reading instructional activities, including both phonics-based and whole-language-based techniques, are beneficial for children's early reading development. For instance, kindergarten teachers should read a variety of materials daily to children and have children read independently during classroom reading instruction (Morrow, Strickland, and Woo, 1999; Neuman, 2002; Snow, Burns, and Griffin, 1998). During reading instruction, teachers can initiate discussions about story authors, central characters, and concepts; engage children in making predictions and explaining characters' motives; and ask children to reflect on the meaning and message of material they have read or heard. Given the link between reading and writing skills, early childhood experts recommend that teachers have children write for a variety of purposes (e.g., lists, stories, poems, and messages) and that they encourage the use of invented spelling while moving over time to conventional forms (Snow, Burns, and Griffin, 1998).

Empirical research on reading instructional activities tends to support the recommendation that teachers provide a balance of phonics and whole-language instructional approaches in kindergarten, although findings vary across studies. A review of studies that compared phonics-based and meaning-based instruction found that

students in phonics-based classrooms scored higher in word recognition, spelling, and vocabulary, while students in whole-language classrooms exhibited higher levels of academic engagement and interest in reading than their peers in phonics-based classrooms (Xue and Meisels, 2004). In their empirical study of ECLS-K data, Xue and Meisels (2004) noted that teachers tended to use both phonics and whole-language instructional activities and that the frequency of both approaches was positively related to children's reading development and their approaches to learning in kindergarten. Guarino and colleagues' (2006) research on ECLS-K data found positive relationships between kindergartners' reading gains and the frequency that their teachers use didactic activities (e.g., reading worksheets and workbooks, basal reading texts) and reading and writing activities (e.g., reading self-selected books, writing stories in a journal, reading aloud and silently). On the other hand, the authors did not find significant relationships between reading outcomes and the frequency of student-centered reading activities (e.g., retelling stories, doing projects related to books/stories, performing plays or skits).

Phonics and whole-language strategies may enhance different domains of children's early development. Stipek and colleagues (1995, 1998) observed that children in programs that focused on rote reading skills knowledge had stronger reading skills at the end of kindergarten (Stipek et al., 1995; Stipek, Fieler, Byler, Ryan, Milburn, and Salmon, 1998). A meta-analysis of reading instructional practices conducted by the National Reading Panel (2000) provided evidence that phonics instruction was more beneficial than non-phonics instruction for increasing children's skills in decoding and word recognition during kindergarten and first grade, especially for socially disadvantaged children.

In terms of socio-emotional development, results from studies seemed to indicate that developmental classrooms foster more positive adjustment to school than academically directed classrooms. For instance, children in developmental classrooms selected more challenging tasks and were less dependent on adults to help them with their work (Stipek et al., 1995). In contrast, children in academically directed classrooms that focused on basic skills reported more negative feelings about school than those in developmental classrooms (Valeski and Stipek, 2001).

Early childhood reading experts recommend that teachers adapt their instructional strategies or provide more individualized instruction for children with below- or above-average skills because reading instructional practices may have different effects for children from different social and academic backgrounds (Guarino et al., 2006; NAEYC, 1998; Snow, Burns, and Griffin, 1998; Xue and Meisels, 2004). Research is inconclusive on the benefits of phonics-based versus whole-language based instructional practices for children from different sociodemographic backgrounds. Xue and Meisels (2004) noted similar benefits of phonics instruction for children from different SES backgrounds but differential benefits of whole-language activities. Specifically, children from higher-SES backgrounds benefited more than children from lower-SES backgrounds from whole-language instruction. A separate study demonstrated that children with low initial reading scores made greater progress in whole-language classrooms than in phonics-based classrooms, while children with higher initial skills had similar reading progress in either phonics or whole-language instructional settings (Sacks and Mergendoller, 1997). Similarly, Huffman and Spear (2000) found that children from urban, lower-income backgrounds scored higher on letter-word identification and applied problems skills when

they were in classrooms with a developmental approach. In contrast, a meta-analysis comparing whole-language, basal, and eclectic reading instruction indicated that primary grade children from lower-SES households performed better on a variety of reading measures if they received basal versus whole-language instruction (Jeynes and Littel, 2000). In terms of learning behaviors, children with lower initial skills were less academically engaged in phonics-based classrooms than their peers with higher initial skills, while academic engagement levels in the whole-language classrooms were similar across initial skill levels (Sacks and Mergendoller, 1997).

This dissertation does not attempt to provide a definitive answer to debates over which instructional philosophy (i.e., phonics-based versus whole-language based approaches; developmental versus academically-directed environments) is better for improving children's kindergarten outcomes. Rather, this study explores the degree to which multiple instructional practices are associated with children's gains in reading achievement and engagement, both in terms of the unique contribution of individual practices as well as the interaction of classroom practices with child outcomes.

In summary, prior research on different types of kindergarten classroom factors demonstrates that a range of instructional resources and teaching practices may be significantly related to children's early reading achievement and their academic engagement. However, individual study findings on the benefits of different classroom factors vary considerably and studies differ in the degree to which they have explored benefits across different outcomes and for different subpopulations of children. Thus, this dissertation aims to fill an important gap in the current literature base by exploring the

potential influence of multiple classroom factors on full-day kindergartners' reading achievement and academic engagement.

### *Limitations of Prior Research*

Results from the review of the existing literature on kindergarten goals, full-day kindergarten effectiveness, and relationships between classroom factors and child outcomes indicate that further evidence is needed on how full-day kindergarten instructional time can be structured to improve children's reading achievement and academic engagement and to reduce inequities in the social distribution of kindergarten outcomes. A major limitation of prior full-day kindergarten studies is that they focus on comparing outcomes of children in full- and part-day programs, rather than on comparing outcomes for children in full-day programs with different instructional environments to identify which classroom factors may be associated with stronger outcomes.

Second, much of the research on kindergarten program outcomes tends to focus on one or two classroom factors, such as comparisons of the effects of different grouping strategies or different class size arrangements but does not look at multiple classroom factors simultaneously to see which factors are related to kindergarten outcomes and to see if factors interact in their relationship with outcomes. Research has clearly identified the components of early childhood programs but it has not clarified how different components work in combination to influence student outcomes (Takanishi and Bogard, 2007). This dissertation extends prior research on full-day kindergarten effectiveness by focusing only on full-day kindergarten classroom settings and by simultaneously modeling several classroom factors that may be influenced by additional time – class

size, presence of an instructional aide, time allocation to subject areas, instructional grouping strategies, and reading instructional curriculum and activities.

Third, prior research on kindergarten effectiveness is limited in that many studies focus on a single, typically academic, outcome. This study examines both academic and behavioral outcomes of kindergarten classroom factors to assess whether classroom factors that increase reading outcomes also increase academic engagement.

Finally, much of the research on full-day kindergarten outcomes, instructional resources, and instructional practices is based on small-scale samples of selected schools or regions; as a result, the findings may not generalize to the population of full-day kindergarten programs and children. Using the large nationally-representative sample data provided in the ECLS-K, this study helps to build the current literature base on the relationship between full-day kindergarten classroom factors and the social distribution of children's progress in reading and academic engagement.

## Chapter 3: Methodology

This dissertation is 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 student, the classroom, and the school level (Bryk and Raudenbush, 1992; Lee, 2000; Odden, Borman, and Fermanich, 2004; Raudenbush and Bryk, 2002). Chapter 1 provided a conceptual map (figure 1) of the hypothesized relationships between full-day kindergarten instructional resources, teachers' instructional practices, family socioeconomic status (SES), and full-day kindergartners' reading achievement and academic engagement. Consistent with a school effects framework, the figure demonstrates the potential links between children's developmental outcomes, classroom factors, and school characteristics. The key relationships of interest in this study are the associations between kindergarten classroom factors (i.e., time-related instructional resources and teachers' instructional practices) and full-day kindergartners' gains in reading achievement and academic engagement over the school year. Specifically, the dissertation focuses on four research questions:

1. *What influence do different full-day kindergarten classroom factors (i.e., instructional resources and teachers' instructional practices) have on children's reading achievement? Do these factors help to explain variations between schools in average reading achievement in kindergarten?*

2. *Do these full-day kindergarten classroom factors differentially influence the reading achievement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average reading achievement of children from different socioeconomic backgrounds?*
3. *What influence do full-day kindergarten classroom factors have on children's academic engagement? Do these factors help to explain variations between schools in average academic engagement in kindergarten?*
4. *Do these full-day kindergarten classroom factors differentially influence the academic engagement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average academic engagement of children from different socioeconomic backgrounds?*

The chapter begins with a description of the data source and the analytic sample used to explore the four research questions. It continues with a description of the data collection instruments and variables used for analysis, and it concludes with an explanation of the analytic procedures used in the study. Information about the data source for this study – the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) – draws heavily from the *ECLS-K Base Year User's Manual* (USDE, 2004) and the *ECLS-K Psychometric Report for Kindergarten and First Grade* (Rock and Pollack, 2002).

#### *Description of the Data Source*

Data for this dissertation 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 1,277 schools with kindergarten programs in the 1998-99 school year. The sample represents almost 4 million children enrolled in kindergarten in the fall of 1998. Approximately 52 percent of children in public schools attended kindergartens identified by schools as being "full-day" programs, which met between two to five days per week and between two to eight hours per school day.

Sample selection for the ECLS-K was based on a multi-stage probability sampling design. At the first stage, NCES sampled 100 primary sampling units (PSUs) consisting of counties or groups of counties from the full set of 1,404 PSUs in the United States. Second, schools with kindergartens were sampled within PSUs based on probability proportional to size, with public schools sampled from a public school sampling frame and private schools sampled from a private school sampling frame. Third, approximately 23 children were sampled in the fall of 1998 from each of the sampled schools. The ECLS-K oversampled private schools, private school children, and Asian/Pacific Islander children to provide adequate sample sizes for statistical comparisons of subpopulations. The overall child assessment completion rate in the kindergarten year was 92 percent and the parent interview completion rate was 89 percent. The weighted school response rate in kindergarten was 74 percent (USDE 2004).

### *Weights*

Due to the complex sample design of the ECLS-K study, analysts must use sampling weights to adjust for the differential probabilities of sample selection and the effects of non-response for subgroups of the population when producing population

estimates and making statistical comparisons. The ECLS-K dataset provides several types of sampling weights that are appropriate for different units of analysis (i.e., child, teacher, school) and combinations of data collection rounds and survey instruments. The missing data analysis in this study used a cross-sectional child weight (C1CW0) to compare characteristics of the study sample to the full ECLS-K sample; this weight includes all ECLS-K children who participated in at least the first round of data collection. The descriptive child-level analyses of SES differences in child outcomes and school-averaged classroom factors used the ECLS-K child panel weight (BYCOMW0); this weight is appropriate for analyses that include children who participated in both the fall and spring kindergarten assessments and who had at least one round of parent and/or teacher information. The final analyses of relationships between classroom factors and child outcomes used the school non-response adjusted base weight (SCHBSW0 X R12SC\_F0) and the child within-school weights (WS\_CWGT), available on an NCES supplemental public-use data file, to account for the nested sample design.

### *Analytic Sample*

Although the full ECLS-K sample includes data for 21,260 kindergartners, the analytic sample used to explore the research questions includes fewer cases. The analytic sample includes children who began kindergarten in the fall of 1998 and 1) were enrolled in a public school, full-day kindergarten program that met daily for at least 5 hours a day; 2) remained with the same teacher across the kindergarten year; 3) had complete reading and academic engagement outcome data in the fall and spring of kindergarten; 4) had complete teacher data on the classroom factors of interest; and 5) had complete data on the basic set of school variables included in analysis. Based on these criteria, the analytic

sample includes 4,654 first-time, full-day kindergartners enrolled in 1,192 classrooms in 331 public schools.

Missing data analyses (i.e., *t* test comparisons) were conducted between the analytic sample and the full sample of public school kindergartners enrolled in full-day programs to identify differences between the two sample distributions that might limit the generalizability of the study's findings. Characteristics of the analytic sample also were compared with characteristics of the excluded sample of full-day kindergartners. Table 1 presents the distribution of selected child, family, and school characteristics for the full ECLS-K sample, the dissertation analytic sample, and the excluded cases sample. For this comparison, the full sample column ( $n = 5,908$ ) includes all ECLS-K children enrolled in a public school full-day kindergarten that met daily for at least five hours per day. The full sample does not include private school children in full-day programs or children who attended programs that were labeled as "full-day" programs but met less than five days per week and/or met less than five hours per day. The analytic sample column ( $n = 4,654$ ) includes children who were part of the full sample and who 1) stayed in the same classroom all year; 2) had complete reading and academic engagement scores; and 3) had complete data on the classroom and school factors included in the dissertation. The excluded cases ( $n = 1,241$ ) include children in the full sample who had missing data on at least one kindergarten reading or academic engagement measure ( $n = 908$ ) or who had missing data for at least one of the school variables ( $n = 333$ ) used in analyses.

**Table 1. Comparisons of the percentage and mean estimates for the full ECLS-K sample and the dissertation analytic sample: 1998-99**

Characteristics	Full sample (n=5,908)		Analytic sample (n=4,654)		full vs. analytic t-value	Excluded sample (n= max of 1,241)		analytic vs. excluded t-value
	Percent	s.e.	Percent	s.e.		Percent	s.e.	
	Percentages							
Child's gender								
Male	50	0.6	50	0.6	-0.118	50	1.6	0.000
Female	50	0.6	50	0.6	0.118	50	1.6	0.000
Child's race/ethnicity								
White, non-Hispanic	52	2.7	56	3.0	-1.065	32	3.1	<b>-5.540</b>
Black, non-Hispanic	26	2.3	25	2.7	0.085	27	2.9	0.454
Hispanic	16	1.7	12	1.3	1.869	35	4.2	<b>5.231</b>
Asian/Pacific Islander	3	0.6	3	0.5	0.256	4	0.8	1.484
Other, non-Hispanic	4	1.5	4	1.8	-0.085	3	1.0	-0.631
Non-English primary home language	10	1.1	5	0.6	<b>3.512</b>	30	4.0	<b>6.131</b>
Single-parent household	29	1.6	28	1.7	0.214	31	2.4	1.020
	Means							
Age at fall K assessment	68.5	0.11	68.5	0.12	0.000	68.5	0.18	0.000
Socioeconomic status (SES)	-0.18	0.03	-0.12	0.03	-1.323	-0.44	0.04	<b>-6.096</b>
Percent minority in classroom	46.5	2.76	42.8	2.98	0.911	63.5	2.83	<b>5.037</b>
Entering reading score	21.4	0.26	21.6	0.28	-0.523	20.1	0.36	<b>-3.289</b>
Entering engagement score	2.9	0.16	3.0	0.18	-0.415	2.8	0.03	-1.096

NOTES: T-values in bold font have a p-value less than .05. Full sample = all public school, first-time kindergartners attending full-day kindergarten at least 5 hours/day for 5 days/week. Analytic sample = children in full sample who stayed in the same classroom all year and who had complete reading and academic engagement scores and data on the classroom and school factors included in the dissertation. Excluded sample = children in the full sample who had missing data on the reading, academic engagement, or classroom/school variables used in analyses. Estimates weighted by C1CW0.

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.

Results from the missing data analysis indicate that the weighted estimates for the analytic sample used in the dissertation are similar to the weighted estimates for the full ECLS-K sample of public school children who attended full-day kindergarten on a daily basis for at least five hours a day. The full sample and analytic sample show similar distributions in terms of children's gender, race/ethnicity, age at the time of the fall kindergarten assessment, and entering reading and academic engagement scores. In addition, both samples include similar percentages of children in single-parent households and have similar mean family SES values. However, the analytic sample includes a significantly smaller percentage of children who come from homes where English is not the primary language (5 percent) compared with the full sample (10 percent). This difference is due to the fact that the ECLS-K reading assessments were only administered in English, so children with limited English skills did not participate in that portion of the ECLS-K assessments and thus did not have reading scores for the fall of kindergarten. The next section presents more detail on the exclusion procedures related to children's English skills.

Comparisons between the analytic and excluded cases sample indicate that the excluded sample is significantly different from the analytic sample on many of the selected characteristics. The excluded sample includes a higher weighted percentage of Hispanic children (35 percent) and a lower percentage of White children (32 percent) than the analytic sample (12 percent and 56 percent, respectively). The excluded sample also includes a larger percentage of children who come from homes where English is not the primary language (30 percent vs. 5 percent). Children from the excluded sample are more likely than children in the analytic sample to live in lower-SES households.

Furthermore, children from the excluded sample had lower reading scores, on average, on the fall ECLS-K reading assessment. On the other hand, the analytic and excluded samples had similar distributions in terms of children's age, gender, family type (i.e., single-parent household), and academic engagement scores in fall kindergarten. In summary, although the analytic sample and excluded sample have noticeable differences in their characteristics, the analytic sample does not deviate substantially from the full sample of public school full-day kindergartners.

### *Data Collection Instruments*

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. This study uses data collected during the kindergarten year in the fall of 1998 and the spring of 1999.

The ECLS-K included direct assessments of children's cognitive skills and teacher ratings of children's socio-emotional skills in the fall and spring of children's kindergarten year. Parents provided information through computer-assisted telephone interviews (CATI) in the fall and spring about themselves, their children, and the home environment. Teachers completed self-administered paper and pencil questionnaires in the fall and spring about themselves, their students, and the classroom environment. School administrators also completed paper and pencil questionnaires about students, staff, and the school environment in the spring of the kindergarten year. The following sections provide more details about the ECLS-K data collection instruments and variables used in the dissertation.

### *Direct Cognitive Assessments of Children*

Trained ECLS-K assessors used computer-assisted personal interviews (CAPI) to conduct one-on-one testing with sample children on a cognitive assessment developed specifically for the ECLS-K. The ECLS-K cognitive assessment batteries measure children's cognitive status in kindergarten, first, third, fifth, and eighth grades and provide a means of measuring academic growth since children's entry into kindergarten. An expert team consisting of item developers from Educational Testing Service (ETS), elementary school curriculum and content area specialists, and elementary school teachers reviewed and selected a pool of assessment battery items from existing published tests, including the Peabody Individual Achievement Test-Revised (PIAT-R), the Peabody Picture Vocabulary Test – Revised (PPVT-R), the Primary Test of Cognitive Skills (PTCS), the Test of Early Reading Ability (TERA-2), the Test of Early Mathematics Ability (TEMA-2), and the Woodcock-Johnson Tests of Achievement-Revised (WJ-R). The team also developed new assessment items that could be used to measure children's cognitive achievement longitudinally (Rock and Pollack, 2002).

Prior to administering the cognitive batteries, the ECLS-K assessors administered a brief language screener, the Oral Language Development Scale (OLDS), to children identified by the school staff as coming from a family that spoke a language other than English. The OLDS assessment measured whether children understood English well enough to take the ECLS-K direct assessments in English. Children who passed the OLDS then participated in the full ECLS-K cognitive battery in English. Those who did not pass the OLDS participated in a reduced version of the ECLS-K battery, which did not include the English versions of the cognitive assessments. For subsequent rounds of

data collection, ECLS-K assessors re-tested all children who did not pass the OLDS in the prior round and administered the full ECLS-K battery in English once the children passed the OLDS screener.<sup>1</sup> In the fall of kindergarten, 42 percent of children from Spanish-speaking homes passed the OLDS and participated in the cognitive assessments in English, as did 61 percent of children from other non-English speaking homes. All of the children in the dissertation analytic sample participated in the English versions of the assessments in both the fall and spring of the kindergarten year.

Assessors typically conducted the cognitive assessments in a school classroom or library. Kindergartners took assessments in three domains: reading, mathematics, and general knowledge (a combination of science and social studies content). The assessment battery for each subject area was identical for the fall and spring administrations. To reduce the testing burden on children, the three cognitive assessment batteries were developed as two-stage tests. In the first stage, all children responded to a routing test with a common set of items in each subject area. Depending on the number of items children answered correctly, assessors routed them to one of the second stage forms, which varied in difficulty. On average, the child assessment took about 50 to 70 minutes to administer to each child, including time spent measuring children's height and weight and assessing their fine and gross motor skills in the fall of kindergarten. After completing the direct assessment, the assessors gave children an ECLS-K bookmark and stickers as a thank-you incentive.

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<sup>1</sup>The ECLS-K Base Year User's Manual (USDE, 2004) provides more details on the OLDS screening procedures and content.

This dissertation focuses on data collected from the fall and spring kindergarten reading assessments. The Variables description section provides more details about the content of the reading assessment and the corresponding test scores.

### *Parent Interviews*

At each round of data collection, ECLS-K staff conducted computer-assisted telephone interviews (CATI) with parents. Parents reported on several different topics, including information about their child, the home environment, parent-child interactions, childcare arrangements, and parent involvement in school. In addition, parents provided information about characteristics of their family and household, such as income, family structure, parental education, and other topics (USDE, 2004). The interview averaged about 50 minutes in the fall and 65 minutes in the spring. . Most interviews were conducted in English; however, NCES made provisions to interview parents who spoke only Spanish, Lakota, Hmong, or Chinese. After completing the interview, parents received a thank-you incentive pamphlet, “Learning Partners – A Guide to Educational Activities for Families”. This dissertation focuses on parent interview variables regarding child demographic information and family socioeconomic status (SES), which are described in more detail in the Variables section.

### *Teacher Questionnaires*

In the fall of the school year, kindergarten teachers completed three different types of self-administered paper and pencil questionnaires. The first questionnaire (Fall Part A) asked about the composition and demographics of the children in the teacher’s classroom. The second questionnaire (Fall Part B) asked about classroom organization,

instructional practices, evaluation methods, teacher attitudes and opinions about kindergarten readiness, teaching, school climate, and teacher background. For each sampled child in the classroom, teachers also completed a third questionnaire (Fall Part C) that asked about the child's academic performance and social skills. As an incentive, NCES reimbursed teachers seven dollars for each child-level Part C questionnaire that they completed and returned. On average, teachers spent about 30 minutes completing the Part A and Part B questionnaires, and about 10 minutes per Part C questionnaire.

In the spring of kindergarten, all teachers completed a questionnaire (Spring Part A) that covered topics similar to those in Fall Parts A and B and they completed a Part C questionnaire for each sampled child. In addition, teachers who were new to the study completed a short (Part B) questionnaire about their personal demographics and professional background. The spring Part A questionnaire took about 30 minutes to complete, Part B took about 15 minutes to complete, and each Part C questionnaire took about 10 minutes to complete (USDE 2004).

Part C of the fall and spring teacher questionnaires included the Social Rating Scale (SRS),<sup>2</sup> an indirect assessment of children's approaches to learning, self-control, interpersonal skills, and problem behaviors. The SRS included 24 individual items about the frequency of children's classroom behaviors, each rated on a scale with values of 1 (Student never exhibits this behavior), 2 (Student exhibits this behavior occasionally or sometimes), 3 (Student exhibits this behavior regularly but not all of the time), and 4 (Student exhibits this behavior most of the time). Teachers completed the SRS in the fall and spring of the kindergarten year for each sampled child in their classroom. NCES used

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<sup>2</sup>The SRS was adapted with permission from the Social Skills Rating System (SSRS) (Gresham and Elliott, 1990).

factor analytic procedures to scale the 24 behavior items into five scales: *Approaches to Learning*, *Self-Control*, *Interpersonal Skills*, *Externalizing Problem Behaviors*, and *Internalizing Problem Behaviors*. The scale scores on the ECLS-K data file represent the mean ratings across all of the individual item ratings that comprise the scale; thus, the scale scores also ranged from 1 to 4. Children received a scale score if the teacher rated them on at least two-thirds of the items that composed the scale (USDE 2004).

This dissertation uses data collected in several of the teacher questionnaires. The Variables section of this chapter provides more detail on the specific teacher questionnaire variables used in the study.

#### *School Administrator Questionnaire*

School administrators completed a self-administered paper and pencil questionnaire in the spring of the school year that collected data on the school, student characteristics, teachers, school policies, and administrator characteristics (USDE 2004). Schools did not receive an incentive for completing the school administrator questionnaire; however, they did receive reimbursement for providing information on other school data collection instruments (i.e., five dollars for each completed student record form). The school administrator questionnaire took about 45 minutes to complete. This dissertation focuses on information about the student socio-demographic characteristics and the school locale, which are described in more detail in the Variables section below.

## *Variables*

This section describes the dependent, independent, and control variables used in the dissertation. Table 2 provides a complete list of the variables included in the study.

### *Dependent Variables*

The two dependent (outcome) variables of interest in this dissertation are children's gains in their reading achievement and their academic engagement over the kindergarten year (i.e., from fall 1998 to spring 1999). Below is a description of each outcome measure.

*Kindergarten reading achievement gains.* The difference between children's item response theory (IRT) scale scores on the fall and spring kindergarten reading assessments is used as the outcome measure for the first two research questions. The reading gain score reflects change in children's knowledge of basic skills (e.g., print familiarity, letter and word recognition), receptive vocabulary, and comprehension. The ECLS-K reading scores were developed using Item Response Theory (IRT). These scores can be compared across children regardless of which second-stage form a particular child received. IRT procedures place each child on a continuous ability scale based on patterns of correct, incorrect, and omitted responses to the administered test items, which vary in difficulty, discrimination, and "guess-ability". The ECLS-K includes transformations of children's ability scale scores on the assessment battery to indicate the number of test items children would have answered correctly in a particular subject area if they answered the full set of items on the first- and second-stages of the assessment, even

though each child only responded to a subset of items based on their routing test performance (USDE, 2004).

Children's kindergarten reading gains scores ranged from -12.6 points to 43.6 points, with a mean of 10.8 points and a standard deviation of 6.2 points. The reliability of the kindergarten reading assessment, based on the variance of repeated estimates of theta, was .95 (USDE, 2004). For the dissertation, the difference in the fall and spring IRT scale scores was standardized for the analytic sample with a mean of zero and a standard deviation (SD) of one to present results as effect sizes (in SD units).

*Kindergarten academic engagement gains.* The difference between children's scores on the *Approaches to Learning* scale from the fall and spring teacher Social Rating Scales (SRS) is used as the outcome measure for the third and fourth research questions. The *Approaches to Learning* scale is based on teachers' ratings of children's attentiveness, task persistence, eagerness to learn, independence, flexibility, and organization. The scale measures children's task orientation and serves as a mechanism to understand the personalities of children and their dispositions toward learning (Meisels, Atkins-Barnett, and Nicholson, 1996). Some researchers view this scale as a proxy for children's academic engagement because it reflects aspects of their learning behaviors that can have an impact on their later achievement (Finn and Pannozzo, 2004; Xue and Meisels, 2004).

**Table 2. ECLS-K data file variables used in the dissertation**

Variable type	Variable name	Description
Outcome measures	readgain	Kindergarten reading gain: difference between children's spring (C2RSCALE) and fall (C1RSCALE) kindergarten reading scale scores
	engagegn	Kindergarten academic engagement gain: difference between children's spring (T2LEARN) and fall (T1LEARN) kindergarten approaches to learning scores (teacher-reported)
Child socioeconomic status (SES)	WKSESL	Composite variable based on mother's and father's education, occupational status, and household income (parent-reported)
Child-level control variables	C1RSCALE	Fall kindergarten reading scale score (direct child assessment)
	T1LEARN	Fall kindergarten approaches to learning score (teacher-reported)
	GENDER	Child's sex
	RACE	Child race
	R1_KAGE	Child's age at time of assessment
	ELAPSEA	New composite of elapsed time (in days) between fall and spring SRS
Classroom resource variables (aggregated to school level)	A1TOTAG	Total class enrollment
	A2REGWRK	Hours/day a regular classroom aide works with children on instructional tasks
Classroom instructional decision variables (aggregated to the school level)	A2 Q28 set	Frequency of various reading/language arts activities (23 variables to be combined using principal components analysis)
	A2 Q29 set	Frequency that different reading/writing skills are taught (19 variables to be combined using principal components analysis)
	A2 Q33a	Frequency children use computers to learn reading, writing, or spelling
	A2OFTRDL	Number days/week have reading/language arts instruction
	A2TXRDL	Minutes per reading/language arts session
	A2OFTXXX	Number days/week have mathematics, science, social studies, music, and art (5
	A2TXXX	Minutes/session in mathematics, science, social studies, music, and art (5
	A2TXPE	Times per week have physical education
	A2TXSPEN	Time spent per session in physical education
	A2WHLCLS	Time spent in teacher-directed whole-class activities
	A2SMLGRP	Time spent in teacher-directed small-group activities
	A2INDVDL	Time spent in teacher-directed individualized activities
A2CHCLDS	Time spent in child-selected activities	
School-level control variables	A2DIVRD	Number of days/week divide class into reading achievement groups
	A2MINRD	Minutes/session in reading achievement groups
School-level control variables	CREGION	Census region
	KURBAN_R	School urbanicity designation (revised)
	SCH_SES	New variable based on mean school SES (based on sample child information) or existing free/reduced lunch variable

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.

Scores on the *Approaches to Learning* scale reflect the frequency of these behaviors, averaged across the six items for children who had valid data on at least four of the six items. The scale scores ranged from 1 (never show any of the behaviors) to 4 (exhibit all of the behaviors most of the time). Children's academic engagement gains scores ranged from -1.8 points to 2.7 points, with a mean gain of 0.1 points and a standard deviation of 0.5 points. The split-half reliability of the *Approaches to Learning* scale scores is .89 (USDE 2004). For the dissertation, the gain score variable is standardized (mean = 0, standard deviation = 1) for the analytic sample to present results as effect sizes (in standard deviation units). This dissertation interprets children's *Approaches to Learning* scale scores as their level of academic engagement, with higher scores representing higher increases in academic engagement.

#### *Child-Level Independent Variables*

The key child-level construct of interest in the dissertation is a measure of children's family socioeconomic status (SES). Below is a description of the SES composite included on the ECLS-K data file.

*Socioeconomic status (SES) composite.* The ECLS-K data file includes a composite variable of family SES, which is derived from data on 1) the mother or female guardian's educational attainment, 2) mother or female guardian's occupation,<sup>3</sup> 3) the father or male guardian's educational attainment, 4) father or male guardian's occupation, and 5) the annual household income. If a child's family had missing data on any of the five variables that were the basis of the SES composite, the ECLS-K used hot-deck

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<sup>3</sup> Parent's occupation was coded using the 1989 General Social Survey (GSS) prestige score.

imputation for missing values prior to calculating the SES composite. If a child's family only had one parental figure, the SES composite was calculated for the available components (e.g., if no father was in the household, the SES composite was based on maternal education, occupation, and household income). The ECLS-K Base Year User's Guide (NCES, 2004) provides more detail on the imputation and calculation procedures for the ECLS-K SES composite variable. The SES composite on the ECLS-K data file is a standardized, continuous variable (mean = 0, standard deviation = 1) based on the full ECLS-K sample of respondents. For the dissertation, the data file composite is standardized on the analytic sample rather than the full ECLS-K sample.

#### *Average Classroom Factor Independent Variables*

The dissertation focuses on two aspects of kindergarten learning environments, classroom *instructional resources* and teachers' *instructional practices*. These variables are aggregated across all kindergarten classrooms within schools to construct measures of the average instructional resources and average instructional practices for schools in the analytic sample. Although it would have been more desirable to treat these variables as direct measures of classroom resources and practices, the ECLS-K sampling frame sampled children within schools rather than within classrooms. As a result, 17 percent of classrooms in the analytic sample only included a single ECLS-K child. Exploratory analyses determined that the data were insufficient to model classroom effects directly; as a result, this study examines classroom effects indirectly as average classroom resources and practices.

Certain *instructional resources* in full-day kindergarten classrooms reduce the child-teacher ratio and thus increase the potential amount of time available for teachers to

spend with each child in the classroom. Two instructional resources explored in the dissertation include average class size and the presence of instructional aides who work directly with children. Other classroom resources, such as physical room characteristics and instructional materials (e.g., computers, books, puzzles, audio-visual equipment) also are likely to influence learning outcomes; however, the limitations of data available in the ECLS-K prevent modeling the effects of these resources in relation to children's reading and academic engagement.

*Class size.* ECLS-K teachers reported the total number of students in their kindergarten classrooms as of October 1998. In the fall of 1998, public school full-day kindergarten classrooms enrolled an average of 21 children, with a range of 9 to 30 children per classroom. The class size variable is averaged at the school level and recoded as a standardized, continuous variable (mean = 0, standard deviation = 1) for analysis purposes.

*Instructional aides.* Teachers reported in the spring survey how many daily hours paid aides worked directly with children on instructional tasks. On average, 76 percent of public school full-day kindergartners had an instructional aide working with children in their classroom for at least one hour per day. Preliminary analyses explored different methods of modeling relationships between the numbers the hours aides worked in the classroom and children's outcomes. These analyses suggested that a dichotomous instructional aide variable (i.e., 0 = no instructional aide in the classroom; 1 = instructional aide in the classroom) would yield similar results to a continuous variable,

so the analyses used the dichotomous variable to simplify the interpretation of possible results. The instructional aide variable is aggregated to the school level. Thus, a value of 0 indicated that the school did not have instructional aides working in kindergarten classrooms, while a value of 1 indicated that at least one kindergarten classroom in the school had an instructional aide present in a classroom for at least one hour per day.

Full-day kindergarten may provide teachers with more time to tailor their *instructional practices* in ways that can enhance children's reading achievement and their academic engagement. Instructional practices explored in the dissertation include the following time-related constructs – time allocation across different subject areas, frequency of children's exposure to reading activities and skills, and frequency of instructional grouping arrangements. Although other aspects of in-school time use, such as unstructured playtime, also may influence children's outcomes, the limitations of data collected in the ECLS-K prevent modeling these types of practices in relation to children's reading and academic engagement. The constructs included in the dissertation are described below in terms of their content.

*Time allocation across subjects.* Kindergarten teachers reported during the spring survey the number of days per week and the amount of minutes per session their students spent in reading and language arts, mathematics, social studies, science, music, art, and physical education. The individual subject areas were aggregated to the school level and then grouped into three sets: 1) weekly hours of instructional time in reading; 2) weekly hours of instructional time in academic subjects (i.e., reading, mathematics, social

studies, and science); and 3) weekly hours of instructional time in non-academic subjects (i.e., music, art, and physical education). On average, children spent about six hours weekly on reading instruction and 13 hours a week in total on academic instruction, out of an average total instructional time of about 17 hours per week. Prior to analyses, two variables were constructed: 1) the proportion of reading instructional time over total academic instructional time (reading + math + social studies + science) and 2) the proportion of total academic instructional time over total instructional time (academic + non-academic). On average, children spent about 77 percent of the total instructional time on academic instruction, with almost half of academic time (48 percent) devoted to reading instruction. The two variables are recoded as standardized, continuous variables (mean = 0, standard deviation = 1) for analysis purposes.

*Frequency of reading skills.* The ECLS-K spring teacher questionnaire included 19 items on reading curriculum skills coverage. Kindergarten teachers circled the frequency that various skills were covered in their classrooms, with response options of 1 (not taught/taught at a higher grade level), 2 (not taught/children should already know), 3 (once a month or less), 4 (2-3 times a month), 5 (1-2 times a week), 6 (3-4 times a week), and 7 (daily). Questionnaire items covered skills that range in difficulty from basic (e.g., conventions of print, letter recognition, writing own name, rhyming words, communicating complete ideas orally) to moderate and more advanced (e.g., using context cues for comprehension, conventional spelling, identifying the main idea of a story, vocabulary, reading aloud fluently, composing and writing complete sentences). Teacher responses to the individual reading skills items were aggregated to the school

level to reflect average curriculum skills coverage in the school. The Statistical Procedures section later in this chapter provides detail about the recoding procedures used for the reading skills items.

*Frequency of reading activities.* The ECLS-K spring teacher questionnaire included 23 items on reading and writing instructional activities. Kindergarten teachers circled the frequency that various activities occurred in their classrooms, with response options of 1 (never), 2 (once a month or less), 3 (2-3 times a month), 4 (1-2 times a week), 5 (3-4 times a week), and 6 (daily). Items covered a range of traditional practices (e.g., working on letter names, doing reading worksheets, working on phonics, writing words from dictation to improve spelling) and reform-based techniques (e.g., reading stories to children where they see the print, having children writing with encouragement to use invented spelling, doing activities and projects related to a book, choosing their own books to read) that teachers might use in their classrooms. Kindergarten teachers also recorded the frequency that their students used computers to learn reading, writing, or spelling, using the same response options as the other instructional activities items. Teacher responses to the individual reading activity items were aggregated to the school level to reflect the average frequency of teaching techniques used in the school. The Statistical Procedures section later in this chapter provides detail about the recoding procedures used for the reading activities items.

*Frequency of different grouping arrangements.* The ECLS-K spring teacher questionnaire asked teachers a series of questions about how frequently they use different

grouping arrangements for instruction. Teachers reported on the amount of time children spent each day in teacher-directed whole class, small group, and individual instruction and how much time they spent in child-selected activities. For analysis purposes, the proportion of time teachers devoted to each of these grouping strategies relative to the total amount of time spent across grouping strategies was calculated. Teacher responses about grouping strategies were aggregated to the school level to reflect the average amount of time devoted to different grouping techniques within the school and were recoded as a standardized variable (mean = 0, standard deviation = 1). Children spent about 38 percent of their time in teacher-directed, whole-class activities, 27 percent of their time in teacher-directed, small group activities, 15 percent of their time in teacher-directed individualized activities, and 20 percent of their time in child-selected activities.

Teachers also indicated whether they used achievement grouping in reading, and if so, how often the class was divided into achievement groups for instruction. This information was aggregated to the school level to reflect the average frequency of achievement grouping time. About 83 percent of full-day kindergartners attend classrooms that use achievement groups for reading instruction. On average, teachers conduct reading achievement groups for one hour per week. Teacher data on hours of reading achievement group instruction were aggregated to the school level to reflect the average amount of hours spent in reading groups. The hours of time spent in reading achievement groups variable was recoded as a standardized, continuous variable (mean = 0, standard deviation = 1) for analysis purposes.

### *Control Variables*

To better isolate relationships between kindergarten classroom factors, children's family SES background, and gains in their reading achievement and academic engagement over the kindergarten year, several child and school characteristic variables are included as statistical controls in the final analyses. Statistically controlling for individual and contextual characteristics that may be associated with the outcomes of interest increases the precision of estimated coefficients. Moreover, in multilevel modeling, the technique to be used in this dissertation, controlling for individual and contextual characteristics increases power for hypothesis testing by reducing the amount of unexplained variance associated with random effects (Raudenbush and Bryk, 2002).

*Child-level control variables.* Child-level control variables include the child's gender, race/ethnicity, fall kindergarten scores on the two outcome measures (i.e., reading and academic engagement), the elapsed time between the fall and spring kindergarten assessments, and the child's age at time of the fall kindergarten assessment. The multilevel analyses include these variables to control for their potential influences on the outcomes of interest. For instance, older children tend to demonstrate more academic skills and more academic engagement than younger children at the end of the kindergarten year (West, Denton, and Reaney, 2000). By controlling for the influence of child characteristics on the outcome measures, the HLM coefficients can be interpreted as the amount of learning that takes place during the kindergarten year, holding constant the effects of children's gender, age, and skills on their reading skills and engagement at kindergarten entry. Since these variables only are included as controls in the dissertation

analyses, the overall findings on relationships between classroom factors and children's reading achievement and academic engagement may over- or under-control for the effects of classroom factors on the outcomes of children from specific racial/ethnic groups, ages, etc. In other words, the overall effects of classroom factors may not apply equally well to all of the subgroups accounted for by the control variables.

*School-level control variables.* School-level control variables include the school region and urbanicity designations, the mean school socioeconomic status (SES) level (i.e., the average SES values for all ECLS-K children in the school), and the mean school fall scores on the reading and academic engagement assessments. The multilevel analyses include school control variables to account for potential differences in school characteristics, such as student composition and school locale, that might be associated with the quality of educational experiences afforded children as well as with the dependent variables explored in the dissertation. Although prior research indicates that full-day kindergarten programs during the 1998-99 school year were more likely to be found in the South, in cities, and in areas that serve lower-SES families (Walston and West, 2004), there is sufficient variation across these variables to warrant their inclusion as controls. Moreover, variation in these school-level variables is associated with potential differences in school resources and developmentally relevant characteristics of children. For instance, in 1998, kindergartners from lower-SES families were more likely than non-poor children to attend schools with larger class sizes, lower average classroom achievement at kindergarten entry, lower teacher qualifications, and worse school environmental conditions (Lee and Burkam, 2002).

### *Statistical Procedures*

This research is conducted in the context of a hierarchical linear modeling (HLM) framework, which recognizes the nested structure of children within classrooms and classrooms within schools (Lee, 2000; Bryk and Raudenbush, 1992; Raudenbush and Bryk, 2002). HLM can simultaneously model relationships within and across multiple units of analysis. For the purposes of this study, HLM permits an analysis of how instructional resources and teachers' instructional practices influence children's mean gains in reading and academic engagement over the kindergarten year as well as the distributive effects of these classroom factors on outcomes for children from different SES backgrounds.

When examining school and classroom effects, HLM models are more appropriate than models restricted to a single unit of analysis (e.g., ANCOVA, Ordinary Least Squares (OLS) regression). For instance, research that uses OLS regression to model relationships at different levels of analysis must either aggregate student data to the school level or disaggregate school data to the student level. Both approaches are inadequate for measuring school effects because the first approach introduces aggregation bias into the models, and the second approach underestimates standard errors due to the clustering of children within schools (Wenglinsky, 2002). In contrast, HLM explicitly models the relationships between children within the same classrooms and schools, as well as the variation in relationships across classrooms and schools. Using HLM, researchers can test whether relationships between child-level predictors and child-level outcomes vary across classrooms or schools (e.g., does the effect of SES on outcomes vary across classrooms or schools). If relationships do vary, researchers also can model

this variation as a function of classroom or school factors (e.g., does the effect of SES on outcomes vary by teachers' average instructional practices or resources) (Raudenbush and Bryk, 2002).

The first section below describes the principal components analysis (PCA) procedures used to prepare the reading activities and skills items for the descriptive and HLM analyses. The second and third sections identify the different types of descriptive analyses and HLM analyses used in the dissertation. Chapter 4 of the dissertation presents results from each of these statistical procedures.

#### *Principal Components Analysis*

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. As noted earlier, data values on the individual instructional practice items represented the frequency that such activities occurred in the classroom, with higher values indicating more frequent practices. The values for the individual items were first converted to a continuous scale representing days per week, using the mid-point value for each response category as the new value. For instance, on the reading activity items, cases with a value of 3, labeled as "2-3 times a month," were assigned a new value of .625 days/week and cases with a value of 5, labeled "3-4 times a week," were assigned a new value of 3.5 days/week. Next, this study aggregated teacher-level responses on each item to the school

level to represent the mean value of each instructional practice item for all kindergarten teachers in the sampled school.<sup>4</sup>

The PCA analysis of the instructional practice items (i.e., reading activities and reading skills) was conducted on weighted, school-level data using Varimax rotation to create orthogonal instructional practice scales. Based on the results from the PCA, each teacher instructional practice item was assigned to a single instructional scale based on the item's highest factor loading across all of the four PCA scales. Items that did not have a factor loading of at least .4 on any scale were dropped from further analyses. For each of the instructional practice scales, the final scale score equaled the mean value of all items that had a factor loading of .4 or higher on the scale. If a school did not have valid data on at least half of the items composing a particular scale, the school received a system missing value for the scale. Prior to the HLM analyses, the scale scores were standardized (mean = 0, standard deviation = 1). Chapter 4 presents details on the results of the PCA analyses and the resulting instructional scales.

### *Descriptive Analyses*

Prior to the HLM analyses, population estimates of means (for continuous variables) and percentages (for categorical variables) were calculated for each of the instructional resource factors, the teachers' instructional practice factors, and the outcome measures for full-day kindergartners for children from low-, middle-, and high-SES backgrounds. Differences in estimates of classroom factors and outcomes scores by children's family SES were tested for statistical significance with *t* test procedures, using

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<sup>4</sup>The ECLS-K surveyed all kindergarten teachers in the sampled schools, even teachers who did not have ECLS-K sample children in their classroom. For the dissertation, data from all teachers in the analytic sample were used as a measure of practices in schools.

AM software that incorporates ECLS-K sampling and replicate weights (i.e., BYCOMW0 and the corresponding BYCOMW1-BYCOMW90 replicate weights) to account for the complex sample design and differential rates of non-response. Results from the descriptive analyses indicate the degree to which children from different SES backgrounds vary in their reading and academic engagement gains over the kindergarten year. The descriptive results also provide insight on variations in full-day kindergarten classroom settings for children from different SES backgrounds. Chapter 4 presents the results from the descriptive analyses.

### *Hierarchical Linear Modeling (HLM) Analyses*

Following the descriptive analysis, a series of two-level HLM analyses (i.e., full-day kindergartners nested within public schools)<sup>5</sup> were conducted using HLM6 software to investigate the effects of average classroom factors on children's reading and academic engagement gains over the kindergarten year, as well as possible effects of average classroom factors on the relationship between children's SES and the aforementioned outcomes.<sup>6</sup> School effects literature refers to this type of analysis as an investigation of a school's "excellence" and "equity" parameters (Lee, 2000). The excellence parameter refers to the extent to which school-level characteristics promote desirable outcomes for

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<sup>5</sup>During preliminary work, both two-level and three-level (i.e., child within classroom within school) HLM models were considered for the dissertation. The two-level (child within school) model was selected for final analyses because if a three-level HLM was used, the small number of children sampled within classrooms and classrooms within sampled schools would result in over 25 percent of the eligible analytic sample children being dropped from the HLM analyses. For instance, 163 classrooms (17%) only have a single ECLS-K sampled child, and 61 (18%) of the sampled schools only have data for a single classroom. Although a three-level model would be ideal for this study, the small sample sizes preclude conducting such an analysis.

<sup>6</sup>As noted in the Weights section, the HLM analyses were conducted using the school non-response adjusted base weight (SCHBSW0 X R12SC\_F0) at level 2 and the child within-school weight (WS\_CWGT) at level 1 to account for the nested sample design.

children (e.g., higher achievement gains), whereas the equity parameter refers to the extent to which school characteristics distribute desirable outcomes equitably across children (e.g., irrespective of a child's SES). The HLM models were run separately for the reading achievement and academic engagement outcomes. This section describes the steps taken to conduct the HLM analyses.

*Unconditional models.* As a preliminary step, a two-level fully unconditional HLM analyses, with no predictor variables, was run separately for each outcome measure to explore how variation in children's reading and academic engagement gains are allocated across children (Level 1) and schools (Level 2) (Raudenbush and Bryk, 2002). Information from the unconditional models on the proportion of variance attributed to each level relative to the total variance in the outcome helps to assess the potential explanatory power of subsequent HLM models that will include the child- and school-level characteristics of interest.

The child- and school-level models for the fully unconditional 2-level HLM are identified below. The child-level equation [3.1] models children's outcomes as a function of the school mean score plus random error:

$$Y_{ij} = \beta_{0j} + r_{ij}, \quad [3.1]$$

where

$Y_{ij}$  is the outcome score (i.e., gain in reading or academic engagement over kindergarten year) of child  $i$  in school  $j$ ;

$\beta_{0j}$  is the mean outcome score of school  $j$ ; and

$r_{ij}$  is the random “child effect”, the deviation of the child’s score from the school mean score. Child effects are assumed to be normally distributed, with a mean of 0 and a variance of  $\sigma^2$ .

The school-level equation [3.2] models the school mean score on the outcome measure as a function of the grand mean plus random variation:

$$\beta_{0j} = \gamma_{00} + u_{0j}, \quad [3.2]$$

where

$\gamma_{00}$  is the grand mean score (i.e., gain in reading or academic engagement over kindergarten year); and

$u_{0j}$  is the random “school effect”, the deviation of the school’s mean score from the grand mean for all schools. School effects are assumed to be normally distributed with a mean of 0 and variance  $\tau_{00}$ .

Once the fully unconditional models are run, the proportion of variance attributed to each level can be calculated as follows (Raudenbush and Bryk, 2002):

$$\begin{aligned} &\text{Proportion of variance at the Level 1 (child), between children within schools} \\ &= \sigma^2 / (\sigma^2 + \tau_{00}) \end{aligned} \quad [3.3]$$

$$\begin{aligned} &\text{Proportion of variance at the Level 2 (schools), between schools} \\ &= \tau_{00} / (\sigma^2 + \tau_{00}) \end{aligned} \quad [3.4]$$

The proportion of variance at the school level provides an estimate of the potential explanatory power of school characteristics on child-level outcomes. The higher the proportion of variance attributable to schools, the more important school-level factors are in explaining children's outcomes.

In addition to examining the proportion of variance explained by each level of a hierarchical structure, researchers also consult the reliability of estimated coefficients for the unconditional models. The reliability of the average outcome (e.g., reading achievement gains or engagement gains) is based on the number of students within each school and the proportion of variance attributable to schools. It is calculated as:

$$\text{Reliability of the school sample mean} = \tau_{00} / [\tau_{00} + (\sigma^2 / n_j)] \quad [3.5]$$

Higher reliability values are desirable because they indicate that a large amount of the variation in a particular coefficient is potentially explainable by specifying factors as predictors at that particular level (i.e., school factors at Level 2), while lower reliability values indicate that much of the observed variation in coefficients is likely to be measurement error or variation that cannot be explained by school variables (Raudenbush and Bryk, 2002). Level-1 coefficients with a reliability less than .05 are often set as “fixed” terms in HLM modeling, indicating that the effects of a Level-1 coefficient do not vary across higher levels (in this case, schools).

*Conditional models.* Following the unconditional models, conditional (explanatory) HLM models describe school-level effects on children's reading and

academic engagement. For the conditional, or specified, HLM models, child- and school-level characteristics are added as predictor variables to explore whether they may account for a portion of the unexplained variance in either reading achievement gains or academic engagement gains. The conditional models also can explore whether some of the relationships at Level 1 (children within schools) vary as a function of factors at Level 2 (schools) (Raudenbush and Bryk, 2002). For the purpose of this study, the primary question of interest is whether the effects of SES on children’s outcomes vary as a function of school-level characteristics.

In the first step of the conditional two-level HLM, a within-school model (Level 1, [3.6]) is constructed to examine relationships between the outcome measure and child-level characteristics, with the child serving as the unit of analysis:<sup>7</sup>

$$Y_{ijk} = \beta_{0j} + \beta_{1j}(\text{child SES}) + \beta_{2j}(\text{child sex}) + \beta_{3j}(\text{child race/ethnicity}) + \beta_{4j}(\text{fall score}) + \beta_{5j}(\text{assessment age at fall K}) + \beta_{6j}(\text{elapsed time between assessments}) + r_{ij} \quad [3.6]$$

where

$Y_{ij}$  is the outcome measure score (i.e., gains in reading or academic engagement over kindergarten year) of child  $i$  in school  $j$ ;

$\beta_{0j}$  is the intercept or mean outcome score for school  $j$ ;

$\beta_{1j}$  is the corresponding Level-1 coefficient indicating the direction and strength of association between children’s SES and their outcome score (net of the other Level-1 predictors);

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<sup>7</sup>Although children’s race/ethnicity is presented as a single variable in this model, dummy-coded variables for each racial/ethnic category are used in the HLM analyses.

$\beta_{2j} - \beta_{6j}$  are the corresponding set of Level-1 coefficients indicating the direction and strength of association between the child-level control variables and the outcome score (net of the other Level-1 predictors); and

$r_{ij}$  is the random “child effect” indicating the deviation of the child’s score from their predicted score, based on the child-level model after accounting for the child-level predictors.

In essence, the coefficients produced in the within-school model indicate whether children’s SES and the child-level control variables are significantly associated with children’s gains in reading achievement and academic engagement over the kindergarten year.

Next, the homogeneity of the Level-1 SES slope regression coefficient is tested to assess whether the effect of children’s SES on their reading and academic engagement outcomes is constant across classrooms. The between-school equation (Level 2, [3.7]) for this test is:

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad [3.7a]$$

$$\beta_{1j} = \gamma_{10} + u_{1j} \quad [3.7b]$$

$$\beta_{pj} = \gamma_{p0} \quad (p = 2 - 6) \quad [3.7c]$$

where

$\gamma_{00}$  is the grand mean on the outcome measure;

$\gamma_{10}$  is the mean distributive effect of child SES on child outcome across schools;

$\gamma_{p0}$  are the mean distributive effects of child-level controls on child outcome scores across schools;

$u_{0j}$  is the deviation of school  $j$  from the estimated intercept; and

$u_{1j}$  is the deviation of school  $j$  from the estimated slope for SES.

If the variance of the child SES coefficient ( $\gamma_{10}$ ) across schools is significant, it will be set as a random coefficient in the specified models and its variation will be explored in relation to school-level predictor variables. However, if the variance of the  $\gamma_{10}$  coefficient is not significant, it is assumed to be a fixed effect for the final models and will not be modeled in relation to school-level variables (i.e., no  $u_{1j}$  will be included and no school-level predictors will be included for the SES variance component).

In the third step, a fully-specified between-school model (Level 2) examines the effects of the school-level averages for the instructional resource and instructional practice variables on the mean school outcomes (e.g., the Level-1 intercept term,  $\beta_{0j}$ ) and the distribution of school outcomes for children from different SES backgrounds (i.e., the Level-1 child SES slope coefficient,  $\beta_{1j}$ ). The intercept ( $\beta_{0j}$ ) and slope<sup>8</sup> for the child SES variable ( $\beta_{1j}$ ) from the Level-1 model will be estimated as random effects at Level 2, with all other child-level variables (i.e., control variables) set as fixed effects. The resulting school model is:<sup>9</sup>

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<sup>8</sup>As noted above, if the child-level SES coefficient does not vary randomly across schools, it will be set as a fixed effect at Level 2. If this is the case, the final HLM models only will model relationships between the child-level intercept (average school-level value for an outcome) and school-level factors.

<sup>9</sup>Most of the classroom instructional resource and practice constructs are included in the final models as multiple continuous or dummy-coded variables (e.g., the reading activities and skills scales consist of multiple continuous scales, which will each be included in the HLM model); however, only the construct labels are included in this section.

$$\beta_{0j} = \gamma_{00} + \gamma_{01} (\text{class size}) + \gamma_{02} (\text{aide}) + \gamma_{03} (\text{reading activities and skills scales}) + \gamma_{04} (\text{computer use in reading}) + \gamma_{05} (\text{time in subjects}) + \gamma_{06} (\text{time in grouping}) + \gamma_{07}(\text{region}) + \gamma_{08}(\text{urbanicity}) + \gamma_{09}(\text{school mean SES}) + u_{0j}, \quad [3.8a]$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} (\text{class size}) + \gamma_{12} (\text{aide}) + \gamma_{13} (\text{reading activities and skills scales}) + \gamma_{14} (\text{computer use in reading}) + \gamma_{15} (\text{time in subjects}) + \gamma_{16} (\text{time in grouping}) + \gamma_{17}(\text{region}) + \gamma_{18}(\text{urbanicity}) + \gamma_{19}(\text{school mean SES}) + u_{1j}, \quad [3.8b]$$

where

$\gamma_{00}$  is the grand mean on the outcome measure;

$\gamma_{01} - \gamma_{06}$  are the measures of the direction and strength of the associations between the school-level characteristics and the mean outcome;

$\gamma_{10}$  is the mean distributive effect of child SES on child outcomes across schools;

$\gamma_{11} - \gamma_{16}$  are the measures of the direction and strength of the associations between the school-level characteristics and the distributive effect of child SES background on child outcome scores across schools; and

$u_{0j}$  and  $u_{1j}$  are the school-level random effects that indicate the deviation of the school

Level-2 coefficient from its predicted value based on the school-level model

after accounting for the influence of the Level-2 predictors.

In essence, the coefficients produced in the Level-2 model (i.e.,  $\gamma$ s) indicate whether classroom factors are significantly associated with differences in children's reading skills and academic engagement gains over the kindergarten year and differences in the distribution of outcomes relative to children's SES.

The key parts of the HLM models in the dissertation are the fully-specified school-level models (3.8a and 3.8b), which provide the estimates of relationships between school-level factors and the outcome factors of interest. The first equation (3.8a) will identify the instructional resources and practices that are associated (positively or negatively) with full-day kindergartners' gains in reading achievement and academic engagement over the school year. The second equation (3.8b) will identify the instructional resources and practices that are associated with decreases or increases in the effects of SES on gains in reading achievement and academic engagement over the kindergarten year. Together, the two models will identify classroom factors that are associated with excellence and equity in children's reading achievement and academic engagement. Chapter 4 presents the results from the HLM analyses.

## Chapter 4: Findings

This chapter presents results from statistical analyses conducted to explore the following research questions:

1. *What influence do different full-day kindergarten classroom factors (i.e., instructional resources and teachers' instructional practices) have on children's reading achievement? Do these factors help to explain variations between schools in average reading achievement in kindergarten?*
2. *Do these full-day kindergarten classroom factors differentially influence the reading achievement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average reading achievement of children from different socioeconomic backgrounds?*
3. *What influence do full-day kindergarten classroom factors have on children's academic engagement? Do these factors help to explain variations between schools in average academic engagement in kindergarten?*
4. *Do these full-day kindergarten classroom factors differentially influence the academic engagement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average academic engagement of children from different socioeconomic backgrounds?*

The first section of this chapter presents findings from the principal components analysis (PCA) that was used to develop a reduced set of instructional practice scales. The second section examines the outcome variables and classroom factor variables for children from different socioeconomic (SES) backgrounds. Section three presents the

results from hierarchical linear modeling (HLM). These models, as described in the previous chapter, explore the relationships between average classroom factors, children's SES, and gains in their reading achievement and academic engagement during kindergarten. Results from the HLM models provide evidence in response to the four research questions posed in the dissertation. The chapter concludes with a summary of key findings from the statistical analyses.

### *Principal Components Analysis*

As described in *Chapter 3: Methodology*, a principal components analysis (PCA) with Varimax rotation of the 23 reading activity and 19 reading skills variables was conducted to identify a reduced set of instructional scales for subsequent analyses. The Velicer's minimum average partial (MAP) test<sup>10</sup> and the PCA scree plot results suggested the optimal number of reading instructional scales (i.e., principal components) to retain for further analyses. Both sets of results indicated that four reading instructional scale components should be retained, and a review of the conceptual fit of individual items into their proposed components supported this recommendation.

Table 3 presents the factor loadings for the individual instructional variables included in the PCA as well as the coefficient alphas (scale reliabilities) and rotated proportion of variance for the four resulting instructional practice scales. The coefficient alpha values for the scales ranged from .66 to .82, indicating good reliability. Figures 2 through 5 compare the mean frequency of individual reading practices within each instructional scale for teachers with low (less than -0.5 standard deviation (SD)), middle

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<sup>10</sup>SPSS code for the Velicer's MAP procedure was obtained from Dr. Brian O'Connor's website "SPSS, SAS, and MATLAB Programs for Determining the Maximum Number of Components and Factors", retrieved online on 3/2/2007 at <http://flash.lakeheadu.ca/~boconno2/nfactors.html>.

**Table 3. Results from principal components analysis of ECLS-K instructional practice items, aggregated at the school level**

	Component			
	Child-initiated activities	Discrete literacy skills	Comprehension skills	Letter-sound knowledge
<b>Items composing the "Child-initiated activities" scale</b>				
listen to teacher read stories where child sees print (Big Books)	<b>0.50</b>	0.05	-0.03	0.10
read silently	<b>0.42</b>	0.29	0.24	0.00
work in a reading workbook or on a worksheet	<b>-0.51</b>	0.31	-0.17	0.23
write with encouragement to use invented spelling, if needed	<b>0.72</b>	0.17	0.17	0.01
read books they have chosen for themselves	<b>0.67</b>	0.13	0.16	0.01
publish their own writing	<b>0.47</b>	0.11	0.25	-0.03
write stories in a journal	<b>0.73</b>	0.16	0.03	-0.04
compose and write stories or reports	<b>0.61</b>	0.41	0.13	-0.07
<b>Items composing the "Discrete literacy skills" scale</b>				
composing and writing complete sentences	0.49	<b>0.56</b>	0.15	-0.03
reading multi-syllable words, like adventure	0.31	<b>0.53</b>	0.21	0.01
using capitalization and punctuation	0.35	<b>0.53</b>	0.12	0.03
composing & writing stories with an understandable begin, mid, & end	0.31	<b>0.51</b>	0.20	-0.03
conventional spelling	0.20	<b>0.55</b>	0.15	0.00
alphabetizing	-0.02	<b>0.46</b>	0.17	0.01
reading aloud fluently	0.23	<b>0.71</b>	0.03	-0.02
read aloud	0.35	<b>0.48</b>	0.08	0.16
read from basal reading texts	-0.36	<b>0.58</b>	-0.04	-0.02
write words from dictation to improve spelling	-0.13	<b>0.46</b>	0.03	0.11

NOTES: The teacher practice items were aggregated to the school level prior to the PCA analysis. The PCA analysis is based on a sample of 331 public schools that offer full-day kindergarten programs.

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.

**Table 3. Results from principal components analysis of ECLS-K instructional practice items, aggregated at the school level – Continued**

	Component			
	Child-initiated activities	Discrete literacy skills	Comprehension skills	Letter-sound knowledge
<b>Items composing the "Comprehension activities" scale</b>				
using context cues for comprehension	0.35	0.43	<b>0.51</b>	-0.11
identifying the main idea and parts of a story	0.17	0.36	<b>0.62</b>	0.05
making predictions based on text	0.32	0.28	<b>0.54</b>	0.00
communicating complete ideas orally	0.26	-0.01	<b>0.58</b>	0.12
remembering and following directions with a series of actions	0.02	-0.05	<b>0.68</b>	0.07
discuss new or difficult vocabulary	-0.05	0.18	<b>0.53</b>	0.18
retell stories	0.16	0.24	<b>0.58</b>	0.04
do an activity or project related to a story or book	0.37	0.05	<b>0.50</b>	0.00
<b>Items composing the "Letter-sound skills" scale</b>				
alphabet and letter recognition	0.02	-0.15	-0.05	<b>0.78</b>
matching letters to sounds	0.07	-0.05	-0.03	<b>0.77</b>
writing own name (first and last)	0.04	0.00	-0.11	<b>0.47</b>
common prepositions, such as over/under, up/down	0.19	0.34	0.22	<b>0.45</b>
work on learning names of letters	-0.07	-0.03	0.06	<b>0.68</b>
practice writing letters of the alphabet	-0.11	0.15	0.18	<b>0.59</b>
work on phonics	-0.13	0.24	0.02	<b>0.58</b>
Rotated % of variance explained by each factor	11.41	10.62	9.46	7.58
Coefficient alpha	0.66	0.80	0.82	0.67

NOTES: The teacher practice items were aggregated to the school level prior to the PCA analysis. The PCA analysis is based on a sample of 331 public schools that offer full-day kindergarten programs.

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.

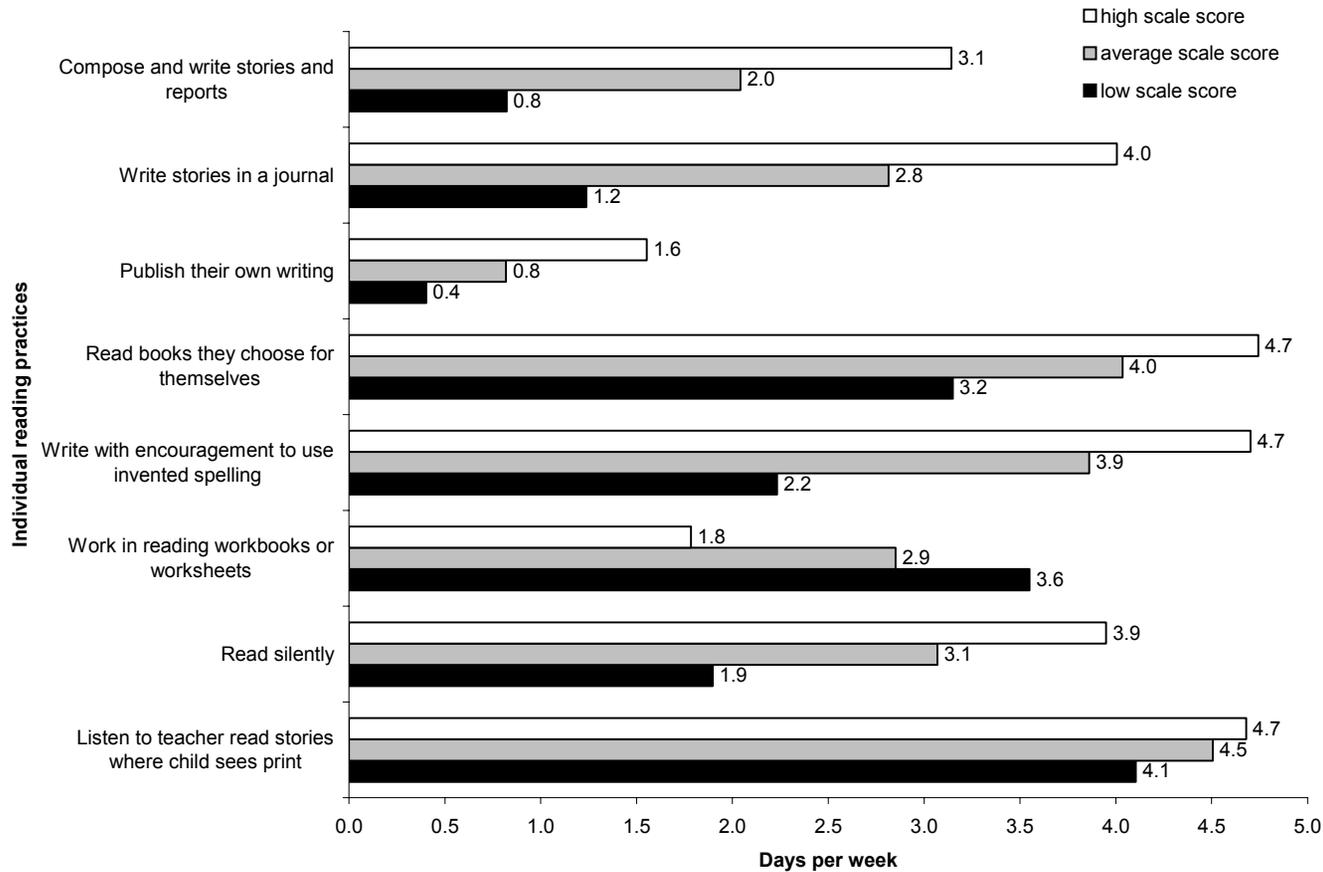
(between -0.5 and 0.5 SD), and high (more than 0.5 SD) scores on the particular scale. The figures aid in interpreting the meaning of the scale values (figures 2 - 5).

The four instructional practice scales derived from the PCA include a *child-initiated activities scale*, a *discrete literacy skills scale*, a *comprehension skills scale*, and a *letter-sound knowledge scale*. Below is a description of the individual items that compose each scale.

The *child-initiated activities scale* consists of eight items that describe how frequently teachers use classroom reading and writing activities that tend to be open-ended in nature and that may allow children greater flexibility in their classroom work. Examples of items in the child-initiated activities scale include teachers encouraging children to use invented spelling, having children write stories in journals, and having children read books that they choose for themselves. One item in this scale, the frequency of working on reading workbooks or worksheets, is negatively related to the overall scale score, meaning that teachers who frequently use workbooks or worksheets to teach reading tend to have lower child-initiated activities scale scores than other teachers. Schools with high classroom-averaged scores on the child-initiated activities scale tend to involve their students in a range of child-initiated activities about four to five times a week; they also spend less time than other teachers (about two days/week) using reading workbooks and worksheets with their students (figure 2). Schools with low scores on this scale tend to have their students use reading workbooks and worksheets more frequently than other teachers (almost four days/week); their students also engage in extended writing activities infrequently (about once a week or less often).

The *discrete literacy skills scale* includes ten items that focus on the frequency of teacher-directed instruction. Much of this instruction focuses on isolated skills practice. Examples of items in the discrete literacy skills scale include practice in reading aloud fluently, using capitalization and punctuation, writing words from dictation to improve spelling, reading from basal texts, and composing and writing complete sentences. Schools with high classroom-averaged scores on the discrete literacy skills scale involve their students in a range of teacher-directed reading, writing, and grammar instruction about three to five times a week (figure 3). Schools with low scores on the discrete literacy skills scale tend to involve their students in such activities once a week or less often.

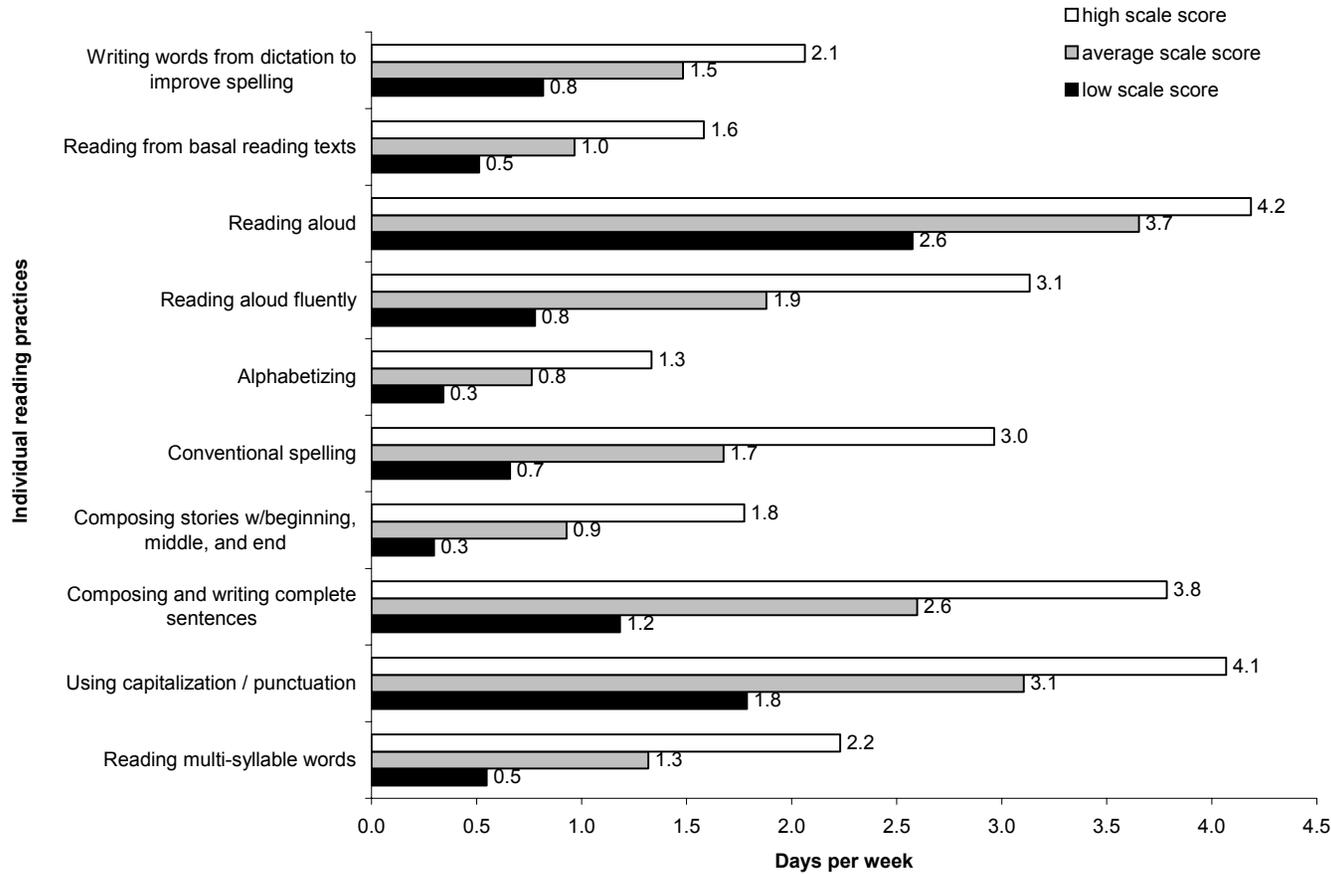
**Figure 2. Frequency of individual reading practices that comprise the child-initiated activities scale by schools with high, average, and low scale scores**



NOTES: This figure is based on a sample of 331 public schools that offer full-day kindergarten programs.

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.

**Figure 3. Frequency of individual reading practices that comprise the discrete literacy skills scale by schools with high, average, and low scale scores**



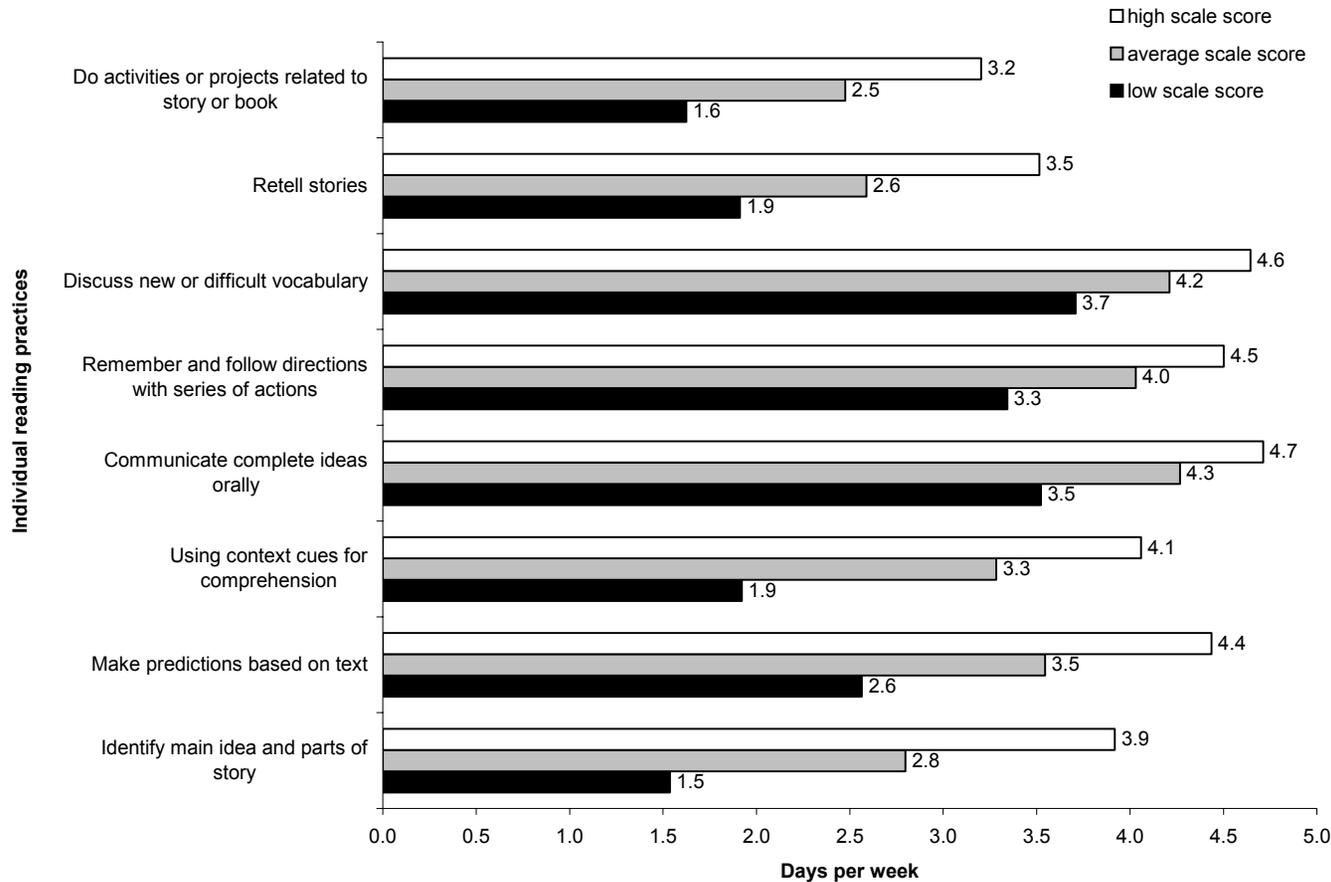
NOTES: This figure is based on a sample of 331 public schools that offer full-day kindergarten programs.

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.

The *comprehension skills scale* includes eight items on the frequency of instruction in oral and written comprehension. Examples of items in the comprehension skills scale include making predictions about text, retelling stories, using context cues for comprehension, identifying the main idea and parts of a story, communicating complete ideas orally, and following complex sets of directions. Schools with high classroom-averaged comprehension skills scale scores tend to work with children on almost all of the comprehension skills activities at least four times a week, while schools with low scale scores tend to teach such skills about two to three times a week (figure 4).

The final scale, *letter-sound knowledge*, is based on seven items about how frequently teachers have their students work on activities like recognizing and writing alphabet letters, matching letters and sounds, and practicing phonics skills. The letter-sound knowledge scale shows little variation in scores across the sample, with most of the high- and middle-scoring schools engaging children in these types of activities on a daily basis. Schools with low classroom-averaged letter-sound knowledge scale scores also engage their students in letter sound activities quite frequently (about four times a week) but not as often as other teachers (figure 5).

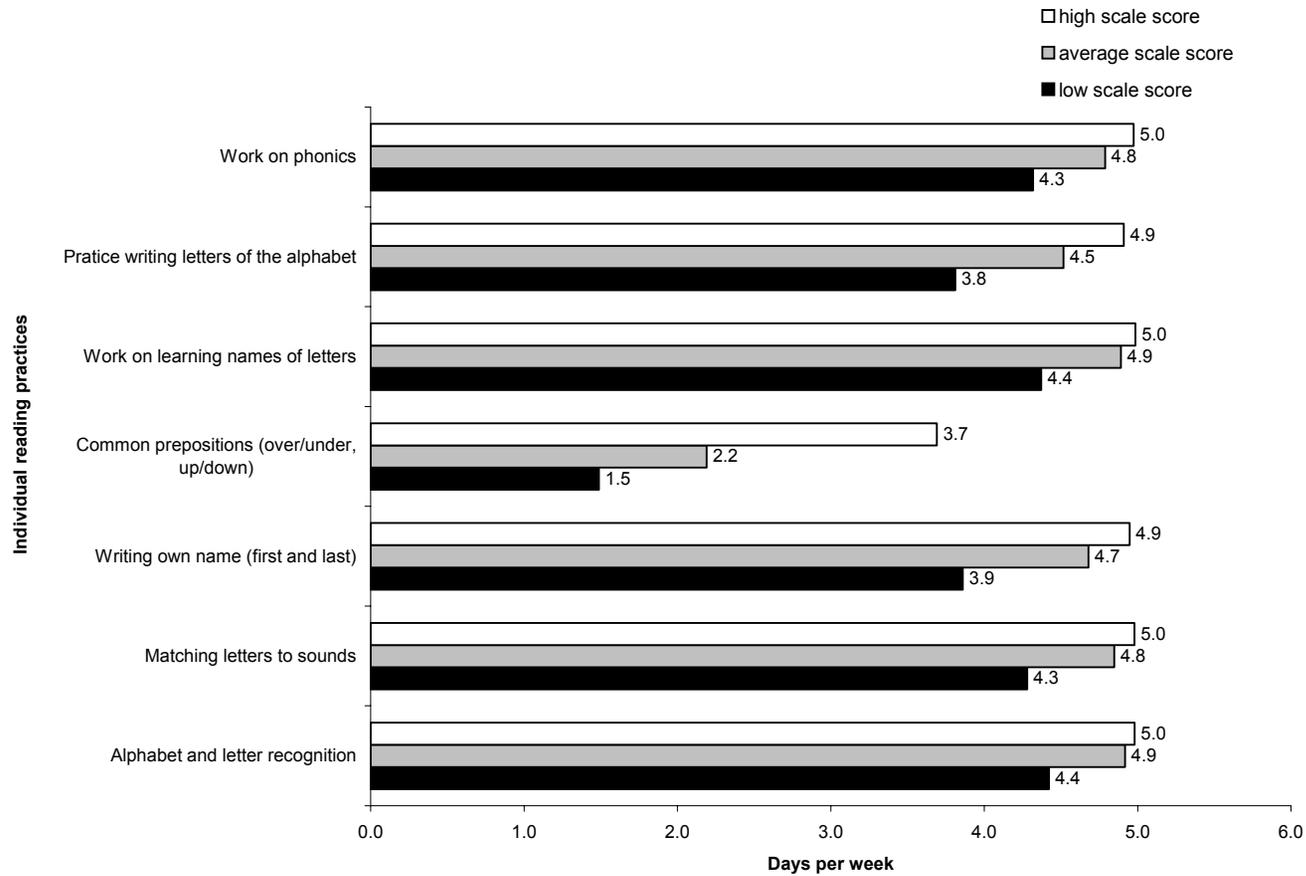
**Figure 4. Frequency of individual reading practices that comprise the comprehension skills scale by schools with high, average, and low scale scores**



NOTES: This figure is based on a sample of 331 public schools that offer full-day kindergarten programs.

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.

**Figure 5. Frequency of individual reading practices that comprise the letter-sound knowledge scale by schools with high, average, and low scale scores**



NOTES: This figure is based on a sample of 331 public schools that offer full-day kindergarten programs.

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.

After preparing all of the instructional resource and practices variables for final analysis, bivariate correlations and Variance Inflation Factors (VIF) for all of the classroom factor variables at the school level were consulted to assess the potential level of multicollinearity in the HLM models (see table 4). The bivariate correlations between classroom factors ranged from  $-.44$  to  $.50$ , with 55 of the 66 correlations (83 percent) having an absolute value of less than  $.20$ . The VIF values are a measure of the degree of multicollinearity between a single independent variable and all other independent variables included in a regression model. VIF values higher than 10 indicate serious multicollinearity in multivariate analyses (Cohen et al., 2003). The VIF values for the classroom factors ranged from 1.07 to 1.81, indicating that multicollinearity was not a serious concern for subsequent analyses.

In addition, the child- and school-level variables of interest were inspected in relation to the assumptions for HLM modeling. In hierarchical analyses, error terms at level 1 and level 2 are assumed to be normally distributed and independent with equal variances (Raudenbush and Bryk, 2002). Furthermore, any child- or school-level predictors that are excluded from the models are assumed to be independent of the error terms and predictor variables included at both levels. Variables used in this dissertation look reasonably appropriate for the assumptions of HLM, though the inclusion of additional variables or the specification of alternative models might alter the results reported for this study.

**Table 4. School-level correlations and variance inflation factors (VIF) between instructional resource and instructional practice variables**

School-level classroom factor correlations	VIF factor value	aide	class size	whole class	child-selected	reading groups	reading / academic time	academic / total time	computer	child-initiated activities	discrete literacy	compre-hension letter-sound	
Instructional aide	1.07	1.00											
class size	1.11	0.19	1.00										
teacher-directed whole class instruction	1.48	-0.04	0.01	1.00									
child-selected activities	1.41	0.02	-0.09	-0.44	1.00								
use reading achievement groups	1.21	0.12	-0.03	-0.19	-0.08	1.00							
reading instruction time / total academic time	1.18	0.02	0.13	0.16	0.00	-0.02	1.00						
academic / total instructional time	1.08	0.11	0.02	0.08	-0.17	0.11	0.09	1.00					
computer use scale	1.15	-0.05	-0.15	-0.10	-0.03	0.06	-0.06	0.02	1.00				
child-initiated activities scale	1.72	-0.02	0.00	-0.29	0.20	0.02	0.12	-0.08	0.25	1.00			
discrete literacy skills scale	1.81	0.03	0.02	-0.16	-0.09	0.27	-0.02	0.08	0.27	0.48	1.00		
comprehension skills scale	1.56	0.03	-0.01	-0.17	0.07	0.02	-0.14	0.02	0.20	0.47	0.50	1.00	
letter-sound knowledge scale	1.15	-0.03	-0.11	0.03	-0.13	0.01	-0.18	0.00	0.17	0.08	0.25	0.18	1.00

NOTES: Estimates are based on a sample of 331 public schools that offer full-day kindergarten programs.

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.



### *Descriptive Analysis*

Prior to the HLM analysis, descriptive statistics were run to illustrate the instructional resources and teaching practices used in public school full-day kindergarten programs. The descriptive statistics provide preliminary information on whether children's SES is related to their gains in reading and academic engagement. In addition, the prevalence of classroom factors is presented for children from low-, middle-, and high-SES backgrounds to assess whether full-day kindergarten programs differed significantly across SES groups. If children's SES is significantly related to the kindergarten outcomes of interest and if classroom factors vary by SES, then HLM can explore whether classroom factors may have an influence on the SES slope.

Table 5 presents information on full-day kindergartners' reading achievement and academic engagement in the fall and spring of kindergarten and their gains in both outcomes over the kindergarten year. It also describes children's access to instructional resources and exposure to instructional practices. The table presents means and standard deviations for the selected variables for the overall sample and group means for children who fall into three categories: the lowest quintile of SES scores (i.e., the lowest one fifth of scores), the middle three quintiles (i.e., between the 20<sup>th</sup> and 80<sup>th</sup> percentile of scores) and the upper quintile (i.e., the highest one fifth of scores). As noted in chapter 3, the BYCOMW0 sampling weight was used to produce population estimates for classroom factors. *T* test comparisons of child outcomes and classroom factors by children's SES category were conducted using AM software, which incorporates the ECLS-K sampling and jackknife (JK2) replicate weights to account for the complex sample design and differential rates of non-response.

Focusing first on children's reading achievement and academic engagement scores, descriptive (*t* test) comparisons indicate that children's SES was positively related to their reading achievement scores at the beginning and end of kindergarten. For instance, children from high-SES households entered kindergarten with the highest fall reading achievement scores and at the end of kindergarten they continued to have higher scores than children from low- and middle-SES households. Children's gains in reading achievement over the kindergarten year also were positively related to their SES. The pattern for the academic engagement scores is similar to the pattern for the reading achievement scores. Children from higher SES backgrounds had the highest academic engagement scores in the fall and spring. However, contrary to reading achievement, the descriptive statistics do not indicate any significant relationships between SES and gains in academic engagement during kindergarten.

**Table 5. Descriptive information on full-day kindergarten skills, average school instructional resources, and average school instructional practices by family socioeconomic status (SES)**

Characteristic	Overall (s.d.) <i>n</i> = 4,654 children	Family SES level		
		Lowest quintile <i>n</i> = 932	Middle three quintiles <i>n</i> = 2,753	Highest quintile <i>n</i> = 969
<b>Reading achievement scores (standardized)</b>				
Fall score <sup>a, b, c</sup>	0 (1.0)	-0.4	-0.1	0.6
Spring score <sup>a, b, c</sup>	0 (1.0)	-0.5	0.0	0.6
Gain score (Spring - Fall score) <sup>a, b, c</sup>	0 (1.0)	-0.2	0.0	0.1
<b>Academic engagement scores (standardized)</b>				
Fall score <sup>a, b, c</sup>	0 (1.0)	-0.5	0.0	0.3
Spring score <sup>a, b, c</sup>	0 (1.0)	-0.3	0.0	0.3
Gain score (Spring - Fall score)	0 (1.0)	0.0	0.0	0.0
<b>Instructional resources</b>				
Mean school class size	21.1 (3.5)	21.0	21.1	21.2
Percent with an instructional aide in the class	76.9 (4.2)	76.7	75.9	79.9
<b>Instructional practices</b>				
Percentage of time in teacher-directed, whole-class instruction <sup>b, c</sup>	38.2 (10.4)	39.4	38.5	36.0
Percentage of time in child-selected activities <sup>b, c</sup>	20.2 (7.7)	19.4	20.1	21.3
Hours per week in reading achievement groups	1.0 (1.0)	1.1	1.0	1.0
Percentage of academic instruction time over total instructional time <sup>b</sup>	77.0 (6.7)	77.1	77.3	76.3
Percentage of reading instructional time over total academic instructional time <sup>a, b</sup>	47.7 (8.3)	46.9	48.2	47.1
Days/week use computers to learn reading, writing, and spelling	1.5 (.8)	1.5	1.4	1.5
Days/week on child-initiated activities <sup>a, b, c</sup>	2.3 (.8)	2.1	2.3	2.5
Days/week on discrete literacy skills instruction	1.9 (.7)	1.9	1.9	1.9
Days/week on comprehension skills instruction <sup>b, c</sup>	3.1 (.6)	3.0	3.1	3.2
Days/week on letter-sound knowledge instruction	4.4 (.4)	4.4	4.4	4.4

NOTES: Analyses are conducted at the child level. Significant differences are noted in each row of the table as follows: a = significant difference between low-SES and middle-SES estimates; b = significant difference between middle-SES and high-SES estimates; c = significant difference between low-SES and high-SES estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Base Year data file.

Results from the descriptive analyses show that children from different SES backgrounds have similar access to kindergarten instructional resources. Public school full-day kindergarten programs enrolled about 21 children per classroom in fall 1998-99. The means for the children coming from the highest SES families are practically the same as the means for children coming from the lowest SES families. Approximately three-quarters of full-day kindergartners attended schools that have classroom instructional aides working with children for at least one hour per day.

Although full-day kindergartners had similar access to instructional resources across schools, children's exposure to some instructional practices was modestly related to family SES. In 1998-99, children from high-SES families spent more time than children from middle- and low-SES families in instructional practices typically associated with developmental teaching philosophies. For instance, high-SES children spent a slightly larger percentage of time in child-selected activities and a smaller percentage of time in teacher-directed whole-class activities compared with middle- and low-SES children.<sup>11</sup> High-SES children also spent more days per week than other children on child-initiated activities and comprehension skills. Children's SES was also related to the amount of time they received instruction in different subject areas. Specifically, middle-SES children spent a slightly higher percentage of total instructional time in academic instruction than did high-SES children and they also spent a slightly higher percentage of academic time in reading instruction than did low-SES and high-SES children. On the other hand, children's frequency of participation in reading achievement groups, discrete literacy skills instruction, letter-sound knowledge instruction, and computer instruction in reading, writing, and spelling were similar across SES levels.

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<sup>11</sup>Middle-SES children also spent more days per week than low-SES children on child-initiated activities.

### *Hierarchical Linear Modeling (HLM) Analysis*

The next step in the analysis is to explore relationships between full-day kindergarten classroom factors and children's gains in reading achievement and academic engagement over the kindergarten year. Using hierarchical linear modeling (HLM), the following analyses assess the extent to which classroom resources and practices, aggregated to the school level, influence average gains in these two learning outcomes. These analyses also explore variation between schools in the effects of children's SES on learning outcomes and assess whether classroom resources and practice influence the distribution of gains in reading achievement and academic engagement within schools. As noted in Chapter 3, these two types of analyses have been referred to in the school effects literature as an examination of a school's "excellence" and "equity" parameters. A two-level HLM model is used to explore these parameters and the corresponding research questions. The Level-1 units are children and the Level-2 units are the public schools with full-day kindergarten programs attended by these children.

#### *Unconditional Models*

The first step in HLM in school effects research is to run an unconditional model. The unconditional model includes only the outcome variable. The primary reason to run the unconditional model is to determine the extent to which a dependent variable varies between schools, in the case of this study, and to assess the reliability of each school's sample mean as an estimate of its true population mean (Raudenbush and Bryk, 2002). The proportion of the total variance represented by the between-school variance component, often referred to as the intra-class correlation coefficient, indicates the extent to which children's individual values for an outcome variable depend on the schools that

they attend. The unconditional models estimate the proportion of variance in children's reading achievement and academic engagement gains that might be explained as a function of the average classroom resources and practices within a school.

As shown in table 6, about 17.6 percent of the variance in children's reading gains in kindergarten lies between schools, while 82.3 percent lies between children attending the same school. Based on the information provided by this analysis, 95 percent of school average reading achievement gains fall within the range of -0.84 standard deviations (SD) to 0.81 SD, with a mean school-level average gain of -0.013 SD.<sup>12</sup> This information indicates a range of roughly 1.7 SD in average reading gains among schools in the ECLS-K sample.

For the academic engagement model, about 7.6 percent of the variance lies between schools, while 92.4 percent of the variance is within schools (table 6). Based on the information provided in the model, 95 percent of school average academic engagement gains fall within the range of -0.52 SD and 0.55 SD, with a mean average gain of 0.016 SD. This information indicates a range of roughly 1.1 SD in academic engagement gains among schools in the ECLS-K sample.

The intraclass correlation coefficients for both outcomes are significant, suggesting that a sufficient portion of variance in children's gain scores might be attributable to between-school differences (i.e., school characteristics). The estimates of the reliability of the sample means for both outcomes are satisfactory, though there is noticeably less reliability in the sample means for gains in academic engagement than for gains in reading achievement. In sum, results from the unconditional model support

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<sup>12</sup> The plausible values range is calculated using the formula  $[\gamma_{00} \pm 1.96 (u_0)^{1/2}]$  (Raudenbush and Bryk, 2002).

further analyses of the relationships of classroom factors on children’s gains in reading and academic engagement over the kindergarten year.

**Table 6. Fully unconditional model for full-day kindergartners’ gains in reading achievement and academic engagement over the kindergarten year, 1998-99**

	Reading achievement gain	Academic engagement gain
Mean school average, $\gamma_{00}$	-0.013	0.016
Between school variance	0.178**	0.075**
Between child variance	0.834	0.917
Total variance	1.013	0.992
Proportion of variance between schools (intraclass correlation coefficients)	.176	.076
Proportion of variance within schools	.823	.924
Reliability	.705	.498

\*\*  $p < .01$ ; \*  $p < .05$ .

NOTES:  $n = 4,654$  children in 331 schools. Weighted by non-response adjusted school weight at Level 2 and within school child weight at Level 1.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Base Year data file.

### *Within-School Models*

Based on the finding that full-day kindergartners’ gains in reading and academic engagement vary across schools, the next step in the HLM analysis is to construct a within-school (child-level) model that specifies the child variables at Level 1 but does not include any Level-2 school variables. The within-school model examines relationships between gains and child-level characteristics, with the child serving as the unit of

analysis. As discussed in Chapter 3, the primary child-level variable of interest in the dissertation is family SES, with other child characteristics including gender, race/ethnicity, age at fall kindergarten assessment, fall kindergarten score (reading or academic engagement), and elapsed time between assessments serving as control variables in the model.

Initially, the child SES variable ( $\beta_1$ ) was centered on the within-group means and set as a random coefficient to test whether the effects of SES varied across schools. In this model, the child-level control variables were centered on the grand mean and set as fixed coefficients (i.e., without a random effect). Table 7 shows the results for the reading and academic engagement models.

Results from the within-school model show that reading achievement and academic engagement gain scores vary significantly across schools after controlling for other child-level characteristics associated with the two outcome variables (see the lower panel, titled Variance components, of the table). Estimates for the adjusted variance between schools for reading achievement gains (0.133) and academic engagement (0.087) remain statistically significant. However, the non-significant variance components for the random coefficient for the SES slope in the reading and academic engagement models (0.001 and 0.010, respectively) indicate that the relationships between children's SES and their gains in reading and academic engagement within schools do not vary across schools. The effects of SES on the outcomes of interest are the same, regardless of the schools attended by children. The SES slopes in the two models also have low reliability (0.014 and 0.098, respectively), a further indication that the SES effects for gains in reading achievement and academic engagement do not vary across

schools. As a result, in all subsequent analyses, the SES slope ( $\beta_1$ ) is grand-mean centered and fixed. These results provide answers to the second and fourth research questions. The effects of SES do *not* vary between schools, so classroom resources and practices do *not* influence differentially the reading achievement gains or the academic engagement gains of students from different SES backgrounds.

**Table 7. Within-school model for full-day kindergartners' gains in reading and academic engagement over the kindergarten year with random SES coefficient, 1998-99**

	Regression coefficients	
	Reading achievement gains	Academic engagement gains
<b>Random coefficients</b>		
Intercept, $\gamma_{00}$	-0.005	0.015
SES slope, $\gamma_{10}$	0.094**	0.072**
<b>Fixed coefficients</b>		
Male, $\gamma_{20}$	-0.115**	-0.243**
Black, non-Hispanic, $\gamma_{30}$	-0.317**	-0.090*
Hispanic, $\gamma_{40}$	-0.089	0.090
Asian/Pacific Islander, $\gamma_{50}$	0.181*	0.028
Other, $\gamma_{60}$	-0.137*	-0.048
Age at time of fall assessment, $\gamma_{70}$	0.040**	0.056**
Fall assessment score, $\gamma_{80}$	-0.099**	-0.397**
Elapsed time between assessments, $\gamma_{90}$	0.173**	-0.004
<b>Reliability of random coefficients</b>		
Intercept, $\beta_0$	0.666	0.582
SES slope, $\beta_1$	0.014	0.098
<b>Variance components:</b>		
Intercept, $u_0$	0.133**	0.087**
SES slope, $u_1$	0.001	0.010
Level-1, $r_0$	0.814	0.784

\*\*  $p < .01$ ; \*  $p < .05$ .

NOTES:  $n=4,654$  children in 331 schools. Weighted by non-response adjusted school weight at Level 2 and within school child weight at Level 1.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Base Year data file.

Table 8 presents the results from the reading and academic engagement within-school models, with all child-level predictors including SES set as fixed coefficients and

centered on the grand mean for each variable for all children. Children’s SES levels are positively related to their gains in both outcomes, indicating that children from families with higher-SES backgrounds make greater gains in reading and academic engagement than children from lower-SES backgrounds after controlling for the other child-level characteristics included in the model. For example, children with a family SES value one SD above the mean have reading gains that are 0.10 SD larger and academic engagement gains that are 0.06 SD larger than children with average family SES values.

**Table 8. Within-school model for full-day kindergartners’ gains in reading and academic engagement over the kindergarten year with fixed SES coefficient, 1998-99**

	Reading achievement gains	Academic engagement gains
<b>Random coefficient</b>		
Intercept, $\gamma_{00}$	0.005	0.019
<b>Fixed coefficients</b>		
SES slope, $\gamma_{10}$	0.098**	0.060**
Male, $\gamma_{20}$	-0.116**	-0.243**
Black, non-Hispanic, $\gamma_{30}$	-0.293**	-0.073
Hispanic, $\gamma_{40}$	-0.075	0.097~
Asian/Pacific Islander, $\gamma_{50}$	0.183*	0.028
Other, $\gamma_{60}$	-0.128*	-0.045
Age at time of fall assessment, $\gamma_{70}$	0.041**	0.055**
Fall assessment score, $\gamma_{80}$	-0.103**	-0.395**
Elapsed time between assessments, $\gamma_{90}$	0.170**	-0.005
<b>Reliability of random coefficients</b>		
Intercept, $\beta_0$	0.647	0.567
<b>Variance components:</b>		
Intercept, $u_0$	0.130**	0.087**
Level-1, $r_0$	0.814	0.791

\*\* p<.01; \* p<.05; ~ p<.10.

NOTES: n=4,654 children in 331 schools. Weighted by non-response adjusted school weight at Level 2 and within school child weight at Level 1.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Base Year data file.

Children's gains in reading and academic engagement also vary with respect to the control variables included in the Level-1 model. Boys make smaller kindergarten gains than girls in both areas (i.e., -0.12 SD gain in reading, -0.24 SD gain in academic engagement). Older children tend to make greater gains than younger children in both outcomes. In terms of race/ethnicity, Black children's gains in reading achievement are over a quarter of a standard deviation smaller than White children's gains, while Asian/Pacific Islander children have gains that are almost one fifth of a standard deviation larger than White children's gains. Other non-Hispanic racial/ethnic groups also have lower reading gains than White children by -0.13 SD. In contrast, children's academic engagement gains are not significantly related to their race/ethnicity (at the  $p < .05$  level).

Children who have more time between the fall and spring assessments show greater reading gains but no difference in academic engagement gains relative to children who have less time between assessments. Finally, both models show a regression to the mean, in that children with higher fall scores make smaller gains in both outcomes over the kindergarten year.

After accounting for child-level characteristics that may be associated with children's gains in reading and academic engagement over the school year, significant variation in the outcome measures is still present across schools. The plausible reading gain values range from -0.70 SD to 0.71 SD and the plausible academic engagement gain values range from -0.56 SD to 0.60 SD.

The proportion of Level-1 (within-school) variance explained by the within-school model can be estimated by comparing the Level-1 variance components ( $r_{\theta}$ ) in the

child-level and unconditional models.<sup>13</sup> About 2.4 percent of the within-school variance in children's reading gains and 13.7 percent of the variance in children's academic engagement gains are explained by the child-level variables included in these models.

### *Fully-specified Models*

In the final steps of the HLM analyses, fully-specified models explore relationships between full-day kindergarten classroom factors (i.e., average school instructional resources and practices) and children's gains in reading achievement and academic engagement over the kindergarten year. In essence, these explanatory models provide evidence about why some schools may have larger mean gain scores than other schools. In the fully-specified models, the intercept from the Level-1 (within-school) model,  $\beta_0$ , becomes the outcome variable for the Level-2 (school-level) models. The Level-1 model remains the same. The Level-2 model includes each of the instructional resource and instructional practice variables as predictors for the intercept term. Two-way interactions between the classroom factors (e.g., class size x frequency of discrete literacy skills; proportion of time on whole-class instruction x frequency of comprehension skills) were also tested and significant interactions were retained in the final models.<sup>14</sup> The HLM models were tested with and without the school-level control variables to assess whether significant relationships between classroom factors and outcomes persisted in both instances. No Level-2 variables were assigned to the SES slope coefficient ( $\beta_1$ ) equation because results from the child-level models indicated that the within-school

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<sup>13</sup> The formula for calculating the proportion variance explained at level 1 is [(unconditional model  $r_0$  - child-level model  $r_0$ )/ unconditional model  $r_0$ ] (Raudenbush and Bryk, 2002).

<sup>14</sup>To identify significant interaction terms for the final model, all interactions were initially entered in the model, then stepwise backward removal techniques (dropping interaction terms individually based on the interaction term with the highest p-value greater than .10) were used to remove non-significant interaction terms.

relationships between child SES and child outcomes did not vary significantly across schools.

*Reading gains model.* Table 9 presents the results of the HLM analyses of classroom factors on children's reading gains during the kindergarten year. Beginning at the top of the table, none of the classroom resources have a significant influence on reading achievement gains. However, as noted in the section of the table that reports the interaction coefficients, each resource moderates the effects of one or more other school-level variables in the model.

Moving down the table to instructional practices, on average, neither whole class instruction nor reading achievement groups are associated with reading gains, but each has a significant interaction with the average class size in schools (coefficients = -0.10 and 0.07 SD, respectively). In schools with smaller than average class size, the coefficient for whole-class instruction is 0.10 SD, whereas in schools with larger than average class size, the coefficient is -0.09 SD.<sup>15</sup> In the case of reading groups, the coefficient is negative in schools with smaller class sizes (-0.06 SD) but positive in schools with larger class sizes (0.09 SD). In other words, whole group instruction contributes to reading achievement gains in schools where teachers have fewer children to work with in their classes, but diminishes gains in school where teachers have larger classroom enrollments; just the opposite is true for readings groups, which contribute to reading gains in schools with larger class sizes and diminish gains in schools with smaller class sizes.

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<sup>15</sup> The interaction terms indicate the extent to which one variable moderates the effect of another variable. In the case of teacher directed, whole group instruction, the average coefficient is .006. In schools with larger class sizes (e.g., 1 SD above the mean), the coefficient is  $.006 + (1 \times -.092)$  or -.086 SD, whereas in schools with smaller class sizes, (e.g., 1 SD below the mean), the coefficient is  $.006 + (-1 \times -.092)$  or .096 SD. This is the basic formula used to interpret all interaction effects in tables 9 and 10.

**Table 9. School-level model of instructional resources and practices on full-day kindergartners' gains in reading achievement, 1998-99**

	Reading gains	Reading gains with school controls included
<b>Average outcome (intercept), <math>\gamma_{00}</math></b>	0.009	0.008
<i>Instructional resources</i>		
Class size, $\gamma_{01}$	-0.007	-0.006
Instructional aide present, $\gamma_{02}$	-0.006	-0.004
<i>Instructional practices</i>		
Proportion of time in teacher-directed, whole-class grouping, $\gamma_{03}$	0.006	0.009
Proportion of time in child-selected activities, $\gamma_{04}$	-0.015	-0.018
Frequency of reading achievement groups, $\gamma_{05}$	0.017	0.019
Proportion of reading time over total academic time, $\gamma_{06}$	0.087**	0.086**
Proportion of academic time over total instructional time, $\gamma_{07}$	0.053*	0.051*
Frequency of discrete literacy skills activities, $\gamma_{08}$	0.156**	0.160**
Frequency of comprehension skills activities, $\gamma_{09}$	-0.171**	-0.176**
Frequency of child-initiated activities, $\gamma_{010}$	-0.007	-0.013
Frequency of letter-sound knowledge activities, $\gamma_{011}$	0.026	0.027
Frequency of computer use to learn reading/writing/spelling, $\gamma_{012}$	-0.004	-0.003
<i>Significant interactions between classroom factors</i>		
Class size x discrete literacy skills, $\gamma_{013}$	-0.092**	-0.096**
Class size x whole-class grouping, $\gamma_{014}$	-0.104**	-0.107**
Class size x reading achievement groups, $\gamma_{015}$	0.073*	0.073*
Comprehension skills x instructional aide, $\gamma_{016}$	0.126*	0.123*
Comprehension skills x whole-class grouping, $\gamma_{017}$	-0.080**	-0.073**
<i>School-level controls</i>		
Mean school SES, $\gamma_{018}$		0.032
Mean school fall assessment score, $\gamma_{019}$		0.009
Midwest, $\gamma_{020}$		0.032
South, $\gamma_{021}$		0.007
West, $\gamma_{022}$		-0.017
Suburb, $\gamma_{0223}$		0.033
Rural, $\gamma_{024}$		-0.024
<b>Fixed coefficients</b>		
SES slope, $\gamma_{10}$	0.103**	0.097**
Male, $\gamma_{20}$	-0.115**	-0.115**
Black, non-Hispanic, $\gamma_{30}$	-0.340**	-0.329**
Hispanic, $\gamma_{40}$	-0.094	-0.086
Asian/Pacific Islander, $\gamma_{50}$	0.150~	0.156~
Other, $\gamma_{60}$	-0.135~	-0.120~
Age at time of fall assessment, $\gamma_{70}$	0.041**	0.040**
Fall assessment score, $\gamma_{80}$	-0.107**	-0.111**
Elapsed time between assessments, $\gamma_{90}$	0.158**	0.159**
<b>Variance components:</b>		
Intercept, $u_0$	0.083**	0.085**
Level-1, $r_0$	0.815	0.815

\*\* p<.01; \* p<.05; ~ p<.10.

NOTES: n=4,654 children in 331 schools. Weighted by non-response adjusted school weight at Level 2 and within school child weight at Level 1.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Base Year data file.

Reading gains are larger also in full-day programs that devote greater proportions of time to academic instruction (i.e., reading, math, science, and social studies) relative to total instructional time (i.e., academic time plus time spent in music, art, and physical education) (coefficient = 0.05 SD). Similarly, reading gains are larger in schools that devote greater proportions of academic time to reading instruction (coefficient = 0.09 SD). The greater the time dedicated to academic activities in general and reading instructional in particular, the greater the gains in reading achievement for kindergartners. These are the only two instructional practices in table 9 without a significant interaction.

Children's reading gains also are associated with the frequency of exposure to discrete literacy skills (e.g., conventional spelling, capitalization and punctuation, reading multi-syllable words) (coefficient = 0.16 SD). However, as average class size increases, the beneficial effects of an emphasis on discrete literacy skills diminish (interaction coefficient = -0.09 SD). In schools with smaller class sizes, the coefficient for discrete literacy skills is 0.25 SD, while in schools with larger class sizes the coefficient is 0.06 SD. Overall, an emphasis on discrete literacy skills increases reading achievement gains for kindergartners in schools, but the extent of the increase depends on the average number of students in teachers' classes.

Just the opposite appears to be true about more frequent instruction on comprehension-based skills (e.g., retelling stories, making predictions based on text, and using context cues for comprehension). On average, achievement gains are lower in schools that emphasize comprehension-based skills (coefficient = -0.17 SD). However, these effects vary with the extent to which teacher aides are available in schools (interaction coefficient = 0.13 SD) and the extent to which schools emphasize teacher-

directed, whole-class grouping increases (interaction coefficient = -0.08 SD). For example, the coefficient for comprehension-based skills is -0.17 SD in schools where teacher's aides are not present and -0.04 SD in schools where teacher's aides are present. In the case of whole-group instruction, the coefficient for comprehension-based skills is -0.09 SD in schools that do not emphasize this instructional format and -0.25 SD in schools that do. Nonetheless, in general, readings gains are lower in schools that emphasize the acquisition of comprehension skills in kindergarten.

The frequency of child-initiated activities, such as children choosing their own books to read, writing stories in journals, and listening to teachers read big books, is not associated with kindergarten reading gains, nor is the frequency of letter-sound skills instruction. Other instructional practices that are not significantly associated with kindergarten reading gains include the frequency that children used computers to learn reading, writing, and spelling and the proportion of time that children spend in child-selected activities relative to other grouping arrangements. These instructional practices also do not interact significantly with any other instructional resources or practices in the model.

Results in the fully-specified model that include school control variables (presented in the second column of results) are similar to those presented in the fully-specified model that does not include school controls (the first column of results). Furthermore, none of the school control variables are significantly associated with differences in average reading gains between schools. Neither school composition nor school locations influenced children's reading achievement gains during kindergarten given the other variables in the model.

Relationships between child characteristics and kindergarten reading gains are similar to the results of the child-level reading gain model. The only difference between the results for the fully-specified model and the child-level model presented in the earlier section is that Asian children's reading gains are no longer significantly different from White children's reading gains after classroom factors are included in the model.

The proportion of variance explained by the fully-specified reading gains model (without school control variables) can be estimated by comparing the Level-2 variance components ( $u_0$ ) from the fully-specified model (table 9) and the within-school model (table 8).<sup>16</sup> The inclusion of the average classroom factors in the model estimating mean reading gains reduces the proportion of between-school variance by 36.2 percent.

*Academic engagement gains model.* Table 10 presents the results of the HLM analyses of average classroom factors on children's engagement gains during the kindergarten year. The academic engagement model produced fewer significant findings than the reading achievement model. The smaller number of significant relationships could be expected, because the unconditional academic engagement model showed a smaller proportion of between-school variance in the engagement model than the reading model (7.6 percent vs. 17.6 percent, respectively). In other words, less variance can be explained by average classroom factors in the engagement model compared with the reading model.

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<sup>16</sup>The formula for calculating the proportion variance explained at level 2 is [(child-level model  $u_0$  - fully-specified model  $u_0$ )/ child-level model  $u_0$ ] (Raudenbush and Bryk, 2002).

**Table 10. School-level model of instructional resources and practices on full-day kindergartners' gains in academic engagement, 1998-99**

	Engagement gains	Engagement gains with school controls included
<b>Average outcome (intercept), <math>\gamma_{00}</math></b>	0.003	0.001
<i>Instructional resources</i>		
Class size, $\gamma_{01}$	-0.021	-0.026
Instructional aide present, $\gamma_{02}$	0.094*	0.084~
<i>Instructional Practices</i>		
Proportion of time in teacher-directed, whole-class grouping, $\gamma_{03}$	-0.077	-0.078
Proportion of time in child-selected activities, $\gamma_{04}$	-0.007	-0.009
Frequency of reading achievement groups, $\gamma_{05}$	-0.003	-0.008
Proportion of reading time over total academic time, $\gamma_{06}$	0.021	0.025
Proportion of academic time over total instructional time, $\gamma_{07}$	0.015	0.020
Frequency of discrete literacy skills activities, $\gamma_{08}$	-0.029	-0.039
Frequency of comprehension skills activities, $\gamma_{09}$	0.001	-0.002
Frequency of child-initiated activities, $\gamma_{010}$	0.046	0.059
Frequency of letter-sound knowledge activities, $\gamma_{011}$	0.017	0.011
Frequency of computer use to learn reading/writing/spelling, $\gamma_{012}$	0.012	0.002
<i>Significant interactions between classroom factors</i>		
Instructional aide x whole-class grouping, $\gamma_{014}$	0.111*	0.116*
Proportion of reading time x comprehension skills, $\gamma_{013}$	-0.077**	-0.084**
<i>School-level controls</i>		
Mean school SES, $\gamma_{015}$		-0.009
Mean school fall assessment score, $\gamma_{016}$		0.003
Midwest, $\gamma_{017}$		-0.208*
South, $\gamma_{018}$		-0.065
West, $\gamma_{019}$		-0.217*
Suburb, $\gamma_{020}$		-0.046
Rural, $\gamma_{021}$		0.018
<b>Fixed effect</b>		
SES slope, $\gamma_{10}$	0.066**	0.069**
Male, $\gamma_{20}$	-0.246**	-0.249**
Black, non-Hispanic, $\gamma_{30}$	-0.106*	-0.123**
Hispanic, $\gamma_{40}$	0.084	0.081
Asian/Pacific Islander, $\gamma_{50}$	0.017	0.031
Other, $\gamma_{60}$	-0.107	-0.076
Age at time of fall assessment, $\gamma_{70}$	0.057**	0.061**
Fall assessment score, $\gamma_{80}$	-0.398**	-0.400**
Elapsed time between assessments, $\gamma_{90}$	-0.006	-0.012
<b>Variance components:</b>		
Intercept, $u_0$	0.056**	0.054**
Level-1, $r_0$	0.790	0.790

\*\* p<.01; \* p<.05; ~ p<.10.

NOTES: n=4,654 children in 331 schools. Weighted by non-response adjusted school weight at Level 2 and within school child weight at Level 1.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Base Year data file.

Findings from the academic engagement model show that children's academic engagement gains are larger in schools where instructional aides are more likely to be present and working with children at least an hour per day (coefficient = 0.09 SD). The presence of instructional aides also interacts with the frequency of teacher-directed, whole-class grouping arrangements (interaction coefficient = 0.11 SD). For example, the coefficient for the presence of instructional aides is 0.20 SD in schools that emphasize whole-class grouping but only -0.02 SD in schools that rarely use this instructional format. The magnitude of the benefits of instructional aides, at least in terms of children's academic engagement, depends on the manner in which teachers organize instruction.

The engagement model also indicates a significant interaction between the proportion of academic time spent on reading instruction and the extent to which children are exposed to comprehension-based skills instruction (interaction coefficient = -0.08 SD). Although, on average, time spent on reading is not associated with gains in engagement, the coefficient in schools that emphasize comprehension-based skills is -0.08 SD, whereas the coefficient in schools that rarely focus on these skills is 0.07 SD. In other words, more time on reading appears to increase gains in kindergartners' academic engagement, but only in schools that emphasize instructional practices other than basic skills in comprehension.

Other than the few significant relationships noted above, none of the other full-day kindergarten instructional resources or practices is associated with gains in children's academic engagement. Results for the fully-specified model that includes school control variables (second column of results) are similar to those presented in the fully-specified

model that does not include school controls. The two interaction terms retain significance in both models, but the significant instructional aide main effect in the model without school controls becomes marginally significant ( $p = .08$ ). The model that includes school control variables also indicates that children's gains in academic engagement are significantly related to the region in which schools are located. Children in full-day kindergarten programs located in the Midwest and West regions make smaller gains in their academic engagement than children in the Northeast region. This finding differs from the reading gains models, in which none of the school control variables were significantly related to the outcome.

Relationships between child characteristics and kindergarten academic engagement gains are similar to the results of the child-level academic engagement gain model. The only difference in results between the fully-specified model and the child-level model presented in the earlier section is that Black children's engagement gains are significantly smaller than White children's engagement gains once average classroom factors are included in the model.

The proportion of variance explained by the fully-specified academic engagement gains model (without school control variables) can be estimated by comparing the level-2 variance components ( $u_0$ ) from the fully-specified model (table 10) and the within-school model (table 8).<sup>17</sup> The inclusion of average classroom factors in the model estimating mean academic engagement gains reduces the proportion of between-school variance by 35.8 percent.

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<sup>17</sup>The formula for calculating the proportion variance explained at level 2 is [(child-level model  $u_0$  - fully-specified model  $u_0$ ) / child-level model  $u_0$ ] (Raudenbush and Bryk, 2002).

### *Summary of Key Findings*

Results from the principal components analysis, the descriptive statistics, and the hierarchical linear modeling procedures provide useful information that addresses the four dissertation research questions. Below is a summary of the key findings from each analysis.

#### *Principal Components Analysis (PCA)*

The PCA of 23 reading activities and 19 reading skills questions yielded four “instructional practice scales” that could be used as predictors of classroom reading instruction. Teachers reported teaching *letter-sound knowledge* to children at least four times a week, on average. *Comprehension skills*, such as identifying the main idea and parts of a story and making predictions based on text, were the next most common set of instructional activities, occurring about three times a week. *Child-initiated activities*, such as children writing stories in a journal and reading books they select for themselves, occurred about twice a week. *Discrete literacy skills*, such as practicing conventional spelling and reading aloud fluently, also occurred about twice a week, on average. The four scales were moderately positively correlated with each other, indicating that teachers who reported greater frequency on one scale were likely to report greater frequency on the other reading scales.

#### *Descriptive Statistics*

Full-day kindergarten classroom factors were compared to assess whether children from different family socioeconomic (SES) backgrounds made equivalent gains in their reading achievement and academic engagement and whether they had similar

access to instructional resources and teaching practices. The descriptive analyses indicated that children from higher-SES backgrounds both began kindergarten and ended kindergarten with higher levels of reading achievement and higher levels of academic engagement. However, while children from higher-SES backgrounds made greater gains than other children in reading achievement during the kindergarten year, they did not make greater gains in academic engagement. Gains in academic engagement were relatively similar for kindergartners, regardless of their SES background.

Results also illustrated that children from varying SES backgrounds have similar access to instructional resources but differential exposure to some instructional practices. Compared with children from low- and middle-SES backgrounds, children from higher-SES backgrounds spend a greater percentage of the instructional day in schools that emphasize child-selected activities and a smaller percentage of the day in schools that emphasize teacher-directed whole-class instruction. Children from higher-SES backgrounds also attend schools that provide greater exposure to child-initiated activities and comprehension skills. Children from middle-SES households spend a greater proportion of the academic day on reading instruction than do other children, and they spend more time on child-initiated activities than do children from low-SES backgrounds. These findings provide evidence that full-day classroom instructional experiences vary for children from different SES backgrounds.

#### *Hierarchical Linear Modeling (HLM) Analysis*

Preliminary analyses using separate (reading and academic engagement) unconditional HLM models showed that about 18 percent of the variance in children's reading gain scores and 8 percent of the variance in children's academic engagement gain

scores occurred between schools. Within-school models were developed to assess whether the relationships between children's SES and their gains in both outcomes varied significantly across schools. The child SES slope was not significant in either the reading or the academic engagement model, suggesting that the effect of SES on the outcomes is roughly the same across schools. As a result, the final fully-specified models included average instructional resources and practices as Level 2 predictors of mean reading and academic engagement gains, but did not include any Level 2 predictors for the child SES slope.

Results from the fully-specified reading gains model indicate that children in schools that spend greater proportions of the instructional day on academic instruction and greater proportions of academic time on reading instruction make greater gains in reading achievement during the kindergarten year. More frequent practice with discrete literacy skills is associated with larger reading gains in schools, whereas more frequent practice with comprehension skills is associated with smaller reading gains in schools. However, the positive effects of discrete literacy skills depend on the average class size in schools and the negative effects of comprehension-based skills depend on the presence of teacher's aides and the frequency of whole-class instruction in schools.

On average, teacher-directed whole-group instruction and reading achievement groups are not related to reading gains, but these practices interact with other variables in the model. Whole-group instruction is positively associated with reading gains in schools with smaller classes and negatively associated with reading gains in schools with larger classes. On the other hand, an emphasis on reading achievement groups is positively associated with reading gains in schools with larger classes and negatively associated

with reading gains in schools with smaller classes. As with discrete literacy skills and comprehension-based skills, the effects of these instructional practices are contingent on classroom resources and other practices.

The fully-specified academic engagement model yields fewer significant relationships between classroom factors and children's outcomes. Children in schools where instructional aides are present make greater gains in academic engagement than children in schools where aides are not present. The benefit of having an instructional aide in the classroom on engagement gains is even larger in classrooms that spend larger proportions of time in teacher-directed whole-class grouping arrangements. Finally, children make smaller gains in engagement if the kindergarten teachers in their school spend more than average amounts of time on reading instruction along with more than average amounts of time on comprehension-based skills.

## Chapter 5: Discussion and Conclusions

This chapter begins by linking findings from the descriptive and HLM analyses to the original research questions posed in the dissertation. Sections two and three discuss study limitations and implications for researchers and policymakers based on evidence from the dissertation. The final sections provide suggestions for future research on full-day kindergarten programs and concluding remarks.

### *Linking Findings to the Research Questions*

This dissertation explores relationships between aspects of full-day kindergarten programs and children's gains in reading achievement and academic engagement over the kindergarten year. As discussed in Chapter 1, the overarching research interest is to examine how the additional time provided by full-day kindergarten programs can be structured to improve children's early learning outcomes. This section links evidence from the study analyses back to the original research questions.

*Research Question 1: What influence do different full-day kindergarten classroom factors (i.e., instructional resources and teachers' instructional practices) have on children's reading achievement? Do these factors help to explain variations between schools in average reading achievement in kindergarten?*

Full-day kindergarten instructional resources and practices have direct and interactive effects on children's gains in reading achievement during kindergarten. Significant classroom factors include the allocation of time across instructional subjects in schools and the frequency of instructional reading skills and activities in schools. Other

classroom factors that interact in their association with reading gains include kindergarten average classroom size, the presence of instructional aides, and time allocation to different grouping strategies in schools. Each of the significant classroom factors is discussed in more detail below.

*Instructional time allocation.* On average, full-day kindergartners spend 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 devote a greater than average proportion of the instructional day to academic subjects tend to make greater reading progress during the kindergarten year. Similarly, children in programs that devote a greater than average proportion of academic time to reading instruction make 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,<sup>18</sup> translates 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, translates 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

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<sup>18</sup> A one standard deviation increase in the percentage of academic instruction was calculated using information from table 5: (mean + one standard deviation) =  $(77.0 + 6.7) = 83.7$  percent. The same calculation was used for percentage of reading instruction (i.e.,  $47.7 + 8.3 = 56.0$  percent).

allocation to specific instructional subjects is positively related to learning in those subjects (Berliner, 1990; Coates, 2003; Cotton, 1989; Guarino et al., 2006). 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.

*Frequency of instructional skills and activities.* Full-day kindergartners participate in discrete literacy skills instruction 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. Findings from this study indicate that children whose schools teach discrete literacy skills more than the average amount tend to make greater progress in reading skills while those whose schools teach comprehension skills more than the average amount make less progress over the kindergarten year.

The finding of contrasting effects of the discrete literacy skills and comprehension skills instructional scales on reading gains is initially unexpected given that teachers who report high levels of instruction in one of the scales also tend to report high levels of instruction in the other scale ( $r = .50$ ). However, one interpretation of the findings is that a different balance of instructional practices would be more effective. Children are exposed to comprehension skills, such as making predictions based on text and using context cues, more frequently than they are exposed to discrete literacy skills, such as reading aloud, composing and writing complete sentences, and using capitalization and punctuation (i.e., 3.1 days/week versus 1.9 days/week, respectively). Results from this

study show that children tend to make greater gains in reading when discrete literacy skills are taught more often (0.16 SD) and comprehension skills are taught less often (-0.17 SD). 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). This study provides insights into what an optimal balance might be in full-day kindergarten programs. For example, increasing the frequency of discrete skills instruction one standard deviation, from an average of 1.9 days/week to 2.6 days/week, and decreasing the frequency of comprehension-based skills instruction one standard deviation, from 3.1 days/week to 2.5 days/week, would translate to an increase of one-third of a standard deviation in reading gains.<sup>19</sup>

Children's frequencies of practice on letter-sound knowledge and on child-initiated activities, such as writing stories in journals and reading books they have chosen for themselves, were not associated with their kindergarten reading gains. One potential reason why 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 letter-sound knowledge on almost a daily basis. As for the non-significant relationships between child-initiated activities and reading gains, one reason for this finding may be that many of the specific variables that compose the instructional scale are writing-based activities, which are not directly measured in the

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<sup>19</sup>A one standard deviation increase in the frequency of discrete literacy skills was calculated using information from table 5: (mean + one standard deviation) =  $(1.9 + 0.7) = 2.6$  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 coefficients for each practice (i.e.,  $0.16 \text{ SD} - (-0.17 \text{ SD}) = 0.33 \text{ SD}$ ).

ECLS-K reading assessment. More interpretations regarding the link between the reading assessment and instructional practices are discussed in the *Study Limitations* section of this chapter.

*Kindergarten class size.* Although the average kindergarten class size within a school does not have a significant main effect on children's reading gains, it interacts significantly with some instructional practices to increase or decrease kindergartners' average reading gains in schools. In 1998-99, public school full-day kindergarten programs enrolled an average of 21 students per classroom. This study shows that the reading gains attributable to more frequent instruction in discrete literacy skills decrease as average class size increases. In other words, the benefit of frequent discrete literacy skills practice on kindergarten reading gains is reduced in schools with larger classes.

Class size also interacts with instructional grouping strategies in its relationship with reading gains. Children spend about 38 percent of the day in teacher-directed, whole-class grouping arrangements and about one hour per week in reading achievement groups. Although the main effect of time spent in teacher-directed whole-class grouping on reading gains is not significant, children in larger than average classrooms make smaller reading gains as their proportion of time in whole-class grouping increases. On the other hand, children in larger than average classrooms make greater reading gains when they spend greater than the average amount of time in reading achievement groups.

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. Similarly, 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 frequent 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).

In sum, evidence from this study differs from that of prior studies that found overall benefits of class size (Glass and Smith, 1978; Robinson, 1990), particularly studies that have found overall effects for kindergartners (Ehrenberg et al., 2001; Finn, Gerber, and Boyd-Zaharias, 2005; Walston and West, 2004) because it identifies interactive 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 for teachers to consider when making pedagogical decisions.

*Presence of instructional aides in the classroom.* Over three-quarters of full-day kindergarten programs have an instructional aide who works with children at least one hour per week. The presence of instructional aides in classrooms interacts positively with the frequency of comprehension skills instruction. In other words, children in full-day

kindergarten programs benefited from instructional aides working with children at least one hour per day when the program placed a heavy emphasis on comprehension skills. One potential reason for this finding may be that the effective teaching of comprehension skills to kindergartners is difficult, so the presence of instructional aides provides additional adults who can interact with children as they practice these skills, such as retelling stories or identifying the main idea and parts of a story. Another possible explanation for this interaction could be that the aides assist teachers by working with some children in other instructional areas while teachers provide instruction in comprehension skills to a smaller group of children who are more developmentally ready for these tasks (Gerber et al., 2001; Karweit, 1988; Pianta et al., 2002; Walston and West, 2004).

*Research Question #2: Do these full-day kindergarten classroom factors differentially influence the reading achievement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average reading achievement of children from different socioeconomic backgrounds?*

Although this study aimed to identify full-day kindergarten classroom factors that are linked with more equitable reading gains across SES backgrounds, results from the child-level HLM model indicated that relationships between family SES and children's reading gains did not vary significantly across schools. In other words, the effect of family SES on children's reading gains was approximately the same across the schools in the study. As a result, full-day kindergarten classroom factors were not modeled as predictors of the children's family SES slope to assess whether certain instructional resources and practices were associated with more equitable reading gains. Potential

interpretations of why the family SES slope did not vary significantly across schools are provided in *Study Limitations* section in this chapter.

*Research Question #3: What influence do full-day kindergarten classroom factors have on children's academic engagement? Do these factors help to explain variations between schools in average academic engagement in kindergarten?*

Full-day kindergarten instructional resources and practices have direct and interactive effects on children's gains in academic engagement during kindergarten, although the number of significant relationships is much smaller than the number found in the reading gains regressions. The only significant main effect for academic engagement gains is the presence of instructional aides in schools. Other classroom factors that interact in their association with academic engagement gains include the proportion of time spent on teacher-directed, whole-class grouping; the proportion of academic time devoted to reading instruction; and the frequency of comprehension skills instruction in schools. Each of the significant classroom factors is discussed in more detail below.

*Presence of instructional aides in classrooms.* Evidence from this study shows that full-day kindergartners in schools that include instructional aides who work with children at least one hour per day have greater gains in their academic engagement than children in programs without instructional aides. The presence of instructional aides is even more beneficial to children's academic engagement as the average proportion of time spent in teacher-directed, whole-class grouping arrangements in schools increases.

Prior research has not explored the impact of classroom instructional aides on children's academic engagement, so findings from this study provide unique information on the potential non-academic benefits of this instructional resource. One possible interpretation of these findings is that instructional aides serve as a second adult in the classroom who can discuss instructional content with children, encourage children in performing difficult tasks, answer any questions or clarify directions, and in general help keep children engaged as the teacher is providing whole-class instruction. Academic engagement also may increase if instructional aides assist the teacher by working with individual children or small groups that need extra assistance from adults to complete classroom assignments.

*Proportion of time devoted to reading instruction and comprehension skills.*

Overall, the average proportion of academic time that is devoted to reading instruction in schools is not related to children's gains in their academic engagement. However, the proportion of reading time interacts negatively with the average frequency that children are exposed to comprehension skills instruction in their schools. In other words, children who spend most of the academic time on reading instruction and who spend more than average time on comprehension skills instruction tend to have smaller academic engagement gains than children who spend less time in reading or less time on comprehension skills.

One possible interpretation of this finding is that children's academic engagement may decrease if they spend much of the instructional day on oral comprehension activities, such as retelling stories, making predictions about text, discussing vocabulary,

and identifying the main idea and parts of stories. During these activities, children may not have many opportunities to share their answers with the teacher during class discussions and thus may lose interest in activities if they are not required to participate. The teacher also may have more difficulty assessing whether children are engaged in comprehension skills activities because children typically provide most of their responses in an oral rather than written format in kindergarten.

Another possibility is that instruction in comprehension skills is a challenging task for many kindergartners. Kindergartners begin school with different levels of readiness; some children may not have the requisite skills required to engage text successfully. Other findings from this study suggest instruction in comprehension skills is most successful when it is done at a frequency similar to discrete skills instruction, when it is done in small groups (as opposed to whole group instruction), and when teacher aides are available to assist children. An emphasis on reading and comprehension skills may frustrate children not ready for these tasks and discourage gains in academic engagement.

Other than the negative relationship between the interaction of reading time and comprehension skills with academic engagement, no other full-day kindergarten classroom factors were negatively associated with children's academic engagement gains. This finding casts doubt on the concerns of some early childhood researchers that too much emphasis on discrete literacy skills or too little emphasis on child-initiated activities can harm children's early academic engagement (Elicker and Mathur, 1997; Stipek et al., 1995; Valeski and Stipek, 2001).

*Research Question #4: Do these full-day kindergarten classroom factors differentially influence the academic engagement of children from different socioeconomic backgrounds? Do these factors help to explain variations between schools in the average academic engagement of children from different socioeconomic backgrounds?*

Similar to the findings from the second research question, relationships between children's family SES and their gains in academic engagement over the kindergarten year did not vary significantly across schools. As a result, full-day kindergarten classroom factors were not modeled as predictors of the children's family SES slope to assess whether certain instructional resources and practices were associated with more equitable academic engagement gains.

#### *Study Limitations*

Prior to making policy recommendations about full-day kindergarten factors that may be positively or negatively related to children's reading achievement and academic engagement, it is essential to identify limitations of the study that may affect final interpretations. This section explores six areas of concern that may impact the study results: the match between ECLS-K assessments and teacher questionnaire information; the use of teacher report as a measure of children's academic engagement; the use of teacher report of full-day kindergarten classroom factors; variation in family SES within public schools; interactions among full-day kindergarten classroom factors; and other empirical limitations of the study. Each area is discussed in detail below.

### *Match Between the ECLS-K Reading Assessment and Teacher Questionnaires*

The ability to relate full-day kindergarten classroom factors to children's reading gains is limited to the degree that the ECLS-K reading assessment measures the full range of reading skills that children are expected to master during the kindergarten year. Some reading skills, such as letter identification, reading words in isolation, vocabulary (i.e., matching words to pictures), and identifying the missing word in a sentence are easier to assess in a standardized setting than more extended skills, such as reading passages and answering open-ended questions, retelling stories, or providing written answers to questions. Although the ECLS-K assessments covered a broad range of skills with varying degrees of difficulty, the assessment may have covered some skill sets better than others (or that skill sets reflect different ranges of difficulty for kindergartners). One interpretation of these findings is that the ECLS-K assessment measured children's knowledge of some skill sets better than others. The absence of findings for some skill sets (e.g., child-initiated activities) and even the negative findings associated with comprehension skills could be due to the assessment having fewer relevant reading items or more error associated with the measurement of these skills. On the other hand, gains in discrete literacy skills may be easier to detect if they are measured more extensively and accurately in the ECLS-K reading test.

### *Teacher Reports of Children's Academic Engagement*

Unlike children's reading achievement scores, which were based on direct child assessment by trained ECLS-K staff, children's academic engagement scores were measured through teacher ratings on the Social Rating Scale (SRS). Any conclusions drawn from analyses of relationships between academic engagement and full-day

kindergarten classroom factors must be tempered by the fact that teachers, as opposed to independent raters, scored children's engagement behaviors. The SRS measures, therefore, may have limited reliability and validity.

Teacher ratings of children's academic engagement may vary from an independent, trained observer in several ways. First, individual teachers may differ in their expectations about how well the average kindergartner should be able to pay attention, persist at tasks, and demonstrate eagerness to learn, independence, flexibility, and organization. As a result, two teachers with differing expectations might rate the same child differently on aspects of academic engagement. Second, teachers' preconceived expectations about children's academic engagement with respect to gender, race/ethnicity, social class, academic skills, or other factors may bias the ratings they assign to some groups of children in their classroom. As noted in Chapter 2, researchers have found that teacher perceptions of children's learning behaviors, including their academic engagement, are related to teacher's social status and race/ethnicity and children's social status, race/ethnicity, and prior academic achievement (Alexander, Entwisle, and Thompson, 1987; Dompnier and Pansu, 2006; Dusek and Joseph, 1983; Rimm-Kaufman, Pianta, and Cox, 2000).

One step taken in this study to reduce differences among teachers in their expectations for student engagement was to restrict the sample to children who did not change teachers during kindergarten. In addition, the outcome measure explored in this dissertation is the gain children made in their academic engagement score, rather than children's academic engagement at the end of kindergarten. By exploring changes in academic engagement as reported by the same teacher, this study reduces some of the

concerns related to differences in teachers' expectations for students. Moreover, the descriptive analyses indicated that the gain score in engagement is less sensitive to preconceived notions of subgroup differences than the individual fall and spring scores because average gains in academic engagement were similar across SES levels.

Although children's engagement scores at each time point were positively associated with their family's SES, the gains scores in academic engagement were not. While the potential bias in teacher ratings remains a limitation of this study, specific analytic decisions made in the restriction of cases and the selection of measures address some of these concerns.

A more fundamental limitation is the lack of variation in children's scores on the academic engagement scale. Overall, in the fall of kindergarten full-day kindergartners scored 3 out of 4 possible points on the approaches to learning scale. These scores indicate that most full-day kindergartners exhibited desirable behaviors often but not all of the time. Scores did not change much from fall to spring (average increase = 0.1 points) due, in part, to the lack of "measurable" room for growth. Although the findings from the unconditional model demonstrated that some children made markedly smaller or larger gains in their academic engagement than the average kindergarten gain, a more sensitive measure of engagement might have detected greater variability in engagement gains during kindergarten. As discussed in Chapter 2, teacher-reported scales of children's academic engagement may serve as crude measures of these learning behaviors because they cannot ascertain whether the skills on which children are observed and rated actually demonstrate that the children are engaged in the learning process. Teacher-reported measures of children's learning behaviors identify whether teachers perceive children to

be demonstrating behaviors associated with school engagement; however, the measures cannot capture if children are actually using these skills to learn the academic material being presented. For instance, a child may be paying attention to the teacher while he/she is teaching a new topic, but the child may not be acquiring the new information being presented. Nevertheless, proxy measures of academic engagement are worth studying because they can provide initial evidence on the potential influences of classroom factors.

#### *Teacher Reports of Full-Day Kindergarten Classroom Factors*

Findings from this study are limited because the ECLS-K used self-administered paper and pencil questionnaires instead of classroom observations to collect teacher and classroom data on full-day kindergarten environments. The accuracy of teachers' reports was not verified; thus, the information teachers provided may not adequately represent classroom factors, especially with regard to instructional practices. Other data collection procedures, such as teacher time-use diaries or classroom observations, may yield more precise estimates of instructional techniques. However, such procedures are costly to conduct and require frequent data collection to produce reliable estimates of instruction that occurs over the full school year. Consequently, these more robust measurement techniques are typically not affordable in large-scale studies (Guarino et al., 2006; Rowan, Camburn, and Correnti, 2004). The lack of classroom observations similarly makes it impossible to judge the quality of instruction, such as teachers' skill in presenting curricular content, implementing teaching practices, and using grouping strategies.

### *Variation in Family SES Within Public Schools*

Although an earlier study of ECLS-K data found that relationships between family SES and children's reading development and approaches to learning varied significantly across schools (Xue and Meisels, 2004), this dissertation did not reach the same conclusion. Instead, evidence from the dissertation suggests that relationships between family SES and children's reading development and academic engagement are similar across public schools. Findings on the significance of the SES slope variation may differ between the two studies, in part, because of the characteristics of the analytic samples used. The dissertation sample includes only first-time full-day kindergartners in public schools, while the Xue and Meisels sample included children who were first-time or repeating kindergartners, who attended part-day or full-day programs, and who attended public or private schools.

Raudenbush and Bryk (2002) note that the precision of the estimate for a school's family SES slope depends both on the sample size and the variability of SES within the school. Schools that are homogeneous in terms of family SES will estimate the SES slope with poor precision. Public schools, which are the focus of this study, have limited variability in terms of family SES because their enrollment is based primarily on geographic boundaries. As a result, the analytic sample used for this study may not have sufficient heterogeneity in children's SES within schools to detect a randomly varying SES slope.

### *Interactions among Full-day Kindergarten Classroom Factors*

Results from the HLM analyses demonstrated that many classroom factors interact with each other in their relationship with full-day kindergarten outcomes.

Significant interaction terms can identify when certain classroom settings, such as larger classes, may benefit more or less from specific instructional techniques, such as hours of reading achievement groups. The dissertation analyses initially tested all two-way interactions between instructional resources and practices and then deleted non-significant interactions using backward stepwise procedures to identify significant relationships. More complex interactions may exist between instructional resources and practices; however, the limited number of schools and the complexity of interpreting three-way, four-way, and more detailed interactions preclude testing interactions with more than two variables.

#### *Other Empirical Limitations*

The dissertation has other empirical limitations that readers must consider when interpreting the analysis results. First, the non-experimental nature of the ECLS-K data collection hinders the ability to draw strong causal conclusions. Children in the study were not randomly sampled to participate in full-day kindergarten classrooms; teachers were not randomly assigned to classrooms with pre-defined levels of instructional resources or instructional practices.

Second, while this study retained most full-day kindergartners in the analytic sample, it excluded from the analyses children in private schools, those who were repeating kindergarten in 1998-99 or who changed teachers or schools during the kindergarten year, and those with incomplete data (e.g., those whose English skills were not sufficient to take the ECLS-K assessments in both kindergarten rounds). As a result, findings from this dissertation may not generalize to the full population of full-day

kindergartners, especially to children attending private schools or those from homes that do not use English as their primary language.

Third, although this study incorporates several child- and school-level control variables, other critical correlates of children's early learning outcomes that are not included in the analyses or observable by the ECLS-K study (e.g., home environmental experiences, child disabilities or special needs, teacher competence) could alter the relationships identified in this study.

Finally, the relatively small number of children sampled per classroom and school (means = 6 and 13, respectively) and the small number of kindergarten teachers within schools (mean = 3 teachers) make it difficult to disentangle classroom-level effects from school-level effects in HLM analysis because the small sample sizes can result in unstable parameter estimates. If a three-level HLM was used for the dissertation, cases with only one child per classroom or one teacher per school would need to be dropped from the models because variation in outcomes could not be calculated within these settings. In the dissertation analytic sample, 163 classrooms (17%) only have a single ECLS-K sample child and 61 (18%) of the sampled schools only have data for a single teacher. The use of three-level HLM models would result in over 25 percent of the eligible analytic sample of children being dropped from analyses. As a result, two-level HLM models were used in the dissertation, with classroom characteristics aggregated to the school level. However, the use of school-aggregated measures of instructional resources and practices at Level 2 in this dissertation only make it possible to measure indirectly the effects of classroom factors on child outcomes.

### *Implications for Researchers and Policymakers*

This dissertation makes a unique contribution to the field of full-day kindergarten research because it concentrates on full-day kindergarten classroom settings and models simultaneous relationships between multiple instructional resources and practices and children's reading achievement and academic engagement. While prior research tends to compare outcomes for children in full-day and part-day kindergarten programs, this study takes a different approach and explores how full-day kindergarten programs can allocate instructional time to improve children's learning and engagement. This section discusses the conceptual, empirical, and methodological contributions of the dissertation for researchers and policymakers.

Researchers, policymakers, and educators agree that the quality of teaching and instructional environments makes a difference in student learning; however, little evidence is available on the specific classroom factors that influence children's achievement and socio-emotional development (Odden, Borman, and Fermanich, 2004; Takanishi and Bogard, 2007). Results from this dissertation highlight classroom resources and instructional practices that are associated with differences in children's gains in their reading achievement and academic engagement over the kindergarten year. For instance, children enrolled in full-day programs that devote more in-school time to academic instruction, and to reading instruction in particular, make greater reading progress over the school year than other children. Also, full-day kindergartners make greater gains in their academic engagement when schools have instructional aides in the classroom that work directly with children.

Furthermore, this study uncovers the important finding that relationships between classroom factors and child outcomes often are moderated by the presence or frequency of other classroom factors. For instance, interactions between classroom factors can improve the negative effects of a factor (e.g., the presence of an instructional aide improves the slower reading gains associated with frequent comprehension instruction) or can hinder the positive effects of a factor (e.g., the benefits of frequent literacy skills instruction are reduced as class size increases). Results from the interactions between classroom factors also support prior research recommendations for a balanced approach to reading instructional practices (Morrow, Strickland, and Woo, 1999; Neuman, 2002; Snow, Burns, and Griffin, 1998). In this study, more frequent instruction on discrete literacy skills, to a level similar to or even greater than the frequency of comprehension skills, is associated with increases in children's reading progress in kindergarten. Overemphasis on comprehension skills, however, is associated with a decline in kindergarten reading gains. Policymakers and researchers can continue to explore the complex relationships between full-day kindergarten instructional environments and children's early learning and academic engagement 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.

Another implication of this study is that it reveals the complexities of measuring children's academic engagement and its relationship with classroom factors. In the ECLS-K teachers reported that, on average, kindergartners began and ended school with relatively high levels of academic engagement, with little change over the school year.

The minimal variation in scores on teacher-reported measures of engagement suggests that policymakers and researchers may want to explore alternative ways of collecting data on this construct, such as classroom observation, to assess whether children's engagement varies more than the study results suggest. One possible reason why this study found few significant relationships between classroom factors and children's gains in academic engagement may be attributed, in part, to the lack of variation in the outcome measure. Thus, more precise measurements of engagement can help researchers and policymakers in their efforts to identify classroom factors that maintain or enhance engagement.

A second potential reason why this study did not uncover a larger set of significant findings on relationships between classroom factors and children's academic engagement could be due to the types of instructional practices included in the models. The ECLS-K teacher questionnaires include large numbers of items on classroom reading activities and skills but few items on other experiences that may enhance children's academic engagement. For instance, teachers did not report about the frequency of unstructured play in the classroom. Likewise, although the teachers were asked about recess time and the availability of instructional materials such as centers for dramatic play, the nature of data provided did not make it possible to include these variables in the analyses. In order to gain a stronger understanding of how classroom environments can foster children's academic engagement, policymakers and researchers need to incorporate a wider set of instructional experiences beyond activities that are focused primarily on academic outcomes.

Finally, analytic modeling constraints encountered during this study can inform researchers and policymakers about potential improvements to sampling procedures for classroom research. This study indirectly explored the effects of classroom factors on children's learning and engagement by aggregating classroom factors to the school level. The study initially tested different possibilities for two- and three-level HLM models prior to selecting the final two-level HLM model design (i.e., children nested within school). Although a three-level model, with children nested in classrooms and classrooms nested within schools, would be the optimal approach to directly measure classroom effects, the number of sample children per classroom and sampled classrooms per school in the ECLS-K precluded such a model. Policymakers and researchers interested in pursuing classroom effects research may consider alternative sampling techniques, such as including all children within a sampled classroom and sampling a larger number of classrooms per school. These procedures might result in more precise measures of variation in outcomes across the different levels of analysis.

#### *Guidance for Future Research*

This dissertation uses a nationally representative dataset to detect the potential influences of full-day kindergarten classroom factors on children's reading achievement and academic engagement. The ECLS-K's large sample of full-day kindergarten programs and students provides greater power than smaller studies to detect significant associations. However, smaller-scale research is useful in that it can build on the findings of this dissertation by exploring the processes through which classroom factors influence children's early educational outcomes. The study limitations and implications noted earlier in this section provide guidance on future research that can help to further explore

some of the research findings uncovered in this study. Future studies should consider the use of classroom observation of instructional resources and practices, refined measures of teacher practices, and multiple assessment measures to evaluate gains in student learning in full-day kindergarten programs. Additional research can also more closely explore the appropriate balance of instructional skills and activities in kindergarten programs and can evaluate the costs associated with implementing full-day kindergarten factors.

### *Classroom Observation*

Classroom observation, in conjunction with other data collection procedures, can aid in collecting more precise measures of teacher practices and children's academic engagement. Studies based on a smaller sample of full-day kindergarten classrooms could conduct multiple observations regarding teachers' time allocation to different reading curriculum and instructional methods. Observational records could identify what skills were taught in the classroom and how the teacher presented them to the class. The records also could be used to identify the amount of time that children have available for unstructured play and for different types of child-directed experiences, such as drama or other arts activities.

To examine the potential of teacher bias, independent classroom observers could rate children's academic engagement behavior using the same scale that the teachers use to rate behavior. Multiple ratings of child behavior then could be compared with the teacher ratings to assess inter-rater reliability. If teachers and raters rated a large enough sample of children simultaneously, researchers could begin to examine the degree of teacher bias or rater error associated with child background characteristics. As noted in the *Study Limitations* section, classroom observations cost more to conduct than paper

and pencil questionnaires, and observations must be conducted multiple times over the course of the school year to provide a representative view of classroom practices and children's academic engagement.

### *Refined Measures of Instructional Practices*

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. Future studies should attempt to capture more specific details about instructional practices in an effort to uncover ways that teachers could improve reading achievement and academic engagement. For example, school district curriculum guides provide preliminary information on the expected content coverage, which researchers could measure during data collection procedures. Similarly, future studies could pilot proposed questionnaire items with kindergarten teachers, as was done in the ECLS-K development, to identify changes and additions to the current item set. In addition, studies should incorporate items that might tap into other classroom experiences that influence children's engagement, such as the frequency of unstructured play or the frequency of child-directed centers. Efforts to develop questionnaires that are closely linked with a range of child outcomes are more feasible with smaller samples of children who attend kindergarten in the same schools or school districts because kindergarten curriculum differs across districts and states.

### *Use of Multiple Assessment Measures*

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 should 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.

The ECLS-K also provides a teacher-reported measure of children's language achievement, which focuses on process-oriented skills that are difficult to measure in standardized testing settings or are impossible to assess in one administration. Future studies could explore relationships between skills measured by teacher report and teacher-reported classroom practices to assess the degree to which results match the dissertation findings.

### *Proper Balance of Instructional Skills and Activities in Full-Day Kindergarten*

This study confirms the recommendations of early childhood researchers and educators that reading instruction is more effective when children experience a balance of 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.

#### *Costs Associated with Classroom Factors*

Finally, the dissertation does not account for the costs of instructional resources to assess whether the benefits of such resources outweigh the costs of implementation. As noted in Chapter 2, class size reduction efforts are costly in that they require more teachers, classroom space, and instructional supplies. Similarly, increases in the presence of instructional aides and in the amount of time that they work in classrooms lead to higher costs for paraprofessional salaries and benefits. Comparisons of the costs and benefits of school instructional practices, however, would be conducted differently from resource comparisons because changes in instructional techniques result for the most part in trade-offs in time usage rather than financial resources. Prior to making changes in full-day kindergarten learning environments, policy analysts must itemize and compare the costs and benefits of changes in allocations of instructional resources and practices.

#### *Conclusion*

This dissertation provides researchers, policymakers, and educators with some of the first evidence on how full-day kindergarten programs might structure their instructional resources and practices in ways that increase children's early reading achievement and academic engagement. The study identifies several factors of full-day kindergarten programs that are associated with differences in children's average school gains in reading achievement and academic engagement 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. On the other hand, the study did not explore whether classroom factors might help to create more equitable outcomes for children from varying family SES backgrounds because relationships between children's SES and their reading and academic engagement gains were similar across public schools. In addition to the research findings, this dissertation provides researchers, policymakers, and educators with guidance on how to improve future research on effective full-day kindergarten programs.

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