

Is Kindergarten the New First Grade?

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Recent accounts suggest that accountability pressures have trickled down into the early elementary grades and that kindergarten today is characterized by a heightened focus on academic skills and a reduction in opportunities for play. This paper compares public school kindergarten classrooms between 1998 and 2010 using two large, nationally representative data sets. We show substantial changes in each of the five dimensions considered: kindergarten teachers' beliefs about school readiness, time spent on academic and nonacademic content, classroom organization, pedagogical approach, and use of standardized assessments. Kindergarten teachers in the later period held far higher academic expectations for children both prior to kindergarten entry and during the kindergarten year. They devoted more time to advanced literacy and math content, teacher-directed instruction, and assessment and substantially less time to art, music, science, and child-selected activities.

Keywords: *kindergarten, early childhood education, academic content, school readiness*

In 2009, a report titled “Crisis in the Kindergarten” warned that kindergarten in the United States had radically changed over the past two decades and that “developmentally appropriate learning practices” centered on play, exploration, and social interactions had been replaced with highly prescriptive curricula, test preparation, and an explicit focus on academic skill building. It called for a “reversal of the pushing down of the curriculum that has transformed kindergarten into de facto first grade” (Miller & Almon, 2009, p. 63).

In recent years, major news outlets have run stories with titles such as “The New First Grade: Too Much Too Soon”; “More Work, Less Play in Kindergarten”; and “Kindergarten or ‘Kindergrind’?” (Gao, 2005; Orenstein, 2009; Tyre, 2006; Vise, 2007). Although anecdotal accounts from teachers and parents describe kindergarten classrooms characterized by mounting homework demands, worksheets, and pressure to learn to read as early as possible, there is surprisingly little empirical evidence about the extent to which kindergarten classrooms have changed over time.

This paper fills that gap, describing changes in public school kindergarten classrooms over time using two large, nationally representative datasets. We document systematic changes across five key dimensions of the kindergarten experience: (a) teachers' beliefs about school readiness, (b) time allocated to academic and nonacademic subjects, (c) classroom organization, (d) pedagogical approach, and (e) assessment practices.

These changes are important to document because a large body of research suggests there are meaningful and potentially

long-term implications to the way early childhood classrooms are structured and taught (Chetty et al., 2011; Claessens, Engel, & Curran, in press; Pianta, La Paro, Payne, Cox, & Bradley, 2002). Although there is growing consensus that children's early childhood learning experiences can meaningfully influence their short- and longer-term life outcomes (Barnett, 1995; Chetty et al., 2011; Yoshikawa et al., 2013), it is less clear precisely what aspects of the early learning environment (e.g., curricular focus, pedagogical approach) are most critical for promoting these gains.

In particular, there is substantial debate among parents, educators, researchers, and policymakers about the potential benefits and risks of orienting early childhood learning experiences more squarely toward academic content (Duncan, 2011; Elkind & Whitehurst, 2001; Zigler, 1987; Zigler & Bishop-Josef, 2006). Although critics of academically focused kindergarten caution that focusing heavily on academic content is not “developmentally appropriate” (Datar & Sturm, 2004; Raver & Knitzer, 2002; Shonkoff & Phillips, 2000; Stipek, 2006), there is also evidence that exposure to academic content in kindergarten (and particularly exposure to *advanced* content) can be beneficial for student learning (Clements & Sarama, 2011; Engel, Claessens, Watts, & Farkas, 2015). An oft-raised concern is that a focus on academic content might crowd out other important types of learning experiences that help develop social and regulation skills or foster physical and mental health, each of which is a predictor of children's longer-term outcomes.



The Changing Nature of Kindergarten

Historical accounts of kindergarten make it clear that the acute tensions between the academic and more broad developmental goals of kindergarten are not new (Dombkowski, 2001; Russell, 2011). Cuban (1992) details the ebbs and flows of these two competing goals for kindergarten over more than a century. Unfortunately, larger-scale empirical evidence about the changing nature of kindergarten is lacking.

Nevertheless, there is a growing impression among practitioners, researchers, and the media that in the past two decades, preschool and kindergarten classrooms have rapidly become more academically oriented and less focused on exploration, social skill development, and play. A common narrative is that accountability pressures, particularly from the federal No Child Left Behind Act (NCLB), have led to changes in the early grades (Goldstein, 2007; Graue, 2009; Pianta, Cox, & Snow, 2007; Stipek, 2006). Although NCLB did not require testing for children before the third grade, some have argued that the intense pressures that principals and teachers felt about their students' performance on high-stakes assessments led to an "accountability shovedown" and the "educationalization of early care and education" (Hatch, 2002; Kagan & Kauerz, 2007).

There is some empirical evidence supporting the claim that NCLB, or accountability pressures more broadly, impacted the learning experiences of young children (Russell, 2007). In a qualitative case study of a Texas elementary school, Booher-Jennings (2005) described the intense pressure teachers in the untested early grades (K–2) felt to prepare their students for third-grade assessments and the reduction of recess to 15 minutes *per week*, despite the concerns of early childhood teachers. In a larger-scaled investigation, Jacob (2005) showed that high-stakes accountability led children in early, untested grades to be "preemptively retained" so that they would not be included in standardized testing. Similarly, several recent studies demonstrate that low-performing teachers in high-stakes grades are disproportionately reassigned to untested early elementary classrooms and that this harms children's learning (Fuller & Ladd, 2013; Grissom, Kalogrides, & Loeb, 2014).

Although accountability pressures are often the presumed impetus for changes to kindergarten classrooms, other shifts over the past two decades may have also contributed to a heightened focus on more advanced content. Notably, there have been substantial increases in both public and private investments in early childhood education. Between 1990 and 2011, the number of 3- to 5-year olds enrolled in public preschool programs more than doubled from 1.2 million to 2.9 million children (Current Population Survey, 2015). It may be the case that this expanded access to public preschool has meant that incoming kindergarteners today have already had substantial exposure to classroom environments and to learning opportunities in a way that may not have been true two decades ago.

Relatedly, a number of scholarly and popular accounts have documented increases in parental investments in their young children's learning as well as heightened pressure among some parents to give young children an academic "edge" (Bassok, Lee, Reardon, & Waldfogel, 2015; Bassok & Reardon, 2013; Kornrich & Furstenberg, 2013; Otterman, 2009; Ramey & Ramey, 2010; Reardon, 2011). Recent work by Bassok and Latham (2014) actually documents substantial increases in the early academic skills of *incoming* kindergarteners. In part, then, it may be that heightened investments in children's early development, both through expanded access to preschool and through changing home environments, have led to children entering school with higher "readiness" than before and that changes in kindergarten teachers' beliefs and practices are partially a response to the entering children.

The Current Study

The existing research demonstrates the link between early childhood learning and later life outcomes and suggests that the content and organization of early childhood classrooms meaningfully impacts young children's learning. Although it is commonly stated that kindergarten classrooms have changed rapidly over the past decades, there is little empirical evidence describing how much these classrooms have changed and along which dimensions. The current study fills these gaps, leveraging two rich, nationally representative data sets to provide a detailed account of how public school kindergarten classrooms have changed. We focus on changes over a dozen years, a relatively short period of time but also a period characterized by heightened accountability through the introduction of NCLB as well as increased investment in early childhood education.

We address three descriptive research questions:

1. To what extent and along what dimensions has the public school kindergarten experience changed between 1998 and 2010?
2. Is kindergarten the new first grade? To what extent do kindergarten classrooms in 2010 mirror first-grade classrooms from the late '90s?
3. Are changes in the kindergarten experience over this period systematically different in schools serving high proportions of children eligible for free or reduced-priced lunch (FRPL) or children who are non-White?

We hypothesized that relative to kindergarten classrooms in 1998, kindergarten classrooms in 2010 would be more focused on academic instruction and assessment, particularly around literacy and math, which are the tested subjects under NCLB. We also hypothesized that an increased focus on literacy and math would crowd out time spent on other

subjects, such as art, music, science, social studies, and physical education (PE). At the same time, we note that over the period we investigated, the percentage of children enrolled in full-day kindergarten rose from 56% to 80% (Bassok, Gibbs, & Latham, 2015). Given this striking increase in the typical number of hours kindergarteners spend in school, another plausible hypothesis would be an across-the-board increase in time devoted to all subjects. To the extent that changes to kindergarten may have been driven by heightened accountability pressures, we expect that kindergarten classrooms in schools that serve the highest percentage of low-income and non-White students, which are also schools most likely to experience accountability pressures, would see the most pronounced changes.

Method

Data

This study leverages data from two kindergarten cohorts of the Early Childhood Longitudinal Study (ECLS-K:1998 and ECLS-K:2011), each of which includes detailed surveys of parents, teachers, and school administrators along with direct child assessments. In both waves of the ECLS-K, kindergarten teachers completed fall and spring surveys (for ECLS-K:1998, see <https://nces.ed.gov/ecls/kinderinstruments.asp>; for ECLS-K:2011, see <https://nces.ed.gov/ecls/instruments2011.asp>). Because the bulk of the items on these surveys were identical or very similar across waves, the data allow for a careful comparison of kindergarten classrooms between 1998 and 2010.¹

Both studies employed a multistage probability design to obtain nationally representative samples of students entering kindergarten in their respective years. In this process, schools were first sampled from “primary sampling units” (counties or groups of counties), and students were then sampled from within schools. The 1998 data collection sampled over 21,000 children, and in 2010 over 18,000 students were sampled.² We limit our sample to public school teachers, as they are the group most likely impacted by public policies, particularly NCLB and other accountability pressures that arose in the years between our two cohorts. Our final samples include about 2,500 public school kindergarten teachers in 1998 and 2,700 teachers in 2010.

Our focus throughout is on the survey responses of kindergarten teachers. However, because children’s teachers were also surveyed the following year, when the majority of children had proceeded to the first grade, we also compare the responses of first-grade teachers in 1999 and 2011, for which we have samples of approximately 3,350 and 3,850, respectively. This comparison allows us to investigate whether the changes we observe over the 12-year span of our study were particularly pronounced in kindergarten relative to another early elementary grade. In addition, where possible, we compare the responses on kindergarten teachers in

2010 with first-grade teachers in 1999 in order to explicitly examine the question we raise in the paper’s title: Is kindergarten the new first grade?³

Measures

The detailed ECLS-K teacher surveys allow us to explore changes to public school kindergarten classrooms across five dimensions: (a) teachers’ beliefs about school readiness, (b) curricular focus and time use, (c) classroom materials, (d) pedagogical approach, and (e) assessment practices. Below, we provide a description of the specific items included in each of these categories. Due to the large number of measures considered in the paper, we opted to dichotomize all of the categorical variables considered to simplify the presentation of results. In supplementary online appendices, we show the full distribution of these categorical variables.

School Readiness Beliefs and Kindergarten Expectations. Teachers were asked how strongly they agreed with a number of statements pertaining to school readiness and their expectations for entering kindergarteners (e.g., “Children who begin formal reading and math instruction in preschool will do better in elementary school”; “Most children should learn to read in kindergarten”). They were also asked to rate the importance of a number of skills for students entering kindergarten (e.g., counting to 20, sitting still, being sensitive to other children’s feelings) on a 5-point scale ranging from *not important* to *essential*. For each of the belief measures, we report the percentage of teachers who rated each skill as either *very important* or *essential* (i.e., a 4 or 5).

Curricular Focus and Time Use. The ECLS-K surveys include a variety of items that allow us to measure changes in curricular focus. First, teachers reported the frequency with which they taught each broad subject area (e.g., reading/language arts, music). In addition to items about aggregated time use, teachers were also asked to describe how often they taught specific skills. For each subject, the skills ranged from fairly simple (e.g., alphabet and letter recognition) to complex (e.g., writing stories with an understandable beginning, middle, and end). We report the percentage of teachers who indicated they taught each broad subject or specific skill daily, at least once a week, and never.

An advantageous feature of the ECLS-K survey for the purpose of this study is that in 1998, teachers could specify that an activity never happened because it is “taught at a higher grade level.” This allows us to describe the extent to which skills that were considered outside the scope of kindergarten by a substantial portion of kindergarten teachers in 1998 are reported as commonplace by kindergarten teachers in 2010.

The ECLS-K surveys also asked teachers questions regarding their coverage of science and social studies topics

(e.g., human body, dinosaurs and fossils, important figures in American history). Although in 1998 teachers were asked to report *how often* they cover each topic, in 2010 teachers were asked only whether the topic was *ever* covered during the year. We therefore examine changes over time in the likelihood these topics were covered *at all* during kindergarten.

Classroom Setup and Materials. Kindergarten teachers reported whether their classrooms had 10 specific activity centers, such as a math area with manipulatives, a water or sand table, a science area, an art area, or a dramatic play area. We report the percentage of teachers who indicated they had each activity area in their classroom. Although the same set of questions was not asked of first-grade teachers, those teachers did report the frequency with which their students used a variety of materials, including art materials, musical instruments, costumes, or science equipment. We report changes over time in the percentage of first-grade teachers who indicated they use these materials daily, weekly, or never.

Pedagogical Approach. In addition to measuring *what* children were taught in kindergarten (content and curricular focus), we also measure *how* they were taught using three sets of variables. Although the surveys do not specifically ask about time allotted for “play,” our goal was to describe the learning environment and the extent to which children had opportunities to make independent choices about their learning experiences. Teachers were asked to report the amount of time their students spent on “child-selected activities” as well as on “teacher-directed whole-class activities.” We report the percentage of teachers who spent about one hour or more per day on child-selected activities and the percentage that spent 3 hours or more on teacher-directed whole-class activities.

We also examined a set of items about the types of literacy and math activities the teachers use in their classroom. Teachers reported the frequency with which they use 20 literacy and 17 math instructional practices. The items ranged broadly from activities children might do independently at their desk (worksheets or workbooks) to hands-on activities, such as working with measuring spoons, to activities like using music or drama to understand math concepts. We describe changes across each of the pedagogy items included in the survey but particularly highlight changes in time devoted to workbooks, worksheets, and textbooks because critical accounts have often pointed to heavy usage of these materials as potentially harmful for children.

Finally, we describe the percentage of teachers who reported having PE or recess on a daily basis, as these are among the best measures available in the data set to measure how frequently children experience active movement and unstructured play opportunities.

Assessment Practices. The final set of items we present relates to assessment practices. Teachers were asked to indicate how important they consider various factors when evaluating the children in their class. These ranged from “effort” and “cooperativeness with others” to a child’s “performance relative to local, state, or professional standards.” We report the percentage of teacher who considered each of these assessment approaches *very important* or *essential*.

In addition, in 2010, kindergarten teachers were asked how frequently they used standardized tests to assess their kindergarteners’ progress. Notably, these items were not included on the 1998 kindergarten survey. However, in 1999, when the majority of the first ECLS-K cohort entered first grade, their teachers were asked the same questions about assessment practices that were later asked in 2010. We compare kindergarten teachers in 2010 with first-grade teachers in 1999 in terms of how often they used standardized assessments.

School and Teacher Characteristics. The ECLS-K data sets include surveys of school administrators collected in the spring of the kindergarten year. Administrators were asked to report the schoolwide percentage of students who were eligible for FRPL as well as the schools’ racial composition. We constructed a variable to indicate that a school was in the top quartile of FRPL-eligible students (i.e., the schools serving the most low-income children) and another to indicate a school was in the top quartile of non-White students (i.e., the lowest percentage of white students). We use these variables to assess whether changes in kindergarten over time differed across schools based on their demographic composition.

As described further below, we explore this question in a logistic regression framework and control for other school and teacher characteristics that may be associated with both the school demographic composition and our outcomes. Most importantly, we account for whether teachers work in a half- or full-day kindergarten classroom. This is a critical covariate because time-use variables differ significantly across these settings and because there has been a substantial shift toward full-day programs over the period examined. To ensure a consistent definition of full-day care across waves, we constructed an indicator set to 1 if the class met for 5 or more hours per day. We also include an indicator for whether each school offers a preschool program, as schools that provide early childhood education programs may have systematically different approaches to their kindergarten curriculum.

To address other potential sources of selection bias, we have measures of school enrollment, class size, urbanicity (city, suburb, rural) and region (Northeast, Midwest, West, South). We also include a set of teacher characteristics. These include teacher experience, modeled as an indicator for whether a teacher is in his or her first 3 years of teaching, indicators for whether the teacher holds an elementary or

early childhood credential, and several demographic covariates. Appendix A1 provides descriptive statistics for these school- and teacher-level covariates.

Analytic Plan

To address our first two research questions, we present descriptive statistics highlighting how kindergarten and first-grade teachers' accounts of their classrooms have changed over a roughly 12-year period. Because all of our measures of the kindergarten outcomes are binary, we run logistic regressions to assess the statistical significance of changes over time. Although the two data sets leveraged in the current study do not track the same teachers or schools, and therefore do not allow us to assess whether individual teachers changed their own practices or beliefs over this time period, we are able to describe the extent to which two kindergarten teaching cohorts resemble one another.

Full-day kindergarten increased substantially over our study period (from 56% to 80%). This is relevant for our analysis because changes we observe in our outcome variables, particularly those related to time use, may in part be driven by the shift toward full-day programs. In other words, students may spend more time on literacy instruction because they spend more time in school. To address this, we run our analyses separately for full- and half-day programs.

We answer our final research question about the relationship between kindergarten teachers' beliefs and practices and the demographic composition of the school where they teach, by estimating logistic regressions that take the form

$$K_Practice = \beta_0 + \beta_1 K2010 + \beta_2 FRPL + \beta_3 FRPL * K2010 + \beta_4 School' + \varepsilon,$$

where our outcome ($K_Practice$) is one of 15 measures of the kindergarten experience, including teachers' beliefs about school readiness, their classroom setup, and their use of textbooks. $K2010$ is an indicator variable set to 1 if the responding teacher is part of the 2010 sample and 0 if he or she is from the 1998 sample. $FRPL$ is an indicator for whether a school is in the top quartile of students eligible for FRPL (i.e., the lowest-income schools). We then include the interaction between these two dichotomous variables (cohort and school demographic composition) to examine whether changes were more pronounced in schools serving the highest proportion of children eligible for FRPL (or those with the most non-White children). $School'$ is a vector of school and teacher covariates as described above. β_0 is a constant term and ε is a stochastic error term. We also run analogous models that replace our $FRPL$ variable with an indicator for whether a school was in the top quartile of non-White students.

We present odds for schools, disaggregated by their demographic composition and separately in 1998 and 2010. We then calculate marginal effects and test whether in each

time period the expected odds of exposure to a particular kindergarten characteristic differed depending on the school characteristic. Finally, we test whether the gaps across these school types grew (or narrowed) over the period studied by calculating the "difference in differences." Standard errors are clustered at the school level to account for the nested nature of the data. In all the analysis that follows, we use sampling weights developed as part of the ECLS-K surveys to make the results nationally representative.

Results

Differences in Kindergarten 1998 to 2010

Below, we describe changes in kindergarten classrooms between 1998 and 2010 along our five primary dimensions.

Teacher Beliefs. The top panel of Table 1 shows responses to a number of questions about academic skills and school readiness. We find increases on all of these. Most strikingly, the percentage of kindergarten teachers who report that they agree or strongly agree that children should learn to read in kindergarten increased sharply from 31% to 80%. We also see substantial increases in the percentage of teachers who think parents should teach their children the alphabet before they start kindergarten as well as the percentage who think children should begin formal reading and math instruction before kindergarten (33- and 30-percentage-point increases, respectively).

The bottom panel of the table shows the percentage of teachers who believe various school readiness skills are very important or essential for kindergarten. The first thing to note is that in 2010 teachers rated *all* 13 characteristics as more important than did kindergarten teachers in 1998. However, we document especially pronounced increases in the percentage of teachers who rated academic skills as important for school readiness. For example, the percentage of teachers who reported that knowing the letters of the alphabet was very important or essential more than doubled from 19% in 1998 to 48% in 2010. The percentage of teachers who indicated color and shape identification and counting skills were important rose by 28 and 22 percentage points, respectively. We see smaller increases in the percentage of teachers who rated self-regulation and social skills as very important (approximately 10 to 16 percentage points). The 33-percentage-point increase in the number of teachers who believed it was important to know how to use a pencil or paintbrush stands out. Although this item does not involve specific familiarity with preliteracy or math academic content, it might be considered academic in that using a pencil is prerequisite for more complex writing skills.

It is also worth noting that in both periods, the academic skill items were among the skills rated as *least* important overall. In other words, although beliefs about the importance of academics have increased more than beliefs in other

TABLE 1

Kindergarten Teachers' Beliefs About School Readiness and Kindergarten Learning, 1998 and 2010

Belief	1998	2010	Difference
Readiness beliefs (percentage indicating they agree or strongly agree)			
Most children should learn to read in kindergarten	31	80	49***
Parents should make sure their kids know the alphabet before they start kindergarten	29	62	33***
Children who begin formal reading and math instruction in preschool will do better in elementary school	34	64	30***
Attending preschool is very important for success in kindergarten	63	83	20***
Homework should be given to kindergarten children almost every day	35	40	5
How important do you believe the following characteristics are for a child to be ready for kindergarten? (percentage indicating skill is very important or essential)			
Academic skills			
Knows most letters	19	48	29***
Identifies primary colors and shapes	31	59	28***
Can count to 20	13	35	22***
Self-regulation			
Can follow directions	78	91	13***
Sits still and pays attention	61	77	16***
Finishes tasks	54	65	11***
Is not disruptive	79	89	10***
Social skills			
Takes turns and shares	73	87	14***
Is sensitive to others' feelings	62	72	10***
Other skills			
Good problem-solving skills	36	49	13***
Able to use pencil and paintbrush	35	68	33***
Communicates verbally	85	92	7***
Knows the English language	47	59	12***

Note. Samples limited to kindergarten teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

* $p < .05$. ** $p < .01$. *** $p < .001$.

areas, teachers in both periods report other skills, such as self-regulation and social interaction, as most important at school entry. Overall, then, our results suggest a heightened emphasis on academic skills among kindergarten teachers in the later period but fail to show that teachers now value these skills over and above other school readiness skills.

Curricular Focus and Time Use. The ECLS-K data provide a number of ways to measure changes in curricular focus, including aggregate measures of exposure to broad subject areas (e.g., reading/language arts, music) as well as *within-subject* content coverage. In this section we describe both.

Overall subject matter exposure. The upper panel of Table 2 presents measures of overall subject matter exposure, showing the percentage of teachers who report daily, weekly, and no exposure to particular subject areas. The top row indicates, for example, that in 1998, nearly all kindergarten teachers (96%) reported teaching reading and language arts daily. Given the ubiquity of literacy instruction in both waves, we are unable

to use these particular time use measures to assess whether, on average, literacy instruction has increased over the time period considered, a point we return to in the next section.⁴

We do observe an increase in the percentage of teachers reporting daily math instruction (from 83% to 91%). We also find that in both periods, teachers report much less frequent instruction in social studies and science than in literacy and math. Approximately a quarter of teachers report daily social studies lessons, and a fifth report that much exposure to science. We do not observe substantial changes in these figures across waves.

Where we do find substantial changes is in time spent on nonacademic subjects, including music, art, dance, theater, and foreign language instruction. In 1998, just over a third of kindergarten teachers reported daily music instruction. This figure dropped by 18 percentage points in 2010, and a similar pattern is evident for art instruction, where the percentage of teachers reporting daily instruction dropped from 27% to 11%. We also document a substantial increase in the likelihood that dance, theater, and foreign language are not taught at all during the

TABLE 2
Frequency of Subject Instruction in Kindergarten and First Grade, 1998 and 2010

Subject	Taught daily			Taught at least weekly			Never taught		
	1998	2010	Difference	1998	2010	Difference	1998	2010	Difference
Kindergarten									
Reading/language arts	96	97	1	100	100	0	0	0	0
Math	83	91	8***	100	99	-1	0	0	0
Social studies	25	24	-1	93	94	1	0	1	1**
Science	18	20	2	92	94	2*	0	1	1**
Music	34	16	-18***	93	89	-4**	1	4	3***
Art	27	11	-16***	95	87	-8***	0	3	3***
Dance/creative movement	12	12	0	58	43	-15***	11	37	26***
Theater	5	2	-3***	39	22	-17***	18	50	32***
Foreign language	8	4	-4**	18	10	-8***	65	83	18***
	1999	2011	Difference	1999	2011	Difference	1999	2011	Difference
First grade									
Reading/language arts	98	94	-4***	100	100	0***	0	0	0
Math	95	93	-2**	100	99	-1	0	0	0*
Social studies	17	17	0	94	93	-1	0	1	1
Science	15	17	2	94	94	0	1	1	0
Music	7	4	-3***	86	85	-1	2	6	4***
Art	4	2	-2**	86	81	-5***	1	4	3***
Dance/creative movement	3	3	0	25	22	-3	37	52	15***
Theater	1	1	0	11	11	0	41	59	18***
Foreign language	3	3	0	12	10	-2	78	84	6***

Note. Samples limited to kindergarten and first-grade teachers in public schools. Figures shown are percentages rounded to closest percentage point. All figures are weighted at the teacher level using appropriate sampling weights.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

kindergarten year. For example, whereas 18% of teachers reported never doing theater activities with their kindergarteners in 1998, in 2010 that figure rose to 50%. Similarly, in 1998 only 11% of teachers reported never teaching dance to their students compared with 37% in 2010. In additional analyses, available upon request, we find that these patterns are quite similar for half-day and full-day kindergarten classrooms.

Curricular coverage. Because in 1998 nearly all teachers already reported regular exposure to all academic topics, and particularly to literacy and math, our crude measures of overall exposure fail to accurately capture changes in exposure to these subject areas over time. For that reason, it is also useful to examine more disaggregated data about the frequency with which teachers cover specific topics within each broader curricular category.

Figure 1 presents changes in time spent on six specific literacy and math topics. We highlight these particular items from among the 14 literacy and 25 math skills included in the survey because they were seen as particularly advanced, where advanced skill is determined based on the percentage of kindergarten teachers in 1998 who reported that the skill was never taught in their classroom

because it was covered in a later grade. For instance, in 1998, 44% of teachers reported that they never taught “conventional spelling.” This figure plummeted to 17% in 2010. Relatedly, the percentage of teachers who reported teaching conventional spelling on a daily basis rose sharply from 45% to 76%. The same general patterns hold for the other topics highlighted in the figure, which include composing and writing complete sentences; composing stories with a beginning, a middle, and an end; place value; writing math equations; and probability.

The top panel of Appendix A2 presents similar figures for all literacy skills included in the survey. Overall, we find sizable increases in nearly all the literacy items included, particularly those that were classified as challenging in the 1998 data (e.g., identifying the main idea and parts of a story, using context clues for comprehension). The only skills for which we observe (modest) declines are relatively basic skills (e.g., alphabet and letter recognition, conventions of print).

The top panel of Appendix A3 shows analogous results for math skills. The same overall pattern holds. For two thirds of the skills included (16 of 25), we find significant increases in the likelihood the skill was covered at least once

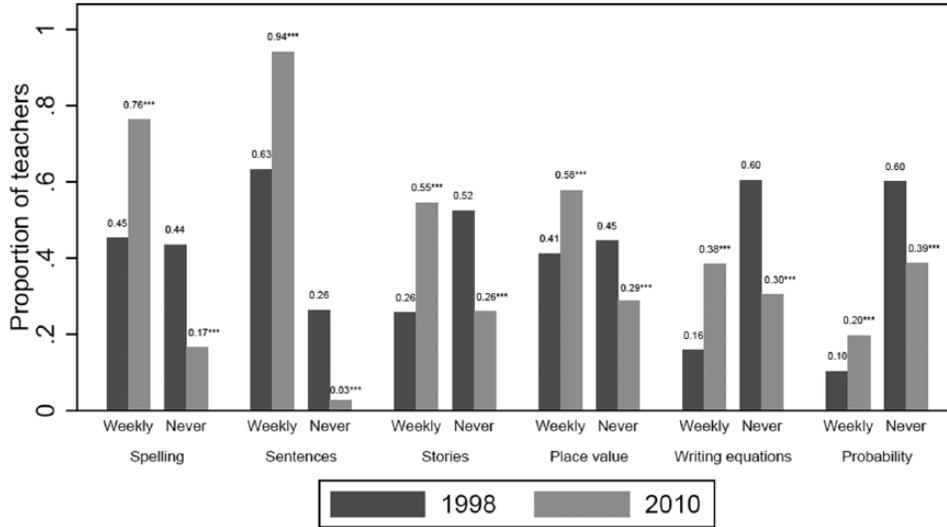


FIGURE 1. Kindergarten language and math content exposure, 1998 to 2010. “How often are each of these skills taught in your class?” Stars indicate significant differences across years. Weekly = at least once per week. Sentences = composing and writing complete sentences. Stories = composing and writing stories with an understandable beginning, middle, and end. Writing equations = writing math equations to solve word problems.
 $*p < .05$. $**p < .01$. $***p < .001$.

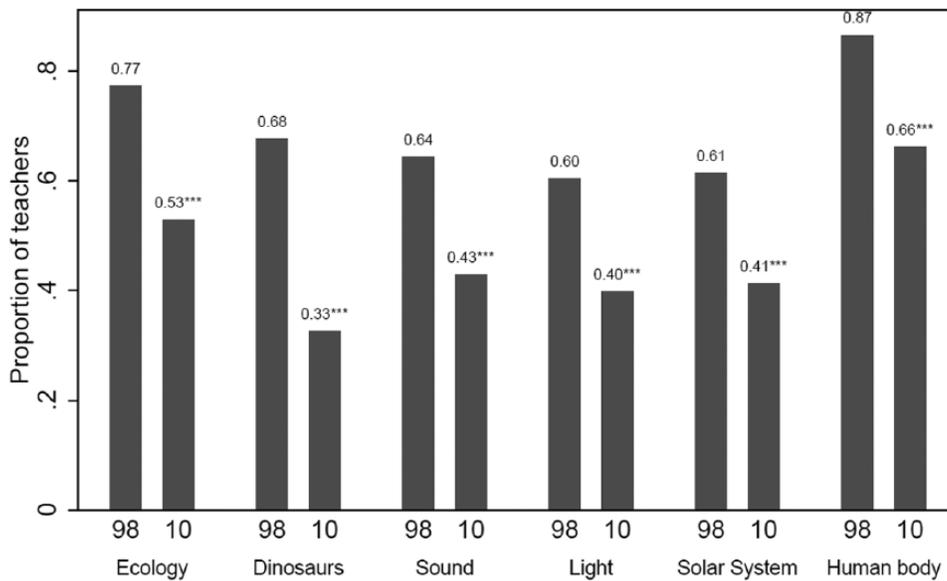


FIGURE 2. Kindergarten science content exposure, 1998 to 2010. Proportion of teachers that indicate topic is covered in the kindergarten year. Stars indicate significant differences across years.
 $*p < .05$. $**p < .01$. $***p < .001$.

a week. We see no significant change in the remaining nine skills. Taken together, these findings suggest a heightened focus on literacy and math skills in kindergarten, with particularly pronounced increases in more advanced tasks.

In stark contrast, when we look at exposure to specific science topics, our results suggest a nearly universal drop in exposure. Figure 2 highlights the percentage of teachers who reported particular science topics are taught in their classroom. For instance,

whereas over two thirds of kindergarten teachers in 1998 reported they taught children about dinosaurs at some point in the school year, only a third reported doing so in 2010. Appendix A4 shows similar figures for all science and social studies topics included in the survey. We document significant drops for 13 of 15 science topics, and in the bulk of these, we observe a drop of at least 10 percentage points. For social studies, the patterns are more inconsistent and the drops, when observed, are more modest.

TABLE 3
Classroom Organization and Materials

Interest area	All students			Half day			Full day		
	1998	2010	Difference	1998	2010	Difference	1998	2010	Difference
Kindergarten teachers: Does your classroom have the following interest areas or centers for activities?									
Reading area with books	100	99	-1	100	99	-1	100	100	0
Listening center	86	80	-6***	87	81	-6**	84	77	-7*
Writing center	91	90	-1	92	90	-2	88	89	1
Math area with manipulatives	97	95	-2**	98	95	-3***	95	95	0
Puzzle or block area	99	93	-6***	99	93	-6***	100	96	-4***
Water or sand table	49	24	-25***	50	23	-27***	46	29	-17***
Computer area	86	84	-2	89	86	-3	81	72	-9*
Science or nature area	64	42	-22***	68	42	-26***	58	45	-13***
Dramatic play area	87	58	-29***	88	57	-31***	86	60	-26***
Art area	92	71	-21***	93	69	-24***	90	77	-13***
First-grade teachers: How often do children use the following materials or resources in your class?									
Art materials	21	18	-3**	80	58	-22***	1	4	3***
Musical instruments	0	1	1*	15	8	-7***	56	75	19***
Costumes	1	0	-1*	4	2	-2***	73	81	8***
Cooking/food-related items	1	2	1	5	4	-1	40	59	19***
Science equipment	8	4	-4***	42	29	-13***	8	5	-3*

Note. Samples limited to kindergarten and first-grade teachers in public schools. Figures shown are percentages rounded to closest percentage point. Full day is defined as 5 or more hours per day. All figures are weighted at the teacher level using appropriate sampling weights.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

Classroom Setup. Table 3 presents changes in exposure to particular interest areas. The first four classroom areas shown are the ones most directly linked to literacy and math instruction (e.g., a reading area with books and a math area with manipulatives). All four were very common in 1998, with between 86% and 100% of teachers reporting their classroom included each of these areas. They remained fairly ubiquitous in 2010, although we do observe a 6-percentage-point decrease in the likelihood of offering a listening center.

We do find substantial drops in the likelihood classrooms included centers focused on the arts or on science. For example, whereas nearly all kindergarten teachers reported having an art area in 1998 (92%), in 2010 that figure dropped to 71%. The likelihood of offering a dramatic play area, a science or nature area, or a water or sand table each dropped by over 20 percentage points. Taken together, these results echo our earlier findings about drops in exposure to science and the arts. To the extent that the presence of such classroom interest areas or centers corresponds to a more hands-on or exploratory approach to learning, these findings may also suggest changes over this period in instructional approach.

Pedagogical Approach. We explore this issue more directly in Table 4, which presents changes in the use of child-selected activities, more didactic instructional activities, and opportunities for free play and physical movement. We describe these patterns below.

Child-selected activities. The first two measures relate to time spent on child-selected activities and time spent on teacher-directed instruction. In 1998, 54% of kindergarten teachers reported that children in their class typically spent about 1 hour or more per day on child-selected activities. By 2010, this figure dropped to 40%. At the same time, the percentage of teachers reporting that their class spends more than 3 hours daily on whole-class activities more than doubled, from 15% in 1998 to 32% in 2010. When looking only at full-day classrooms, we find the drop in child-selected activities is even more pronounced (a 28-percentage-point decrease).

Didactic instructional activities. The next set of items in Table 4 focuses on the use of worksheets, workbooks, and textbooks in kindergarten classrooms. Daily use of textbooks in kindergarten more than doubled for both reading and math. For instance, only 11% of teachers in 1998 reported using a basal reader daily, compared with 26% of teachers in 2010. We also observe substantial increases in daily use of worksheets, up 17 percentage points for reading and 15 for math. The heightened use of textbooks and worksheets in kindergarten is evident in both half-day and full-day settings.

It is worthwhile to consider these trends within the context of the complete set of items measuring approaches for teaching literacy and math. These are presented in the lower panels Appendix A2 and Appendix A3 and are sorted by the change in the likelihood that a teacher reported a particular approach

TABLE 4
Kindergarten Teachers' Reported Approaches to Instruction

Instructional approach	All kindergarten teachers			Full day			Half day		
	1998	2010	Difference	1998	2010	Difference	1998	2010	Difference
In a typical day, children spend about 1 hour or more on child-selected activities (1 = yes)	54	40	-14***	72	44	-28***	29	12	-17***
In a typical day, children spend 3 or more hours on teacher-directed whole-class activities (1 = yes)	15	32	17***	22	37	15***	4	7	3*
Do children in your classroom do the following activities daily?									
Work in a reading workbook or on a worksheet	28	45	17***	30	47	17***	21	34	13**
Read from basal reading texts	11	26	15***	13	28	15***	7	13	6**
Do math worksheets	20	35	15***	24	37	13***	12	27	15***
Do math problems from their textbooks	8	18	10***	10	19	9***	3	15	12***
Frequency of physical education/recess									
Children in your class usually have physical education daily (1 = yes)	21	21	0	23	23	0	19	14	-5
Children in your class usually have recess daily (1 = yes)	73	82	9***	81	88	7**	62	55	-7

Note. Samples limited to kindergarten teachers in public schools. Figures shown are percentages rounded to closest percentage point. All figures are weighted at the teacher level using appropriate sampling weights. Full day is defined as 5 or more hours per day.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

was used weekly. For literacy, we observe substantial increases across a diverse set of measures, but the largest increases are in the use of textbooks, writing words from dictation to improve spelling, writing stories and reports, and using workbooks and worksheets. We observe drops for only three (of 20) instructional approaches (e.g., a 3-percentage-point drop in the likelihood children practice writing the letters of the alphabet at least once a week, from 98% to 95%).

When examining approaches to math instruction (lower panel of Appendix A3), we find significant increases in eight of 17 of the instructional approaches mentioned. Here, too, the largest increases are in time spent using textbooks and worksheets as well as time spent completing math problems on the chalkboard. That said, teachers also reported increases in less didactic approaches, such as using music to understand math concepts or explaining how problems are solved. Overall, the results are consistent with an increase in time spent on reading and mathematics instruction broadly, with particularly large gains in time spent on rote, didactic tasks.

PE and recess. The bottom panel of Table 4 shows how frequently kindergarteners are exposed to PE and recess. Contrary to the hypothesis that kindergarten classrooms in the later period would have fewer opportunities for play or physical activities, we observe no change in the percentage of students who participated in daily PE and document a 9-percentage-point *increase* in the percentage of students who had recess daily. We do note drops in PE and recess for

children attending half-day programs, although these are not statistically significant.

Assessment. In the top panel of Table 5, we show how kindergarten teachers' views about assessment have changed over time. In 1998, more than 95% of teachers indicated that they valued children's improvements over time, their effort, their classroom behavior, and their ability to follow directions. We observe very little change across these measures over time. We do document changes in the importance teachers placed on two factors: First, the percentage of teachers who indicated they consider an individual child's achievement relative to local, state, or professional standards to be very important or essential rose from 57% to 79%. Second, we see a similar increase in the importance teachers place on children's performance relative to their classmates, up from 47% to 67%.

Is Kindergarten the New First Grade?

Our second research question aims to directly address the question posed in the paper's title. The recent release of first-grade data for the most recent wave of the ECLS data allows us to examine the extent to which the first-grade experience has changed, comparing responses from first-grade teachers in the 1999–2000 school year and the 2011–2012 school year. We are also able to compare how much kindergarten in 2010 mirrors first grade in 1999.

The bottom panel of Table 2 shows the frequency of subject instruction reported by first-grade teachers across the two

TABLE 5
Teachers' Assessment Philosophy and Practices

Assessment	Kindergarten			First grade		
	1998	2010	Difference	1999	2011	Difference
How important is each of the following in evaluating the children in your class? (percentage of teachers responding <i>very important</i> or <i>essential</i>)						
Individual child's achievement relative to the rest of the class	47	67	20***	52	60	8***
Individual child's achievement relative to local, state, or professional standards	57	79	22***	59	79	20***
Individual improvement or progress over past performance	97	99	2***	98	98	0
Effort	98	98	0	98	97	-1
Classroom behavior or conduct	96	96	0	94	98	4***
Cooperativeness with other children	94	94	0	92	91	-1
Ability to follow directions	98	98	0	98	98	0
How often do you use state or local standardized tests to assess your children?						
Never		27	-4***	31	22	-9***
1 or 2 times per year ^a		44	-14***	58		
Once or twice a month ^a		23	15***	8		
At least weekly		6	3***	3	6	3**

Note. Samples limited to teachers in public schools. Bottom panel compares kindergarten teachers in 2010 to first-grade teachers in 1999. Figures shown are percentages rounded to the closest percentage point. All figures are weighted at the teacher level, using appropriate sampling weights.

a. In first grade of 2011, the response options were changed so that it was not possible to construct comparable estimates for the middle two categories (*1 or 2 times per year* and *once or twice a month*).

* $p < .05$. ** $p < .01$. *** $p < .001$.

cohorts. We begin by comparing kindergarten with first grade only in the 1998 wave. We find large differences between these two grades, especially with respect to time spent on nonacademic subjects. For instance, in 1998, 34% of kindergarten teachers reported daily exposure to music, and 27% reported daily exposure to art. In contrast, among first-grade teachers in 1999, those figures were 7% and 4%, respectively. This suggests that in the late '90s, kindergarteners were 5 times more likely to experience daily music lessons and nearly 7 times more likely to experience daily art than first graders. Roughly 60% of kindergarten teachers reported teaching dance/creative movement on a weekly basis in 1998, and about 40% reported doing a weekly theater/drama activity. Among first-grade teachers, the rates were far lower (25% and 11%, respectively). Although the differences we describe could, in theory, reflect changes between the 1998 and 1999 school years that applied to both kindergarten and first-grade classrooms, we assume that we are measuring differences in children's typical learning experiences as they progressed one school year from kindergarten to first grade.

Turning to changes in first-grade teachers' reports of subject instruction between 1999 and 2011, we find patterns that mirror those observed among kindergarten teachers. In other words, we see smaller (but still significant) drops over time in first-grade teachers reporting daily music or art instruction and increases in teachers reporting they never teach dance, theater, or foreign language.

Similarly, in the bottom panel of Table 3, we show that first-grade teachers reported large drops in the frequency with which their students use materials related to nonacademic instruction. For example, the likelihood a first-grade teacher reported using art materials in his or her classroom on a weekly basis dropped from 80% to 58%, and the likelihood of using science materials weekly dropped from 42% to 29%. Similarly, the likelihood that first-grade teachers reported their students never use musical instruments or cooking materials each increased by 19 percentage points.

Taken together, these findings suggest that in the late '90s, kindergarten and first-grade classrooms differed in their focus and time use. Since then, both grade levels experienced reductions in time spent on the arts and potentially science as well.

Although kindergarten classrooms did become more similar to first-grade classrooms, kindergarten teachers were still somewhat more likely to have daily social studies instruction and substantially more likely to have daily art and music instruction.

The bottom panel of Table 5 compares the frequency of standardized testing reported by kindergarten teachers in 2010 to that of first-grade teachers in 1999. Recall that in 1998, kindergarten teachers were not asked this question. We find that in 2010, just under 30% of kindergarten teachers report using standardized tests at least once per month. By comparison, only 11% of first-grade teachers in 1999 reported using standardized

tests this frequently. On the dimension of standardized test use, our results suggest that kindergarten classrooms in the later period devote considerably more time to standardized tests than first-grade teachers did 11 years earlier.

Differences in Patterns Across Schools

The preceding analyses highlighted substantial changes across nearly all measures examined. To assess whether these patterns of change differed across schools based on their demographic composition, we ran a set of exploratory logistic regressions. Table 6 presents results from these analyses, in which we consider 15 measures that have changed meaningfully between 1998 and 2010 (e.g., beliefs about reading in kindergarten, use of textbooks, time spent on art) and assess whether changes were more pronounced in schools serving higher proportions of children eligible for FRPL or children who are non-White. Results from similar logistic regressions for all measures presented in Tables 1 through 5 are presented in supplementary online appendices. The pattern of those results is largely similar to the pattern described here.

We present the odds of each kindergarten outcome for each school type in each period. For instance, the first column examines the likelihood that teachers agree or strongly agree that incoming kindergarteners need to know the alphabet. We see that in 1998, the odds of a teacher holding this belief was .51 among teachers working in schools in the highest quartile with respect to children eligible for FRPL. In schools serving relatively fewer eligible children, the odds are only .34. The statistically significant difference indicates that teachers serving more school lunch-eligible children were more likely to hold this belief.

Above, we already showed that on average, teachers in 2010 were far more likely to hold this belief than their counterparts in 1998. The results here indicate that although these increases were not isolated to those teachers serving the most school lunch-eligible children—we see substantial increases across both groups—they were more pronounced in schools serving the most low-income children. By 2010, the “gap” in this belief for schools serving more low-income children had broadened substantially, from 0.17 to 1.00. Patterns are quite similar when we consider schools based on their racial composition. To summarize, then, the results from this first column indicate that in both periods, teachers working in schools serving more FRPL-eligible or non-White children were significantly more likely to believe alphabet knowledge was critical for incoming kindergarteners. While both groups experienced substantial increases in this belief by 2010, the gap between them had broadened substantially.

It is important to note that our approach to examining interactions is based on the odds ratio metric and that had we used a probability metric, the interaction terms of interest may suggest different patterns (Buis, 2010). As an illustration, the raw probability that a kindergarten teacher indicated that knowing

the alphabet was important or very important in 1998 was .33 among teachers working in schools with the most children eligible for FRPL, compared to .27 for schools serving lower percentages of lunch-eligible children. By 2010, the analogous figures were .69 and .60. For this particular outcome, using a probability metric rather than an odds measure still suggests that teachers working in schools serving the most low-income children experienced a larger increase in this outcome over time (.37 versus .33). However, this difference is modest and not statistically significant. Given the potential for a different interpretation depending on metric, we also considered the raw probabilities for all outcomes considered in Table 6 and briefly summarize those trends after presenting the results based on the odds metric.

Turning back to the findings presented in Table 6, we see that the patterns for most variables mirror those described above for alphabet knowledge. In 25 of 30 cases, we find that teachers in schools serving more low-income and more non-White children are more likely to report higher academic expectations, didactic approaches to teaching, and fewer centers for hands-on learning (although these gaps vary in magnitude and are statistically significant for only 16 of 30 cases). By 2010, we observe across-the-board increases in academic beliefs, focus on assessments, classroom structure, and use of didactic instructional approaches. As with the earlier period, teachers in schools serving more low-income and more non-White children are still more likely to hold these beliefs; in all 30 cases, the direction of the difference is consistent with this pattern, and these differences are statistically significant in 21 of 30 cases.

To fully address our research question, we examine whether the changes in the kindergarten experience over this period systematically differed in schools serving high proportions of children eligible for FRPL or children who are non-White. Specifically, we test whether the gaps across schools, which were observed across both periods, broadened or narrowed over time. We do find that gaps broadened substantially with respect to teacher beliefs and textbook use. For instance, the “marginal effect” of being in a school serving a high percentage of FRPL-eligible children with respect to believing most children should learn to read in kindergarten is 0.28 in 1998 but 2.87 in 2010. Marginal effects for daily textbook use for math increased from .04 to .16. In other words, gaps that were already present in 1998 were exacerbated by 2010.

Notably, other gaps, for instance those with respect to having access to particular learning centers (e.g., art area, science area) actually narrowed. For instance, in 1998, kindergarten teachers in schools serving more non-White children were less likely to report their classroom had an art area relative to those teachers serving lower percentages of non-White children. Although this pattern was still present in 2010, the gap had narrowed substantially. The same pattern also emerges for a teacher reporting his or her classroom had a science area. However, even in those cases where we observe narrowing, we still saw across-the-board drops in

TABLE 6
Logit Models Predicting Changes in Teachers' Beliefs and Assessment Practices 1998 to 2010, by School Demographic Composition Measures

Variable	Teacher beliefs			Textbook use			Class time			Classroom space			Art/Music		
	Knowing alphabet before K is important	Most children should learn to read in K	Formal reading/math in preschool is important	Achievement relative to state/local standards is important	Read from basal reading texts daily	Do math problems from textbooks daily	3 or more hours/day on whole-class activities	More than 1 hour/day on child selected activities	Science is taught at least weekly	Classroom has science or nature area	Classroom has dramatic play area	Classroom has water or sand table	Classroom has art area	Art is taught at least 3 times per week	Music is taught at least 3 times per week
Differential changes by percentage eligible for FRPL															
1998, low % FRPL	0.34	0.34	0.36	1.11	0.08	0.05	0.10	1.20	24.41	1.88	5.39	0.77	9.62	1.25	0.92
1998, high % FRPL	0.51	0.62	0.73	1.66	0.14	0.09	0.17	1.23	13.01	0.12	-4.08*	-0.32	-3.29	0.12	-0.05
Difference in 1998	0.17*	0.28**	0.37**	0.54*	0.06	0.04	0.08*	0.03	-11.39*	0.81	1.84	0.38	3.33	0.12	0.19
2010, low % FRPL	1.43	3.68	1.44	3.53	0.27	0.16	0.36	0.57	22.55	0.53	0.74	0.14	1.21	0.06	0.11
2010, high % FRPL	2.43	6.55	3.02	5.00	0.49	0.33	0.61	0.49	19.00	-0.28**	-1.10***	-0.24***	-2.12***	-0.06**	-0.08**
Difference in 2010	1.00***	2.87**	1.58***	1.48*	0.22***	0.17**	0.24**	-0.08	-3.55	-0.40	2.98	0.08	1.17	-0.18	-0.03
Difference in difference (2010 - 1998)	0.82**	2.59**	1.21***	0.93	0.15*	0.13*	0.16	-0.11	7.84	1.76	9.47	1.08	12.91	1.13	0.97
Differential changes by percentage non-White															
1998, low % non-white	0.32	0.34	0.37	1.26	0.08	0.06	0.12	1.34	21.14	2.07	8.33	1.11	16.28	1.18	0.96
1998, high % non-White	0.64	0.63	0.84	1.42	0.15	0.07	0.13	1.03	11.56	1.02	5.11	0.64	6.43	1.28	1.16
Difference in 1998	0.33***	0.29**	0.47***	0.15	0.06*	0.01	0.01	-0.31	-9.58*	-1.06***	-3.21*	-0.47**	-9.85***	0.10	0.20
2010, low % non-White	1.42	3.96	1.50	3.58	0.27	0.15	0.37	0.59	21.74	0.78	1.90	0.38	3.23	0.11	0.18
2010, high % non-White	2.86	5.56	2.99	4.35	0.45	0.42	0.63	0.49	21.65	0.57	0.57	0.10	1.14	0.10	0.15
Difference in 2010	1.44***	1.61	1.49***	0.77	0.18**	0.27***	0.27***	-0.10	-0.09	-0.21	-1.33***	-0.28***	-2.09***	-0.01	-0.02
Difference in difference (2010 - 1998)	1.11***	1.31	1.02*	0.62	0.12	0.25***	0.26**	0.21	9.49	0.85**	1.88	0.19	7.76**	-0.11	-0.22

Note. Models include all public school kindergarten teachers and include controls for school characteristics (e.g., total enrollment, urbanicity, region of the country, provision of preschool) as well as teacher characteristics (e.g., gender, race, experience, certification). Sample sizes are between 3,700 and 4,000, rounded to the nearest 50 as per National Center for Education Statistics requirements. FRPL = free or reduced-price lunch.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

access to these centers, and we find gaps that suggest schools serving fewer low-income and non-White children are still more likely to offer these types of centers.

Taken together, the results shown in Table 6 show that in 1998, there were significant differences in kindergarten teachers' beliefs and practices based on schools' demographic composition, with those schools serving more low-income and non-White children generally reporting a higher focus on academic and didactic instruction. Our findings indicate that the large average changes we document in this paper occurred across the board. In 2010, the differences across school demographics were still present and in many cases were even larger than before, although in a few cases we do also find some narrowing.

As mentioned above, our analysis focuses on the odds ratio metric, which can produce a different pattern of interaction results and indeed does for some of the outcomes considered in Table 6. That said, when we consider changes over time in the raw percentage of teachers reporting each of these beliefs or practices, we still find that teachers in schools serving the most children eligible for FRPL and those serving the most non-White children reported greater increases with respect to textbook use and teacher-directed instruction and also find larger drops in music, art, dramatic play, and so on.

In additional models, available upon request, we also examined whether our findings were sensitive to more flexible regression specifications. These included models in which all covariates were interacted with the indicator for the 2010 cohort, to allow for changes over time in the relationship between school and teacher characteristics and kindergarten classroom characteristics, and models in which we simultaneously considered school poverty and school racial composition. These models all yielded substantively similar results, although larger standard errors led to fewer statistically significant coefficients.

Discussion

This paper is the first to provide nationally representative empirical evidence on the changing nature of public school kindergarten over a period characterized by heightened accountability pressures in elementary schools as well as heightened investments in early childhood education. We consider changes along five broad dimensions and find meaningful shifts across all five. We show that relative to their counterparts in 1998, public school kindergarten teachers in 2010 are far more likely to believe that academic instruction should begin prior to kindergarten entry. They are also more than twice as likely to expect that most children will leave their classrooms knowing to read. We observe a corresponding increase in literacy and math content instruction in kindergarten classrooms, with particularly large increases in time spent on "challenging" topics previously considered outside the scope of kindergarten.

Given the substantial shift toward full-day kindergarten over the period investigated, it was conceivable that we would find increases in time devoted to *all* subjects. However, this was not the case. We document substantial reductions in time spent on art, music, and science (but not social studies, PE, or recess).

Further, teachers in 2010 were far less likely to indicate that their classroom included various activity centers, including art areas, dramatic play areas, science areas, or water/sand tables. These trends are consistent with the possibility that a heightened focus on literacy and math instruction crowded out coverage of other subjects. Taken together with the drops we document in child-selected activities and the increases in teacher-directed instruction as well as the heightened use of textbooks, workbooks, and worksheets, our results may also suggest important shifts in the pedagogical approaches to kindergarten instruction.

We document striking increases in the use of standardized tests in early elementary classrooms. In 2010, roughly 30% of public school kindergarten teachers reported using standardized tests at least once a month. This is 2.6 times more often than the rate reported by first-grade teachers in 1999. Further, there was a 20-percentage-point increase in both kindergarten and first-grade teachers indicating that they consider children's performance relative to state or local standards very important or essential.

Overall, our results suggest that public school kindergarten classrooms became increasingly similar in structure and focus to typical first-grade classrooms of the late '90s but that first-grade classrooms have also shifted away from art, music, and science instruction and increased their emphasis on assessment. We do note that our exploratory analysis of changes to the first-grade teaching practices reflects responses from teachers of kindergarteners who were not retained and may yield somewhat distinct patterns if the first-grade teachers of children retained in kindergarten were also included.

Finally, our findings indicate that although changes to kindergarten classrooms were pervasive, in many cases they were more pronounced among schools serving high percentages of low-income and non-White children, particularly with respect to teacher expectations and didactic instruction.

Implications and Next Steps

It is not yet clear how much the large changes documented in this study have impacted children's development. Existing evidence is conflicting, with some studies suggesting that a heightened focus on academic instruction will improve children's learning trajectories and narrow achievement gaps, and others suggesting that a focus on early academic content is unnecessary and potentially harmful.

A number of recent papers show that children's academic skills during early childhood—particularly their math skills—are the strongest predictors of their later performance on a

number of cognitive and noncognitive outcomes (Claessens, Duncan, & Engel, 2009; Claessens & Engel, 2013; Duncan et al., 2007; Watts, Duncan, Siegler, & Davis-Kean, 2014). There is also evidence that exposure to academic content in preschool and kindergarten (particularly, engaging and advanced content) can be beneficial for student learning (Claessens et al., in press; Clements & Sarama, 2011; Engel et al., 2015). Magnuson, Ruhm, and Waldfogel (2007), for example, show that more academically oriented early elementary experiences can help children who did not attend preschool catch up with their peers.

At the same time, studies have also suggested that an early focus on literacy instruction and academic content more broadly has negative consequences (Copple & Bredekamp, 2009; Huffman & Speer, 2000; Marcon, 1999; Stipek, Feiler, Daniels, & Milburn, 1995). Stipek (2006), for example, suggests that a heightened focus on academics may be stressful for children and may negatively impact their motivation, self-confidence, and attitudes toward school. Nobel laureate James Heckman argues that the focus on cognitive and academic skill building in early childhood programs is misplaced and that the long-term benefits of early childhood interventions are driven through their impact on noncognitive social and behavioral skill building (Heckman, Krueger, & Friedman, 2004).

The emergence of the Common Core State Standards, which provide specific content standards for kindergartens in literacy and mathematics, has led to vigorous debates about appropriate instruction in the early grades (Carlsson-Paige, McLaughlin, & Almon, 2015). It is important to point out, as do the researchers embedded in these debates, that engaging literacy and math instruction need not be at odds with “play” and other types of pedagogical approaches considered developmentally appropriate in early childhood (Bassok, Claessens, & Engel, 2014; Clements & Sarama, 2014; Pondiscio, 2015). Indeed, the definition of developmentally appropriate instruction has evolved over time. Increasingly, developmental scientists agree that there are ways to meaningfully engage young children in literacy and math learning and that the effectiveness of such efforts depends on the pedagogical approach, the quality of teaching, and the connection of the instruction to young children’s curiosity (Katz, 2015; Snow & Pizzolongo, 2014).

To summarize, the key contribution of the current study is that it provides careful documentation of very large changes in kindergarten over a relatively short, 12-year period. Our findings suggest a shift toward more challenging (and potentially more engaging) literacy and math content. However, they also highlight a concerning drop in time spent on art, music, science, and child-selected activities, as well as much more frequent use of standardized testing.

Further research is needed, and is currently under way, to understand how much the large changes documented in this study impacted children’s development in both cognitive and social domains during the kindergarten year and beyond.

Additional research is also needed to better understand the drivers of these changes, focusing in particular on the heightened role of high-stakes accountability as well as the expanded access to school-based public preschool and changes in home parenting practices. A better understanding of the causes for these changes is critical, as the effects of these changes may depend on the extent to which the changes are driven by pressures to meet heightened accountability requirements in the later grades versus efforts to be responsive to children who are starting kindergarten with more academic exposure and classroom experiences than their counterparts in the late ’90s.

APPENDIX A1

Comparison of School/Class, Teacher, and Child Characteristics, 1998 to 2010

Characteristic	1998	2010
School/class characteristics		
Full-day kindergarten (K)	0.61	0.84
Small class (≤18 students)	0.25	0.30
School offers preK	0.36	0.52
Large school (>750 students)	0.28	0.24
Small school (<250 students)	0.06	0.02
Northeast	0.13	0.12
Midwest	0.16	0.21
South	0.44	0.47
West	0.27	0.21
Teacher characteristics		
New teacher (≤3 years)	0.16	0.13
Male	0.02	0.02
White	0.81	0.81
Hispanic	0.10	0.10
Black	0.07	0.06
Other race	0.03	0.03
Elementary certification	0.88	0.84
Early childhood certification	0.56	0.58
Child characteristics		
Male	0.51	0.51
White	0.58	0.52
Hispanic	0.19	0.25
Black	0.16	0.13
Asian	0.03	0.04
Speaks a non-English language	0.22	0.24
Does not speak English	0.03	0.03
Attended formal preK	0.68	0.67
Attended preK/K in same building	0.12	0.17
Mother graduated high school	0.86	0.87
Mother graduated college	0.23	0.31

Note. Samples limited to kindergarten teachers in public schools. All means are weighted using appropriate sampling weights. Figures are presented as proportions. School/class and teacher characteristics were estimated using the teacher-level data set leveraged in this study. Child characteristics were estimated using a student-level data set.

APPENDIX A2

Kindergarten Literacy Content Coverage and Instructional Activities, 1998 and 2010

ELA Topic/Activity	Taught daily			Taught at least weekly			Never taught		
	1998	2010	Difference	1998	2010	Difference	1998	2010	Difference
Topic									
Composing and writing sentences	28	56	28***	63	94	31***	26	3	-23***
Conventional spelling	18	42	24***	45	76	31***	44	17	-27***
Composing and writing stories with an understandable beginning, middle, and end	7	18	11***	26	55	29***	52	26	-26***
Identifying the main idea and parts of a story	27	34	7***	74	87	13***	12	4	-8***
Using context clues for comprehension	35	45	10***	81	92	11***	11	4	-7***
Rhyming words and word families	25	44	19***	88	96	8***	1	1	0
Making predictions based on text	40	48	8***	92	96	4***	2	1	-1**
Communicating complete ideas orally	66	66	0	95	97	2	1	1	0
Remembering and following directions that include a series of actions	63	67	4*	94	95	1*	1	1	0
Common prepositions, such as <i>over</i> , <i>under</i> , <i>up</i> , and <i>down</i>	21	24	3	65	66	1	8	8	0
Matching letters to sounds	84	88	4***	99	99	0*	0	1	1*
Alphabet and letter recognition	90	87	-3*	99	98	-1***	1	2	1***
Writing own name (first and last)	82	84	2	95	93	-2*	2	4	2**
Conventions of print (left-to-right orientation, book holding)	76	70	-6***	96	91	-5***	1	4	3***
Activity									
Read from basal reading texts	11	26	15***	30	57	27***	63	36	-27***
Write words from dictation to improve spelling	11	21	10***	44	69	25***	38	14	-24***
Compose and write stories or reports	16	27	11***	54	71	17***	21	11	-10***
Work in a reading workbook or on a worksheet	28	45	17***	70	86	16***	20	7	-13***
Read silently	38	48	10***	70	83	13***	20	10	-10***
Write with encouragement to use invented spellings, if needed	46	62	16***	85	96	11***	4	1	-3***
Retell stories	17	27	10***	78	88	10***	0	0	0
Read aloud	43	62	19***	87	97	10***	5	1	-4***
Listen to you read stories but they don't see the print	41	41	0	65	72	7***	19	13	-6***
Write stories in a journal	29	31	2	69	74	5**	14	11	-3
Work in mixed achievement groups on language arts activities	46	47	1	78	82	4*	9	6	-3***
Read books they have chosen for themselves	57	60	3	92	95	3**	3	1	-2***
Peer tutoring	19	20	1	54	57	3	20	19	-1
Work on phonics	84	92	8***	99	100	1**	0	0	0*
Discuss new or difficult vocabulary	60	63	3*	98	98	0	0	0	0
Listen to you read stories where they see the print (e.g., Big Books)	74	75	1	97	97	0	0	0	0
Do an activity or project related to a book or story	17	19	2	71	71	0	4	4	0
Practice writing the letters of the alphabet	69	68	-1	98	95	-3***	0	1	1
Perform plays and skits	1	1	0	12	8	-4***	22	36	14***
Dictate stories to a teacher, aide, or volunteer	16	20	4*	70	66	-4*	3	10	7***

Note. Samples limited to kindergarten teachers in public schools. Figures shown are percentages rounded to closest percentage point. All figures are weighted at the teacher level using appropriate sampling weights. ELA = English language arts.

* $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX A3

Kindergarten Math Content Coverage and Instructional Activities, 1998 and 2010

Math Topic/Activity	Taught daily			Taught at least weekly			Never taught		
	1998	2010	Difference	1998	2010	Difference	1998	2010	Difference
Topic									
Writing math equations to solve word problems	3	7	4***	16	38	22***	60	30	-30***
Performing simple data collection and graphing	11	19	8***	39	56	17***	7	3	-4***
Place value	28	42	14***	41	58	17***	45	29	-16***
Counting by 2s, 5s, and 10s	31	45	14***	71	84	13***	10	5	-5***
Subtracting single-digit numbers	13	17	4**	53	66	13***	17	7	-10***
Recognizing the value of coins and currency	15	25	10***	47	59	12***	10	15	5**
Adding single-digit numbers	19	25	6***	68	78	10***	7	3	-4***
Estimating probability	2	3	1*	10	20	10***	60	39	-21***
Writing all numbers between 1 and 100	5	8	3***	19	29	10***	47	31	-16***
Reading simple graphs	19	27	8***	57	66	9***	3	2	-1
Reading two-digit numbers	46	57	11***	80	87	7***	10	5	-5***
Reading three-digit numbers	20	23	3	33	40	7**	51	44	-7***
Counting beyond 100	21	24	3*	40	46	6***	36	32	-4
Using measuring instruments accurately	3	3	0	20	25	5**	20	17	-3
Ordinal numbers (e.g., 1st, 2nd, 3rd)	24	26	2	59	63	4	3	3	0
Writing numbers between 1 and 10	32	38	6***	85	88	3**	2	3	1**
Identifying relative quantity (e.g., equal, most, less, more)	24	29	5**	79	82	3*	2	1	-1
Sorting objects into subgroups according to a rule	10	12	2	63	65	2	3	3	0
Making, copying, or extending patterns	26	29	3	76	77	1	2	2	0
Estimating quantities	7	8	1	39	40	1	10	12	2
Telling time	14	18	4**	43	44	1	17	20	3
Fractions (e.g., recognizing that 2/4 of a circle is colored)	2	1	-1	11	11	0	43	47	4
Correspondence between number and quantity	47	51	4**	94	93	-1	1	2	1*
Ordering objects by size or other properties	8	9	1	58	57	-1	2	2	0
Recognizing and naming geometric shapes	23	25	2	70	69	-1	4	4	0
Activity									
Do math problems from their textbooks	8	18	10***	22	38	16***	74	56	-18***
Complete math problems on the chalkboard	9	17	8***	41	54	13***	35	27	-8***
Do math worksheets	20	35	15***	73	85	12***	7	2	-5***
Explain how a math problem is solved	20	31	11***	65	77	12***	8	4	-4***
Solve math problems in small groups or with a partner	11	19	8***	56	68	12***	12	8	-4***
Use music to understand concepts	6	19	13***	35	46	11***	24	20	-4**
Use creative movement or creative drama to understand math concepts	4	11	7***	30	37	7***	26	25	-1
Work on math problems that reflect real-life situations	17	19	2	66	71	5**	7	4	-3**
Peer tutoring	16	15	-1	47	49	2	27	25	-2
Engage in calendar-related activities	93	94	1	98	99	1	0	0	0
Use a calculator for math	1	1	0	4	4	0	76	76	0
Work in mixed achievement groups on math activities	33	30	-3	73	73	0	13	13	0
Count out loud	82	85	3**	100	99	-1	0	0	0
Play math-related games	24	28	4*	86	85	-1	0	1	1*
Work with counting manipulatives to learn basic operations	31	31	0	94	92	-2*	0	0	0
Work with geometric manipulatives	19	19	0	81	76	-5***	0	0	0
Work with rulers, measuring cups, spoons, or other measuring instruments	3	2	-1	25	19	-6***	7	10	3*

Note. Samples limited to kindergarten teachers in public schools. Figures shown are percentages rounded to closest percentage point. All figures are weighted at the teacher level using appropriate sampling weights.

* $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX A4

Percentage of Kindergarten Teachers Covering Different Topics in Science and Social Studies, 1998 and 2010

Topic	1998	2010	Difference
Science			
Dinosaurs and fossils	68	33	-35***
Ecology	77	53	-24***
Sound	64	43	-21***
Human body (e.g., senses, basic systems)	87	66	-21***
Light	60	40	-20***
Solar system and space	61	41	-20***
Machines and motors	38	23	-15***
Magnetism and electricity	56	41	-15***
Water	78	68	-10***
Scientific method	53	44	-9***
Health, safety, nutrition, and personal hygiene	99	93	-6***
Tools and their uses	59	54	-5*
Plants and animals	99	95	-4***
Weather (e.g., rainy, sunny)	99	98	-1
Understanding and measuring temperature	66	69	3
Social studies			
Geography	72	65	-7***
Different cultures	92	88	-4**
Community resources (e.g., grocery store, police)	96	93	-3**
Important figures and events in American history	92	90	-2
Map-reading skills	66	67	1
Social-problem solving	82	83	1
Reasons for rules, laws, and government	79	85	6***

Note. Samples limited to kindergarten teachers in public schools. Figures shown are percentages rounded to closest percentage point. All figures are weighted at the teacher level using appropriate sampling weights.
 * $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX B1

Kindergarten Teachers' Beliefs About School Readiness and Kindergarten Learning, 1998 and 2010

Please indicate the extent to which you agree with the following statements on children's preparation for school.	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010
Most children should learn to read in kindergarten	7	1	32	6	30	14	26	49	5	31
Parents should make sure their kids know the alphabet before they start kindergarten	4	1	28	11	39	27	24	42	5	20
Children who begin formal reading and math instruction in preschool will do better in elementary school	6	1	24	9	36	26	25	35	9	29
Attending preschool is very important for success in kindergarten	1	1	9	3	27	13	38	33	25	50
Homework should be given to kindergarten children almost every day	14	10	35	31	15	19	23	27	12	13

Note. Samples limited to kindergarten teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B2

Frequency of Subject Instruction in Kindergarten and First Grade, 1998 and 2010

How often do you teach the following subjects in your classroom?	Never		Less than once per week		1–2 times per week		3–4 times per week		Daily	
	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010
	Kindergarten teachers									
Reading/language arts	0	0	0	0	1	1	3	2	96	97
Math	0	0	0	0	2	1	14	8	83	91
Social studies	0	1	7	5	39	35	29	34	25	24
Science	0	1	8	5	46	37	27	37	18	20
Music	1	4	6	7	42	63	16	11	34	16
Art	0	3	5	10	41	61	27	15	27	11
Dance/creative movement	11	37	32	20	34	20	11	10	12	12
Theater	18	50	44	29	27	16	7	4	5	2
Foreign language	65	83	18	7	8	5	2	1	8	4
First-grade teachers										
Reading/language arts	0	0	0	0	1	1	1	4	98	94
Math	0	0	0	1	1	1	4	5	95	93
Social studies	0	1	5	6	45	41	33	35	17	17
Science	1	1	5	5	45	39	34	38	15	17
Music	2	6	12	9	72	75	6	6	7	4
Art	1	4	12	15	71	73	11	5	4	2
Dance/creative movement	37	52	39	26	19	16	3	3	3	3
Theater	41	59	48	31	10	9	1	1	1	1
Foreign language	78	84	10	6	8	6	1	1	3	3

Note. Samples limited to kindergarten and first-grade teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B3

First-Grade Classroom Organization and Materials

How often are the following materials or resources used in your class? (first-grade teachers)	Not available		Never		≤1 time per month		2–3 times per month		1–2 times per week		3–4 times per week		Daily	
	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010
	Art materials	0	3	0	1	4	16	15	22	36	29	23	12	21
Musical instruments	34	37	22	38	19	13	10	4	14	7	1	0	0	1
Costumes	46	44	28	38	18	15	4	2	3	1	1	0	1	0
Cooking/food-related items	26	33	14	26	42	31	13	6	4	2	0	1	1	2
Science equipment	5	3	2	3	21	30	29	35	24	20	10	5	8	4

Note. Samples limited to first-grade teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B4

Approaches to Instruction in Kindergarten

How much time does your class spend in the following activities?	No time		Half hour or less		About 1 hour		About 2 hours		≥3 hours	
	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010
	Child-selected activities	2	5	45	55	43	33	9	6	2
Whole-class activities	0	0	10	4	41	25	34	39	15	32

Note. Samples limited to kindergarten teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B5

Physical Education and Recess in Kindergarten

How often does your class do the following activities?	Never		<1 day/week		1–2 days per week		3–4 days per week		Daily	
	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010
Physical education	8	3	6	4	51	56	14	15	21	21
Recess	7	7	—	—	6	3	14	8	73	82

Note. Samples limited to kindergarten teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B6

Kindergarten Teachers' Assessment Philosophy and Practices, 1998 and 2010

How important is each of the following in evaluating the children in your class(es)?	Not important		Somewhat important		Very important		Extremely important	
	1998	2010	1998	2010	1998	2010	1998	2010
Individual child's achievement relative to the rest of class	7	4	46	29	32	36	14	31
Individual child's achievement relative to local, state, or professional standards	6	2	36	19	38	40	19	39
Individual improvement or progress over past performance	0	0	2	1	28	26	69	73
Effort	0	0	2	2	31	33	66	64
Classroom behavior or conduct	0	0	4	3	36	30	60	67
Cooperativeness with other children	0	0	5	6	41	40	53	54
Ability to follow directions	0	0	2	2	32	30	66	68

Note. Samples limited to kindergarten teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B7

First-Grade Teachers' Assessment Philosophy and Practices, 1999 and 2011

How important is each of the following in evaluating the children in your class(es)?	Not important		Somewhat important		Very important		Extremely important	
	1999	2011	1999	2011	1999	2011	1999	2011
Individual child's achievement relative to the rest of class	7	8	41	32	35	33	18	26
Individual child's achievement relative to local, state, or professional standards	7	2	33	19	38	41	22	38
Individual improvement or progress over past performance	0	0	2	2	30	26	68	72
Effort	0	0	2	3	29	32	69	66
Classroom behavior or conduct	1	0	5	2	31	28	63	69
Cooperativeness with other children	0	0	7	9	38	42	54	49
Ability to follow directions	0	0	2	2	28	31	69	67

Note. Samples limited to first-grade teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B8

Kindergarten Literacy Content Coverage and Instructional Activities (Full distributions), 1998 and 2010

Topic/Activity	Never		≤1 time per month		2–3 times per month		1–2 times per week		3–4 times per week		Daily	
	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010
How often is each of the following reading and language arts skills taught in your class(es)?												
Composing and writing sentences	26	3	5	1	5	2	19	13	17	26	28	56
Conventional spelling	44	17	6	3	5	4	15	17	12	17	18	42
Composing and writing stories with an understandable beginning, middle, and end	52	26	11	9	11	10	12	20	7	16	7	18
Identifying the main idea and parts of a story	12	4	4	3	10	7	25	25	22	28	27	34
Using context clues for comprehension	11	4	2	1	6	3	21	18	25	29	35	45
Rhyming words and word families	1	1	2	0	9	4	31	18	31	34	25	44
Making predictions based on text	2	1	2	0	4	3	23	17	29	31	40	48
Communicating complete ideas orally	1	1	1	1	2	2	11	10	19	21	66	66
Remembering and following directions that include a series of actions	1	1	1	1	3	2	12	10	19	18	63	67
Common prepositions, such as <i>over</i> and <i>under</i> , <i>up</i> and <i>down</i>	8	8	8	9	18	17	24	23	20	19	21	24
Matching letters to sounds	0	1	0	0	0	0	2	2	13	9	84	88
Alphabet and letter recognition	1	2	0	0	0	0	2	2	8	8	90	87
Writing own name (first and last)	2	4	1	1	2	2	4	4	8	5	82	84
Conventions of print (left-to-right orientation, book holding)	1	4	1	2	2	2	7	8	13	13	76	70
How often do children in your class(es) do each of the following reading and language arts activities?												
Read from basal reading texts	63	36	4	4	3	3	11	14	8	17	11	26
Write words from dictation, to improve spelling	38	14	9	9	9	9	21	29	12	19	11	21
Compose and write stories or reports	21	11	12	8	13	9	22	23	15	21	16	27
Work in a reading workbook or on a worksheet	20	7	4	3	6	4	22	17	20	24	28	45
Read silently	20	10	4	3	6	3	16	15	16	20	38	48
Write with encouragement to use invented spellings, if needed	4	1	5	1	6	2	18	11	21	22	46	62
Retell stories	0	0	7	3	15	8	35	32	26	29	17	27
Read aloud	5	1	3	1	5	1	22	12	22	23	43	62
Listen to you read stories but they don't see the print	19	13	11	9	5	5	11	19	13	13	41	41
Write stories in a journal	14	11	8	6	9	8	24	25	16	19	29	31
Read books they have chosen for themselves	9	6	6	5	7	7	14	17	18	18	46	47
Work in mixed achievement groups on language arts activities	3	1	2	1	3	3	17	15	18	20	57	60
Peer tutoring	20	19	13	12	13	11	22	23	12	15	19	20
Work on phonics	0	0	0	0	0	0	3	1	12	7	84	92
Discuss new or difficult vocabulary	0	0	1	0	1	1	13	11	25	24	60	63
Listen to you read stories where they see the print (e.g., Big Books)	0	0	0	1	2	2	8	8	15	14	74	75
Do an activity or project related to a book or story	4	4	8	10	17	15	32	33	22	19	17	19
Practice writing the letters of the alphabet	0	1	0	2	1	2	11	13	19	15	69	68
Perform plays and skits	22	36	46	40	20	16	8	6	2	1	1	1
Dictate stories to a teacher, aide, or volunteer	3	10	11	13	16	11	36	27	17	18	16	20

Note. Samples limited to kindergarten teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX B9

Kindergarten Math Content Coverage and Instructional Activities (Full distributions), 1998 and 2010

Topic/Activity	Never		≤1 time per month		2–3 times per month		1–2 times per week		3–4 times per week		Daily	
	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010	1998	2010
How often is each of the following math skills taught in your class(es)?												
Writing math equations to solve word problems	60	30	13	15	11	16	9	22	4	10	3	7
Performing simple data collection and graphing	7	3	21	13	33	28	21	25	7	12	11	19
Place value	45	29	8	6	6	7	7	9	6	7	28	42
Counting by 2s, 5s, and 10s	10	5	7	3	12	8	23	19	17	19	31	45
Recognizing the value of coins and currency	17	7	14	11	16	16	24	27	16	21	13	17
Subtracting single-digit numbers	10	15	18	11	24	16	22	20	10	14	15	25
Adding single-digit numbers	7	3	9	5	16	13	29	27	20	26	19	25
Estimating probability	60	39	19	23	10	19	6	12	2	4	2	3
Reading simple graphs	47	31	20	24	14	16	10	14	4	7	5	8
Writing all numbers between 1 and 100	3	2	11	8	29	23	27	26	11	13	19	27
Reading two-digit numbers	10	5	4	2	6	6	16	12	18	18	46	57
Reading three-digit numbers	51	44	9	10	6	6	7	9	6	8	20	23
Counting beyond 100	36	32	14	13	11	9	11	12	7	10	21	24
Using measuring instruments accurately	20	17	32	28	28	30	14	16	3	5	3	3
Ordinal numbers (e.g., 1st, second, third)	3	3	14	12	24	22	22	22	13	14	24	26
Writing numbers between 1 and 10	2	3	2	2	11	7	28	23	25	27	32	38
Identifying relative quantity (e.g., equal, most, less, more)	2	1	4	3	15	13	33	28	22	25	24	29
Making, copying, or extending patterns	3	3	7	7	27	25	34	33	20	20	10	12
Sorting objects into subgroups according to a rule	2	2	3	3	19	17	31	29	19	20	26	29
Estimating quantities	10	12	23	21	29	27	24	23	8	9	7	8
Telling time	17	20	21	17	19	19	19	18	10	8	14	18
Correspondence between number and quantity	43	47	30	27	15	15	8	8	2	2	2	1
Ordering objects by size or other properties	1	2	1	1	4	4	18	14	29	28	47	51
Fractions (e.g., recognizing that 2/4 of a circle is colored)	2	2	9	11	31	30	34	33	16	16	8	9
Recognizing and naming geometric shapes	4	4	6	7	20	20	29	27	19	17	23	25
How often do children in your class(es) do each of the following math activities?												
Do math problems from their textbooks	74	56	2	3	2	4	8	10	6	10	8	18
Complete math problems on the chalkboard	35	27	11	8	13	11	20	20	12	17	9	17
Do math worksheets	7	2	8	5	12	8	31	25	22	25	20	35
Use music to understand concepts	8	4	12	8	15	12	26	23	18	22	20	31
Explain how a math problem is solved	12	8	12	9	19	16	29	27	17	21	11	19
Solve math problems with in small groups or with a partner	24	20	21	18	19	16	20	17	9	11	6	19
Use creative movement or creative drama to understand math concepts	26	25	23	22	21	17	19	18	7	8	4	11
Work on math problems that reflect real-life situations	7	4	10	9	18	17	29	29	20	23	17	19
Engage in calendar-related activities	27	25	15	14	12	12	20	21	12	13	16	15
Peer tutoring	0	0	1	0	1	0	2	1	4	4	93	94
Use a calculator for math	76	76	14	15	6	6	2	2	1	1	1	1
Count out loud	13	13	6	6	8	8	20	21	20	22	33	30
Work in mixed achievement groups on math activities	0	0	0	0	0	1	4	3	13	11	82	85
Work with counting manipulatives to learn basic operations	0	1	4	4	10	11	35	30	27	27	24	28
Play math-related games	0	0	1	1	5	6	25	26	38	36	31	31
Work with geometric manipulatives	0	0	4	7	15	17	34	34	28	24	19	19
Work with rulers, measuring cups, spoons, or other measuring instruments	7	10	35	40	33	31	17	13	5	4	3	2

Note. Samples limited to kindergarten teachers in public schools. All means are weighted at the teacher level using appropriate sampling weights. Figures shown are percentages rounded to closest percentage point.

APPENDIX C1

Kindergarten Teachers' Beliefs About School Readiness and Kindergarten Learning, Marginal Effects From Logit Models

Variable	Readiness beliefs				Academic skills				Self-regulation				Social skills				Other skills			
	Most children should learn to read in K	Knowing alphabet before K is important	Formal reading/math in preschool is important	Attending preK is important for success in K	Homework should be given to children daily	Knows most letters	Identifies primary colors and shapes	Can count to 20	Can follow directions	Sits still and pays attention	Finishes tasks	Is not disruptive	Takes turns and shares	Is sensitive to others' feelings	Good at solving problems	Able to use pencil and paintbrush	Communicates verbally	Knows the English language		
Differential changes by percentage eligible for FRPL																				
1998, low % FRPL	0.34	0.34	0.36	1.43	0.31	0.19	0.44	0.10	4.02	1.67	1.17	3.98	2.71	1.55	0.46	0.53	6.55	1.05		
1998, high % FRPL	0.62	0.51	0.73	2.45	0.88	0.27	0.63	0.21	3.96	1.48	1.28	3.97	3.27	1.94	0.72	0.60	6.64	0.84		
Difference in 1998	0.28**	0.17*	0.37**	1.02*	0.57**	0.08	0.19*	0.11**	-0.06	-0.19	0.11	-0.01	0.56	0.39	0.26*	0.07	0.09	-0.20		
2010, low % FRPL	3.68	1.43	1.44	4.56	0.46	0.79	1.31	0.41	9.82	3.22	1.83	7.56	6.58	2.68	0.91	1.90	13.28	1.50		
2010, high % FRPL	6.55	2.43	3.02	7.61	1.53	1.33	1.81	0.85	13.38	4.19	1.59	10.71	5.79	2.37	1.02	3.45	15.03	1.38		
Difference in 2010	2.87**	1.00***	1.58***	3.05**	1.07***	0.54***	0.50*	0.44***	3.56	0.97	-0.24	3.15	-0.79	-0.31	0.11	1.55**	1.75	-0.11		
Difference in difference (2010 - 1998)	2.59**	0.82**	1.21***	2.03	0.49	0.46**	0.31	0.34**	3.63	1.16	-0.35	3.16	-1.34	-0.70	-0.16	1.47**	1.66	0.09		
Differential changes by percentage non-White																				
1998, low % non-White	0.34	0.32	0.37	1.41	0.29	0.19	0.42	0.10	4.14	1.59	1.27	4.00	3.03	1.73	0.51	0.51	7.04	1.14		
1998, high % non-White	0.63	0.64	0.84	2.86	1.35	0.29	0.57	0.23	3.27	1.45	1.07	4.11	2.76	1.51	0.70	0.59	5.25	0.55		
Difference in 1998	0.29**	0.33***	0.47***	1.46**	1.06***	0.10*	0.15	0.12***	-0.87	-0.13	-0.20	0.11	-0.27	-0.21	0.19	0.07	-1.79	-0.59***		
2010, low % non-White	3.96	1.42	1.50	4.38	0.40	0.81	1.32	0.41	9.37	3.11	1.77	7.59	6.43	2.50	0.85	1.96	13.20	1.68		
2010, high % non-White	5.56	2.86	2.99	9.32	2.61	1.43	1.75	0.94	14.62	4.47	1.64	9.63	6.24	2.61	1.23	3.17	14.51	1.03		
Difference in 2010	1.61	1.44***	1.49***	4.95**	2.21***	0.62***	0.43*	0.53***	5.24	1.36*	-0.13	2.04	-0.19	0.11	0.38**	1.21**	1.31	-0.65***		
Difference in difference (2010 - 1998)	1.31	1.11***	1.02*	3.49*	1.15**	0.52**	0.28	0.41***	6.11*	1.49*	0.07	1.94	0.08	0.32	0.19	1.14*	3.10	-0.06		

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers' gender, race, certification, and experience level. Sample includes all public school kindergarten teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. K = kindergarten; FRPL = free or reduced-price lunch. * $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX C2a

Frequency of Subject Instruction in Kindergarten, Marginal Effects From Logit Models

Variable	Proportion of kindergarten teachers reporting that they taught each subject daily								
	Reading/ language arts	Math	Social studies	Science	Music	Art	Dance/ creative movement	Theater	Foreign language
Differential changes by percentage eligible for FRPL									
1998, low % FRPL	37.36	6.80	0.33	0.19	0.49	0.34	0.16	0.05	0.05
1998, high % FRPL	52.52	10.85	0.29	0.21	0.46	0.36	0.12	0.04	0.07
Difference in 1998	15.16	4.05	-0.04	0.02	-0.03	0.02	-0.03	-0.01	0.02
2010, low % FRPL	70.14	11.48	0.26	0.18	0.19	0.12	0.16	0.02	0.02
2010, high % FRPL	33.31	13.80	0.35	0.29	0.11	0.06	0.09	0.01	0.02
Difference in 2010	-36.84*	2.32	0.09	0.10	-0.08**	-0.06**	-0.07**	-0.01	0.00
Difference in difference (2010 – 1998)	-52.00	-1.73	0.13	0.09	-0.05	-0.08	-0.04	0.00	-0.02
Differential changes by percentage non-White									
1998, low % non-White	39.28	6.95	0.34	0.21	0.48	0.37	0.14	0.05	0.04
1998, high % non- White	37.95	7.35	0.27	0.14	0.58	0.33	0.13	0.04	0.12
Difference in 1998	-1.33	0.40	-0.08	-0.07*	0.10	-0.04	-0.01	-0.01	0.08*
2010, low % non-White	47.71	10.82	0.26	0.18	0.17	0.10	0.15	0.02	0.02
2010, high % non- White	66.51	19.90	0.36	0.29	0.15	0.09	0.10	0.01	0.05
Difference in 2010	18.80	9.08*	0.10	0.11	-0.02	-0.01	-0.05*	-0.01*	0.03*
Difference in difference (2010 – 1998)	20.13	8.68	0.18*	0.18**	-0.12	0.03	-0.05	0.00	-0.05

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers' gender, race, certification, and experience level. Sample includes all public school kindergarten teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. FRPL = free or reduced-price lunch.

* $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX C2b

Frequency of Subject Instruction in First Grade, Marginal Effects From Logit Models

Variable	Proportion of first-grade teachers reporting that they taught each subject daily								
	Reading/ language arts	Math	Social studies	Science	Music	Art	Dance/ creative movement	Theater	Foreign language
Differential changes by percentage eligible for FRPL									
1998, low % FRPL	47.81	20.69	0.15	0.15	0.07	0.03	0.03	—	0.01
1998, high % FRPL	42.75	18.73	0.20	0.15	0.09	0.04	0.03	—	0.04
Difference in 1998	-5.06	-1.96	0.04	0.00	0.03	0.01	-0.01	—	0.03
2010, low % FRPL	28.64	19.36	0.18	0.17	0.04	0.02	0.03	—	0.02
2010, high % FRPL	9.81	7.84	0.19	0.20	0.02	0.01	0.03	—	0.02
Difference in 2010	-18.82***	-11.52***	0.00	0.03	-0.01	-0.01	0.00	—	0.00
Difference in difference (2010 – 1998)	-13.76	-9.56	-0.04	0.03	-0.04	-0.02	0.00	—	-0.03

(continued)

APPENDIX C2b (CONTINUED)

Variable	Proportion of first-grade teachers reporting that they taught each subject daily								
	Reading/ language arts	Math	Social studies	Science	Music	Art	Dance/ creative movement	Theater	Foreign language
Differential changes by percentage non-White									
1998, low % non-White	44.41	20.35	0.17	0.16	0.06	0.03	0.03	—	0.01
1998, high % non-White	90.89	16.91	0.18	0.13	0.08	0.04	0.03	—	0.06
Difference in 1998	46.48	-3.44	0.01	-0.03	0.02	0.01	0.00	—	0.05**
2010, low % non-White	25.65	17.69	0.19	0.18	0.03	0.02	0.03	—	0.02
2010, high % non-White	11.62	8.36	0.20	0.21	0.02	0.02	0.03	—	0.03
Difference in 2010	-14.03***	-9.33***	0.01	0.03	-0.01	0.00	0.00	—	0.02
Difference in difference (2010 - 1998)	-60.52	-5.90	0.01	0.05	-0.03	-0.01	0.00	—	-0.03

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers' gender, race, certification, and experience level. Sample includes all public school first-grade teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. FRPL = free or reduced-price lunch.
* $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX C3a

Kindergarten Classroom Organization and Materials, Marginal Effects From Logit Models

Variable	Does your classroom have the following interest areas or centers for activities?									
	Reading area with books	Listening center	Writing center	Math area	Puzzle or block area	Water or sand table	Computer area	Science or nature area	Dramatic play area	Art area
Differential changes by percentage eligible for FRPL										
1998, low % FRPL	—	6.15	10.83	37.15	243.92	1.08	9.48	1.76	9.47	12.91
1998, high % FRPL	—	8.41	15.14	44.89	107.79	0.77	11.18	1.88	5.39	9.62
Difference in 1998	—	2.26	4.31	7.74	-136.13	-0.32	1.70	0.12	-4.08*	-3.29
2010, low % FRPL	—	4.62	11.88	23.36	24.26	0.38	5.99	0.81	1.84	3.33
2010, high % FRPL	—	2.90	8.06	15.37	8.84	0.14	8.25	0.53	0.74	1.21
Difference in 2010	—	-1.72*	-3.82	-7.99	-15.42**	-0.24***	2.25	-0.28**	-1.10***	-2.12***
Difference in difference (2010 - 1998)	—	-3.99	-8.14	-15.73	120.71	0.08	0.55	-0.40	2.98	1.17

(continued)

APPENDIX C3a (CONTINUED)

Variable	Does your classroom have the following interest areas or centers for activities?									
	Reading area with books	Listening center	Writing center	Math area	Puzzle or block area	Water or sand table	Computer area	Science or nature area	Dramatic play area	Art area
Differential changes by percentage non-White										
1998, low % non-White	—	7.55	10.70	34.71	358.74	1.11	9.03	2.07	8.33	16.28
1998, high % non-White	—	5.36	11.73	36.17	80.04	0.64	6.14	1.02	5.11	6.43
Difference in 1998	—	-2.19	1.02	1.46	-278.70	-0.47**	-2.90	-1.06***	-3.21*	-9.85***
2010, low % non-White	—	4.28	11.49	25.08	26.06	0.38	6.46	0.78	1.90	3.23
2010, high % non-White	—	3.10	7.00	12.60	7.16	0.10	6.30	0.57	0.57	1.14
Difference in 2010	—	-1.18	-4.49*	-12.48**	-18.89***	-0.28***	-0.17	-0.21	-1.33***	-2.09***
Difference in difference (2010 – 1998)	—	1.01	-5.52	-13.94	259.81	0.19	2.73	0.85**	1.88	7.76**

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers' gender, race, certification, and experience level. Sample includes all public school kindergarten teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. FRPL = free or reduced-price lunch. * $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX C3b

First-Grade Classroom Materials, Marginal Effects From Logit Models

Variable	I use the following materials in my class daily.				
	Art materials	Musical instruments	Costumes	Cooking/food-related items	Science equipment
Differential changes by percentage eligible for FRPL					
1998, low % FRPL	0.26	—	0.01	0.00	0.09
1998, high % FRPL	0.24	—	0.01	0.00	0.03
Difference in 1998	-0.02	—	0.00	0.00	-0.06***
2010, low % FRPL	0.23	—	0.00	0.01	0.03
2010, high % FRPL	0.12	—	0.00	0.00	0.04
Difference in 2010	-0.11***	—	0.00	-0.01	0.01
Difference in difference (2010 – 1998)	-0.09	—	0.00	-0.01	0.07***
Differential changes by percentage non-White					
1998, low % non-White	0.26	—	0.01	0.01	0.08
1998, high % non-White	0.16	—	0.00	0.00	0.05
Difference in 1998	-0.10*	—	0.00	0.00	-0.02
2010, low % non-White	0.24	—	0.00	0.01	0.03
2010, high % non-White	0.10	—	0.00	0.00	0.04
Difference in 2010	-0.14***	—	0.00	-0.01	0.01
Difference in difference (2010 – 1998)	-0.04	—	0.00	-0.01	0.03

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers' gender, race, certification, and experience level. Sample includes all public school kindergarten teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. FRPL = free or reduced-price lunch. * $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX C4

Kindergarten Teachers' Reported Approaches to Instruction, Marginal Effects From Logit Models

Variable	Instructional approach		Do students do the following daily?				PE/recess	
	>1 hour/ day on child- selected activities	≥3 hours/ day on whole- class activities	Use a reading workbook or worksheet	Read from basal reading texts	Do math worksheets	Do math problems from textbooks	Children usually have PE daily	Children usually have recess daily
Differential changes by percentage eligible for FRPL								
1998, low % FRPL	1.20	0.10	0.35	0.08	0.18	0.05	0.25	3.38
1998, high % FRPL	1.23	0.17	0.37	0.14	0.24	0.09	0.24	4.80
Difference in 1998	0.03	0.08*	0.02	0.06	0.06	0.04	-0.01	1.42
2010, low % FRPL	0.57	0.36	0.72	0.27	0.47	0.16	0.23	7.00
2010, high % FRPL	0.49	0.61	0.96	0.49	0.77	0.33	0.18	5.93
Difference in 2010	-0.08	0.24**	0.24	0.22***	0.30**	0.17**	-0.05	-1.07
Difference in difference (2010 – 1998)	-0.11	0.16	0.22	0.15*	0.24	0.13*	-0.04	-2.49
Differential changes by percentage non-White								
1998, low % non-White	1.34	0.12	0.34	0.08	0.18	0.06	0.21	3.78
1998, high % non-White	1.03	0.13	0.39	0.15	0.29	0.07	0.30	3.48
Difference in 1998	-0.31	0.01	0.05	0.06*	0.11	0.01	0.08	-0.30
2010, low % non-White	0.59	0.37	0.77	0.27	0.47	0.15	0.22	6.50
2010, high % non-White	0.49	0.63	0.94	0.45	0.82	0.42	0.27	5.76
Difference in 2010	-0.10	0.27***	0.16	0.18**	0.34**	0.27***	0.05	-0.73
Difference in difference (2010 – 1998)	0.21	0.26**	0.11	0.12	0.23	0.25***	-0.03	-0.43

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers' gender, race, certification, and experience level. Sample includes all public school kindergarten teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. PE = physical education; FRPL = free or reduced-price lunch.

* $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX C5a

Kindergarten Teachers' Assessment Philosophies, Marginal Effects From Logit Models

Variable	The following is "very important" or "essential" for evaluating students in kindergarten						
	Achievement relative to class	Achievement relative to state/local standards	Improvement or progress over past performance	Effort	Classroom behavior or conduct	Cooperation with other children	Ability to follow directions
Differential changes by percentage eligible for FRPL							
1998, low % FRPL	0.78	1.11	41.87	64.15	35.14	20.93	96.35
1998, high % FRPL	1.11	1.66	42.69	30.33	20.84	11.16	61.12
Difference in 1998	0.34*	0.54*	0.82	-33.82	-14.30	-9.77*	-35.23
2010, low % FRPL	1.86	3.53	82.33	44.30	32.68	17.19	76.37
2010, high % FRPL	2.41	5.00	101.26	43.90	25.50	11.61	73.50
Difference in 2010	0.55*	1.48*	18.93	-0.41	-7.18	-5.58*	-2.87
Difference in difference (2010 – 1998)	0.22	0.93	18.11	33.42	7.11	4.20	32.36

(continued)

APPENDIX C5a (CONTINUED)

Variable	The following is “very important” or “essential” for evaluating students in kindergarten						
	Achievement relative to class	Achievement relative to state/local standards	Improvement or progress over past performance	Effort	Classroom behavior or conduct	Cooperation with other children	Ability to follow directions
Differential changes by percentage non-White							
1998, low % non-White	0.77	1.26	43.20	45.50	31.83	20.05	129.59
1998, high % non-White	1.23	1.42	36.41	51.29	21.73	15.71	46.86
Difference in 1998	0.45**	0.15	-6.78	5.79	-10.10	-4.34	-82.73*
2010, low % non-White	1.83	3.58	90.89	42.20	32.31	16.40	82.95
2010, high % non-White	2.65	4.35	84.02	45.59	23.12	12.11	66.95
Difference in 2010	0.82*	0.77	-6.88	3.40	-9.19	-4.28	-16.00
Difference in difference (2010 – 1998)	0.37	0.62	-0.09	-2.40	0.91	0.06	66.73

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers’ gender, race, certification, and experience level. Sample includes all public school kindergarten teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. FRPL = free or reduced-price lunch. * $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX C5b

First-Grade Teachers’ Assessment Philosophies, Marginal Effects From Logit Models

Variable	The following is “very important” or “essential” for evaluating students in 1st grade						
	Achievement relative to class	Achievement relative to state/local standards	Improvement or progress over past performance	Effort	Classroom behavior or conduct	Cooperation with other children	Ability to follow directions
Differential changes by percentage eligible for FRPL							
1998, low % FRPL	1.10	1.28	45.48	94.17	20.40	13.20	72.60
1998, high % FRPL	1.20	1.84	43.17	27.86	13.58	10.12	29.14
Difference in 1998	0.10	0.56*	-2.31	-66.31*	-6.83	-3.08	-43.46
2010, low % FRPL	1.35	3.83	65.02	50.77	69.48	11.56	57.65
2010, high % FRPL	1.99	4.05	57.12	33.43	32.85	7.44	29.27
Difference in 2010	0.64**	0.23	-7.90	-17.33	-36.63*	-4.12**	-28.38*
Difference in difference (2010 – 1998)	0.53	-0.33	-5.59	48.97	-29.80	-1.04	15.09
Differential changes by percentage non-White							
1998, low % non-White	0.99	1.28	50.26	65.64	17.16	11.62	51.82
1998, high % non-White	1.59	1.69	46.18	120.82	36.27	18.01	72.06
Difference in 1998	0.60*	0.41	-4.07	55.18	19.11	6.39	20.23
2010, low % non-White	1.35	3.82	68.60	47.83	75.22	11.22	50.75
2010, high % non-White	1.97	4.44	53.95	37.30	27.81	7.92	35.64
Difference in 2010	0.62**	0.62	-14.65	-10.53	-47.41**	-3.29*	-15.11
Difference in difference (2010 – 1998)	0.02	0.21	-10.57	-65.72	-66.52**	-9.69	-35.34

Note. Table presents marginal effects from models that include an indicator for cohort, an indicator for school demographic characteristic, and the interaction of the two. All models also include controls for full-day status, class size, school enrollment, whether a school offers preK, region of the country, urbanicity, and teachers’ gender, race, certification, and experience level. Sample includes all public school kindergarten teachers, and sample sizes are between 3,500 and 3,800, rounded to the nearest 50 as per National Center for Education Statistics requirements. Standard errors are clustered at the school level. FRPL = free or reduced-price lunch. * $p < .05$. ** $p < .01$. *** $p < .001$.

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Notes

1. Note that the ECLS-K:1998 tracks a cohort of children that entered kindergarten in the fall of 1998. In contrast, the ECLS-K:2011 tracks a cohort that entered kindergarten in the fall of 2010 (not 2011).

2. In addition to a nationally representative sample of kindergarteners, the ECLS-K:1998 also collected data on a nationally representative sample of kindergarten teachers (which included some teachers who did not teach any of the sampled students). The ECLS-K:2011 did not sample teachers in this way. For comparability, we therefore omit from our sample teachers in 1998 who did not teach one of the sampled students. Thus, our sample is most accurately described as “the teachers of a nationally representative sample of kindergarten students.” However, including these omitted teachers in our analysis does not yield substantive differences in our findings.

3. Note that the design of the ECLS-K allows us to include only the first-grade teachers of children from our base sample who proceeded to first grade in the year after kindergarten. The first-grade teachers of children retained in kindergarten after the base year are not included, such that our results may differ from a nationally representative sample of teachers of first graders.

4. Ideally we could make comparisons across waves in minutes spent per day or week on each of the subject areas. Unfortunately, differences in item wording across waves preclude this type of analysis.

References

- Barnett, W. S. (1995). Long-term effects of early childhood programs on cognitive and school outcomes. *Future of Children*, 5(3), 25–50.
- Bassok, D., Claessens, A., & Engel, M. (2014, June 4). The case for the new kindergarten: Challenging and playful. *Education Week*. Retrieved from http://www.edweek.org/ew/articles/2014/06/04/33bassok_ep.h33.html
- Bassok, D., Gibbs, C. R., & Latham, S. (2015). *Do the effects of early childhood interventions systematically fade? Exploring variation in the persistence of preschool effects*. EdPolicyWorks working paper. Retrieved from http://curry.virginia.edu/uploads/resourceLibrary/36_Preschool_Fade_Out.pdf
- Bassok, D., & Latham, S. (2014). *Kids today: Changes in school readiness in an early childhood era*. Retrieved from http://curry.virginia.edu/uploads/resourceLibrary/35_Kids_Today.pdf
- Bassok, D., Lee, R., Reardon, S. F., & Waldfogel, J. (2015). *Socioeconomic gaps in early childhood experiences, 1998 to 2010*. Unpublished manuscript.
- Bassok, D., & Reardon, S. F. (2013). “Academic redshirting” in kindergarten: Prevalence, patterns, and implications. *Educational Evaluation and Policy Analysis*, 35(3), 283–297.
- Booher-Jennings, J. (2005). Below the bubble: “Educational triage” and the Texas Accountability System. *American Educational Research Journal*, 42(2), 231–268.
- Buis, M. L. (2010). Stata tip 87: Interpretation of interactions in non-linear models. *Stata Journal*, 10(2), 305–308.
- Carlsson-Paige, N., McLaughlin, G. B., & Almon, J. (2015). *Reading instruction in kindergarten: Little to gain and much to lose*. Jamaica Plain, MA: Defending the Early Years/Alliance for Children.
- Chetty, R., Friedman, J. N., Hilger, N., Saez, E., Schanzenbach, D. W., & Yagan, D. (2011). How does your kindergarten classroom affect your earnings? Evidence from Project Star. *Quarterly Journal of Economics*, 126(4), 1593–1660.
- Claessens, A., Duncan, G. J., & Engel, M. (2009). Kindergarten skills and fifth-grade achievement: Evidence from the ECLS-K. *Economics of Education Review*, 28(4), 415–427.
- Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record*, 115, 1–29.
- Claessens, A., Engel, M., & Curran, F. C. (in press). Academic content, student learning, and the persistence of preschool effects. *American Educational Research Journal*.
- Clements, D. H., & Sarama, J. (2011). Early childhood mathematics intervention. *Science*, 333(6045), 968–970.
- Clements, D. H., & Sarama, J. (2014). *Play, mathematics, and false dichotomies*. Retrieved from <http://preschoolmatters.org/2014/03/03/play-mathematics-and-false-dichotomies/>
- Copple, C., & Bredekamp, S. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. National Association for the Education of Young Children. 1313 L Street NW Suite 500, Washington, DC 22205-4101.
- Cuban, L. (1992). Why some reforms last: The case of the kindergarten. *American Journal of Education*, 100(2), 166–194.
- Current Population Survey. (2015). *School enrollment of the population 3 years old and over, by level and control of the school, race, and Hispanic origin 1995 to 2013*. Washington, DC: U.S. Census Bureau. Retrieved from <http://www.census.gov/hhes/school/data/cps/historical/>
- Datar, A., & Sturm, R. (2004). Physical education in elementary school and body mass index: Evidence from the Early Childhood Longitudinal Study. *American Journal of Public Health*, 94(9), 1501–1506. doi.org/10.2105/AJPH.94.9.1501
- Dombkowski, K. (2001). Will the real kindergarten please stand up? Defining and redefining the twentieth-century US kindergarten. *History of Education*, 30(6), 527–545. doi.org/10.1080/00467600110064762
- Duncan, G. J. (2011). The importance of kindergarten-entry academic skills. In E. F. Zigler, W. S. Gilliam, & W. S. Barnett (Eds.), *The pre-K debates: Current controversies and issues* (pp. 89–93). Baltimore, MD: Brookes.
- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K. A., Huston, A. C., Klebanov, P., . . . Brooks-Gunn, J. (2007). School

- readiness and later achievement. *Developmental Psychology*, 43(6), 1428–1446.
- Elkind, D., & Whitehurst, G. (2001). Young Einsteins : Should Head Start emphasize academic skills? *EducationNext*, 1(2). Retrieved from <http://educationnext.org/young-einsteins/>
- Engel, M., Claessens, A., Watts, T. W., & Farkas, G. (2015, April). *The misalignment of kindergarten mathematics content*. Paper presented at the annual meeting of the American Education Research Association, Chicago, IL.
- Fuller, S. C., & Ladd, H. F. (2013). School-based accountability and the distribution of teacher quality across grades in elementary school. *Education Finance and Policy*, 8(4), 528–559. doi.org/10.1162/EDFP_a_00112
- Gao, H. (2005, April 11). Kindergarten or “kindergrind”? School getting tougher for kids. *Union-Tribune San Diego*. Retrieved from <http://legacy.utsandiego.com/news/education/20050411-9999-1n11kinder.html>
- Goldstein, L. S. (2007). Beyond the DAP versus standards dilemma: Examining the unforgiving complexity of kindergarten teaching in the United States. *Early Childhood Research Quarterly*, 22(1), 39–54.
- Graue, E. (2009). Reimagining kindergarten: Restoring a developmental approach when accountability demands are pushing formal instruction on the youngest learners. *School Administrator*, 66(10), 10–15.
- Grissom, J., Kalogrides, D., & Loeb, S. (2014). *Strategic staffing: How accountability pressures affect the distribution of teachers within schools and resulting student achievement*. Vanderbilt University working paper.
- Hatch, J. A. (2002). Accountability shovedown: Resisting the standards movement in early childhood education. *Phi Delta Kappa*, 83(6), 457–462.
- Heckman, J. J., Krueger, A. B., & Friedman, B. M. (2004). *Inequality in America*. Cambridge, MA: MIT Press.
- Huffman, L. R., & Speer, P. W. (2000). Academic performance among at-risk children: The role of developmentally appropriate practices. *Early Childhood Research Quarterly*, 15(2), 167–184. doi.org/10.1016/S0885-2006(00)00048-X
- Jacob, B. A. (2005). Accountability, incentives and behavior: The impact of high-stakes testing in the Chicago Public Schools. *Journal of Public Economics*, 89(5/6), 761–796.
- Kagan, S. L., & Kauerz, K. (2007). Reaching for the whole: Integration and alignment in early education policy. In R. C. Pianta, M. Cox, & K. L. Snow (Eds.), *School readiness and the transition to kindergarten in the era of accountability* (pp. 11–30). Baltimore, MD: Brookes.
- Katz, L. (2015). *Lively minds: Distinctions between academic versus intellectual goals for young children*. Retrieved from <http://deyproject.org/2015/04/09/lively-minds-distinctions-between-academic-versus-intellectual-goals-for-young-children/>
- Kornrich, S., & Furstenberg, F. (2013). Investing in children: Changes in parental spending on children, 1972–2007. *Demography*, 50(1), 1–23.
- Magnuson, K. A., Ruhm, C., & Waldfogel, J. (2007). The persistence of preschool effects: Do subsequent classroom experiences matter? *Early Childhood Research Quarterly*, 22(1), 18–38.
- Marcon, R. A. (1999). Differential impact of preschool models on development and early learning of inner-city children: A three-cohort study. *Developmental Psychology*, 35(2), 358–375.
- Miller, E., & Almon, J. (2009). *Crisis in the kindergarten: Why children need to play in school*. New York, NY: Alliance for Childhood.
- Orenstein, P. (2009, April 29). Kindergarten cram. *The New York Times*. Retrieved from http://www.nytimes.com/2009/05/03/magazine/03wwln-lede-t.html?_r=0
- Otterman, S. (2009, November 21). Tips for the admissions test . . . to kindergarten. *The New York Times*. Retrieved from <http://www.nytimes.com/2009/11/21/nyregion/21testprep.html>
- Pianta, R. C., Cox, M. J., & Snow, K. L. (Eds.). (2007). *School readiness and the transition to kindergarten in the era of accountability*. Baltimore, MD: Brookes.
- Pianta, R. C., La Paro, K., Payne, C., Cox, M. J., & Bradley, R. (2002). The Relation of kindergarten *The Elementary School Journal*, 102(3), 225–238.
- Pondiscio, R. (2015). *Is Common Core too hard for kindergarten?* Retrieved from <http://edexcellence.net/articles/is-common-core-too-hard-for-kindergarten>
- Ramey, G., & Ramey, V. A. (2010). The rug rat race. *Brookings Papers on Economic Activity*, 2010(1), 129–176.
- Raver, C. C., & Knitzer, J. (2002). *Ready to enter: What research tells policymakers about strategies to promote social and emotional school readiness among three- and four-year-old children*. Retrieved from <http://academiccommons.columbia.edu/catalog/ac:127551>
- Reardon, S. F. (2011). The widening academic achievement gap between the rich and the poor: New evidence and possible explanations. In G. J. Duncan & R. J. Murnane (Eds.), *Whither opportunity? Rising inequality, schools and children's life chances* (pp. 91–116). New York, NY: Russell Sage Foundation.
- Russell, J. L. (2007). *Not kid stuff anymore? Institutional change in kindergarten education*. Berkeley: University of California.
- Russell, J. L. (2011). From child's garden to academic press: The role of shifting institutional logics in redefining kindergarten education. *American Educational Research Journal*. Advance online publication. doi.org/10.3102/0002831210372135
- Shonkoff, J. P., & Phillips, D. (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academy Press.
- Snow, K. L., & Pizzolongo, P. (2014). Not yesterday's kindergarten [Weblog post]. Retrieved from <http://www.naeyc.org/blogs/gclarke/2014/02/not-yesterday%E2%80%99s-kindergarten>
- Stipek, D. (2006). No child left behind comes to preschool. *Elementary School Journal*, 106(5), 455–466.
- Stipek, D., Feiler, R., Daniels, D., & Milburn, S. (1995). Effects of different instructional approaches on young children's achievement and motivation. *Child Development*, 66(1), 209–223. doi.org/10.1111/j.1467-8624.1995.tb00866.x
- Tyre, P. (2006, September 10). The new first grade: Too much too soon. *Newsweek*. Retrieved from <http://www.newsweek.com/new-first-grade-too-much-too-soon-109667>
- Vise, D. de. (2007, May 23). More work, less play in kindergarten. *The Washington Post*. Retrieved from <http://www>

washingtonpost.com/wp-dyn/content/article/2007/05/22/AR2007052201696.html

Watts, T. W., Duncan, G. J., Siegler, R. S., & Davis-Kean, P. E. (2014). What's past is prologue: Relations between early mathematics knowledge and high school achievement. *Educational Researcher*, 43(7), 352–360.

Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M., Espinosa, L. M., Gormley, W. T., . . . Zaslow, M. J. (2013). *Investing in our future: The evidence base on preschool education*. New York, NY: Foundation for Child Development.

Zigler, E. F. (1987). Formal schooling for four-year-olds? No. *American Psychologist*, 42(3), 254–260. doi.org/10.1037/0003-066X.42.3.254

Zigler, E. F., & Bishop-Josef, S. J. (2006). The cognitive child versus the whole child: Lessons from 40 years of Head Start. In D. G. Singer, R. M. Golinkoff, & K. Hirsh-Pasek (Eds.), *Play = learning: How play motivates and enhances children's*

cognitive and social-emotional growth (pp. 15–35). New York, NY: Oxford University Press.

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