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The Role of Early Schooling in Shaping Inequality in Academic, Executive Functioning, and Social-Emotional Skills

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Abstract

Children from historically marginalized racial/ethnic and socieconomic groups on average, score lower on widely used assessments of academic, executive functioning, and social-emotional skills at kindergarten entry, but the extent to which these differences are shaped by exposure to early schooling is unclear. Using data from a public prekindergarten and kindergarten program in Boston, we leverage a seasonal comparison design to examine how patterns change during the school year relative to summer periods. Although trends vary somewhat by the skill domain and groups compared, we largely find that exposure to early schooling is compensatory or neutral in shaping inequality. This suggests that prekindergarten and kindergarten together contribute to more equitable outcomes than would otherwise be expected in the absence of schooling. However, we find no evidence of systematic differences in access to high-impact classroom processes, which leaves open the question of which aspects of early schooling are most associated with declining inequality.

Keywords

education, racial inequality, class inequality

Public prekindergarten is an important lever for boosting children's kindergarten readiness and reducing early social inequality (Chaudry et al. 2021; Phillips et al. 2017; Weiland and Yoshikawa 2013). The benefits of prekindergarten can last into adulthood, shaping outcomes such as educational attainment, earnings, and health (Gray-Lobe, Pathak, and Walters 2016; Phillips et al. 2017). However, even as disparities by student race/ethnicity and socioeconomic status [SES] in general prekindergarten access have narrowed over time, access to high-quality early learning opportunities remains stubbornly unequal (McCormick et al., 2023). Public prekindergarten programs in communities with many low-income families and those with high proportions of racial/ethnic minorities tend to have lower average quality ratings than schools in other communities (Bassok and Galdo 2016; Chaudry et al. 2021; Latham et al. 2021). These realities suggest that prekindergarten may provide unequal learning environments that either exacerbate social inequality or mute the potential of public prekindergarten for mitigating early opportunity gaps.

Notably, students begin school with large racial/ethnic and SES disparities on academic, cognitive, and social-emotional assessments (DiPrete and Jennings 2012; Downey, Workman, and von Hippel 2019; Reardon and Portilla 2016), which generally do not change substantially in size over later grades (von Hippel and Hamrock 2019; von Hippel, Workman, and Downey 2018). We follow Ladson-Billings (2006) in conceptualizing these disparities as the result of profound historical, economic, sociopolitical, and moral debts owed by the United States to students from historically

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marginalized racial/ethnic and lower income backgrounds. Because these gaps emerge in the years prior to kindergarten, inequitable access to high-quality early schooling is thought to be one key mechanism that shapes racial/ethnic and SES inequality in academic, executive functioning, and social-emotional assessment scores. Although the cumulative nature of cognitive development and skill growth suggests that the most meaningful time to measure and understand skill disparities is likely before kindergarten (Knudsen et al. 2006; Shonkoff and Phillips 2000), the majority of studies on the implications of schooling for inequality do not measure grades earlier than kindergarten. As a result, we know very little about how prekindergarten programs facilitate or mitigate inequality in valued educational and childhood outcomes.

In this study, we investigate the development of racial/ethnic and SES inequality in academic, executive functioning, and social-emotional skills over the course of prekindergarten and kindergarten relative to the summer in between these years. We address two specific research questions:

Research Question 1: Do racial/ethnic and SES disparities in academic, executive functioning, and social-emotional assessment scores grow faster in or out of school over the course of prekindergarten and kindergarten?

Research Question 2: To what extent are racial/ethnic and SES differences in exposure to high-impact classroom processes associated with assessment score disparities over time?

Our data are drawn from a diverse group of children attending prekindergarten and kindergarten in the Boston Public Schools (BPS) during the 2016–2017 and 2017–2018 school years, respectively. We use a seasonal comparison design (SCD) to examine growth in assessed skills across years, comparing changes in disparities on assessment scores during the school year to those same trends during the summer between prekindergarten and kindergarten (i.e., what might have been expected to occur in the absence of schooling). Because classroom processes in the early grades may be an important mechanism for understanding how schools do (or do not) facilitate inequality, we also incorporate data on children's specific exposure to classroom experiences that have been shown to be associated with academic and behavioral skill development (Maier et al. 2022; Weiland and Guerrero-Rosada 2022). In this way, we begin to show not just *if* schools shape inequality but also *how* they might do so in the early years.

Our research extends prior work on how early childhood education shapes social inequality (Downey 2020; Downey et al. 2019; McCormick et al. 2021; von Hippel et al. 2018) in several ways. Because most of the literature to date has focused on academic assessments, we also include executive functioning and social-emotional skills assessments. Furthermore, we consider disaggregated trends in inequality by student race/ethnicity and SES, which extends prior work that examined trends in inequality between White and non-White students in the prekindergarten and kindergarten years (see McCormick et al., 2021).

We find that changes in assessed skills vary when comparing racial and socioeconomic differences across skill domains, but in general, our findings are consistent with a framework where schools are compensatory or neutral in shaping inequality. These findings expand to the early childhood period the conclusion that disparities in summer learning may accumulate over the elementary school years to explain differential academic outcomes (Alexander, Entwisle, and Olson 2007) and confirm prior findings that prekindergarten and kindergarten can compensate for preexisting academic disparities (McCormick et al. 2021). Although results should be interpreted with caution given that only the math assessments are interval-scaled (see von Hippel and Hamrock 2019), these findings provide suggestive evidence that schools are at best compensatory and at worst neutral engines in shaping inequality. Finally, we find no evidence of systematic differences in access to high-impact classroom processes by race/ethnicity or SES among students in the sample. This too suggests that prekindergarten and kindergarten may be compensatory or largely neutral in nature across skill domains. None of our results suggest that schools are associated with exacerbating inequality.

Taken together, our results indicate that prekindergarten and kindergarten together contribute to more equitable outcomes than would otherwise be expected in the absence of schooling. Furthermore, our results provide evidence on how social environments and institutions shape skills early in life, with implications for both theory and policy.

Background

Early Skill Development and Exposure to Schooling

There are a number of scholarly debates about the role that schooling plays in the production—and reproduction—of disparities in assessed skills. The bulk of studies in this domain use SCDs to measure learning gains and determine the extent to which changes in inequality that can be attributed more specifically to schools themselves (Downey 2020; McCormick et al. 2021; Passaretta and Skopek 2021). These designs compare the amount of learning gained over the school year to that gained (or lost) over the summer periods. In doing so, summer provides a counterfactual to schooling: Rather than only testing if inequality grows during the school year, these studies compare school-year growth magnitudes to the changes in disparities that occur during summer, which are the gains that would have been expected during the school year in the absence of schooling. Indeed, some schools that might be otherwise considered "failing," based on poor overall academic achievement levels, are actually remarkably successful at

creating opportunities for school-year gains in academic skills (Carr et al. 2022; Downey, von Hippel, and Hughes 2008; Reardon 2019).

A number of studies have tackled the question of school-year skill development relative to summertime skill development in settings serving K–12 students. In general, most disparities in academic skills that disadvantage students from marginalized groups tend to grow faster over the summer than during the school year (Downey, von Hippel, and Broh 2004; McCormick et al. 2021; von Hippel et al. 2018). For example, estimates from von Hippel et al. (2018)—using data that covered kindergarten, first grade, and second grade—showed that socioeconomic academic disparities tend to shrink over the course of kindergarten and early elementary school years but grow over the summer. However, they also found that the opposite was true for the White-Black test score gap, where schooling was related to an increase in the White-Black gap, but the gap tended to shrink over the summer. Other studies have found that children from families with low incomes tend to benefit more academically from early school-based experiences (e.g., expanded time in school or access to prekindergarten) than do students from more affluent backgrounds (Passaretta and Skopek 2021; Pearman 2019; Raudenbush and Eschmann 2015). For social and behavioral skills, schools also tend to be largely neutral in shaping disparities, with race/ethnicity, SES, and gender differences growing at similar rates during kindergarten and first and second grades compared to the summer periods (Downey et al. 2019). Likewise, research on how executive functioning development is influenced by exposure to schooling suggests that unlike skills that are more likely to be influenced by teaching, executive functioning skills may be less malleable (Lipsey et al. 2017; Moffett et al. 2023; Taylor et al. 2015), at least without specific executive function interventions (Raver 2012). However, even though children increasingly attend public prekindergarten programs (Chaudry et al. 2021), we know much less about how these patterns look during students' earliest exposure to formal schooling.

Importance of High-Quality Early Learning Experiences

About 68 percent of 4-year-olds in America attended a formal, center-based prekindergarten program as of 2018[1] (National Center for Education Statistics 2021). Support for expanding public prekindergarten has been driven by a number of factors, including evidence of heightened "malleability" of children's skills during early childhood (Knudsen et al. 2006; Shonkoff and Phillips 2000) and the efficacy of these investments for supporting children's school readiness skills (Phillips et al. 2017; Weiland and Yoshikawa 2013; Yoshikawa et al. 2013). For example, evidence from both the Tulsa and Boston prekindergarten programs show that high-quality prekindergarten attendance is associated with more advanced social skills in kindergarten (Gormley et al. 2011; Weiland and Yoshikawa 2013). Research has also found that social and behavioral skills tend to be more associated with teacher effectiveness at these stages than academic skills, although the two are interrelated given that social and behavioral skills have a positive relationship with academic growth (Jennings and DiPrete 2010).

However, prekindergarten programs are variable in quality and type (Bassok and Galdo 2016; Maier et al. 2022; Pianta, Downer, and Hamre 2016; Valentino 2018). In general, communities with low average incomes and communities with high fractions of racial/ethnic minorities have the lowest access to high-quality prekindergarten classrooms (operationalized as care type, i.e., informal vs. formal care, and structural quality, including class size and teacher education levels; Bassok and Galdo 2016), but there is evidence that the benefits of prekindergarten programs may be largest for children from families with low incomes (Weiland and Yoshikawa 2013). Moreover, Latham et al. (2021) found that students living in majority-Black census tracts were less likely to live in close proximity to high-quality universal prekindergarten programs. This suggests that although access to prekindergarten has expanded in recent years, access to the highest quality programs—even in publicly funded, universal systems—remains stratified.

Prekindergarten quality is typically conceptualized as having two domains: structural and process quality (Maier, Hsueh, and McCormick 2020; Weiland and Guerrero-Rosada 2022; Yoshikawa et al. 2013). Structural quality refers to the organization and resources of the prekindergarten program, such as teacher-student ratio, class size, and teacher qualifications (Guerrero-Rosada et al. 2021; Yoshikawa et al. 2013). Process quality reflects the nature of interactions between teachers and students and instructional practices (Bassok and Galdo 2016; Cryer 1999; Guerrero-Rosada et al. 2021). The Classroom Assessment Scoring System (CLASS) scale is widely used in the field of early and education to measure process quality, which comprises interactions between teachers and children or between children and classmates (Pianta et al. 2016; Weiland and Guerrero-Rosada 2022). Measures of process quality have been shown to have distinct relationships with student learning in math and reading as well as executive functioning, social-emotional development, and kindergarten readiness (Weiland et al. 2013). In general, however, the magnitude of these associations is small, and recent replications have found null effects of the CLASS domains on prekindergarten gains in math, reading, and executive functioning skills (Guerrero-Rosada et al. 2021; McDoniel et al. 2022). Content-rich and

[1]However, these numbers have dropped since the onset of the COVID-19 pandemic (National Center for Education Statistics 2021).

cognitively demanding instruction, key indicators of instructional quality on CLASS, have been shown to relate to gains in math and language during the prekindergarten year (Maier et al. 2022). In a sample of classrooms implementing the BPS prekindergarten program (Maier et al., 2022), content-rich instruction and cognitively demanding instruction consistently predicted faster gains in mathematics, with particularly pronounced associations for children who entered school with higher initial levels of mathematics achievement. To date, however, there is little evidence on whether these associations vary for children from different racial/ethnic or SES backgrounds (Maier et al. 2022).

Disparities in prekindergarten learning outcomes and experiences are important because they shape disparities in kindergarten readiness, which in turn shape later skill disparities as students progress through school (Justice, Koury, and Logan 2019; La Paro and Pianta 2000). Indeed, there is evidence that universal high-quality prekindergarten is positively associated with later college-going patterns (Gormley et al. 2023), although more research is needed to fully establish the link between prekindergarten and later outcomes. Although kindergarten readiness disparities have slowly narrowed since the late 1990s (Bassok and Latham 2017; Bassok, Latham, and Rorem 2016), the magnitude of these gaps demonstrates that out-of-school and early childhood opportunities play a substantial role in shaping academic disparities before students arrive in the classroom. In addition, the magnitude of these disparities tends to remain relatively constant over time, suggesting that early childhood factors shape gaps for years to come (von Hippel and Hamrock 2019). Providing high-quality prekindergarten has been identified as a leading policy strategy for promoting more equitable learning outcomes. States, districts, and localities have responded by making sizeable investments in building public prekindergarten programs. However, achieving the goal of reducing disparities in children's skills at entry to first grade may be impeded by inequality in access to quality prekindergarten and kindergarten programs.

Study Contribution

Importantly, prior studies in this domain have tended to begin analyses with the kindergarten year and focused on later grades. Furthermore, very few studies have examined how student skill development varies by race/ethnicity and SES for prekindergarten and kindergarten. This is, in part, due to a data issue: Many national data sets—including the often-used Early Childhood Longitudinal Study Kindergarten—begin in kindergarten, precluding a comprehensive investigation of prekindergarten trends. Two studies have examined these patterns, however, and are therefore the most relevant to the present study. First, using data from 40 classrooms in six states Kim and Camilli (2014) showed that prekindergarten students' language/literacy test score gains in general were larger during the school year than during the summer. In addition, McCormick et al. (2021) investigated both SES gaps and gaps between White and non-White students in math and language skill development in BPS. They found that gaps between White and non-White students tended to grow in the summer before kindergarten due to White students' relatively higher summer growth rates. This study did not disaggregate beyond comparing White to grouped non-White children. Likewise, their estimates indicated that academic gaps between students from families with lower versus higher incomes tended to grow over the summer. We build on and extend these studies by investigating disaggregated racial/ethnic and socioeconomic gaps and by including measures of executive functioning and social-emotional and academic domains. In addition, we examine inequality in exposure to classroom processes and how these processes might explain inequality in skill development.

Data

Participants

The sample for the current study consists of 325 students attending the Boston Public Schools (BPS) prekindergarten program in a public school (n = 20) or a community-based organization (CBO) implementing the BPS prekindergarten curriculum and professional development model during the 2016–2017 school year (n = 10).[2] Original recruitment began with students from 41 public prekindergarten classrooms and 10 CBO classrooms, nested within 20 public schools and 10 CBO centers. The BPS prekindergarten program is free, full-day, and open to any age-eligible child in Boston.

The data collection team sought to create a sample that was representative of the broader population of BPS elementary schools offering a public prekindergarten program.[3] As such, we randomly selected 25 public schools out of the 76

[2]Participating teachers use a relatively standardized curriculum in their classrooms. Ninety-two percent of prekindergarten teachers included in the current study sample reported using BPS's *Focus on K1* curriculum (McCormick et al., 2020), which uses an adapted version of the *Opening the World of Learning* (Schickedanz and Dickinson 2004) language and literacy curriculum and *Building Blocks* (Clements and Sarama 2008), an early mathematics curriculum for preschool children. Ninety-four percent of the participating kindergarten teachers reported that they implemented BPS's *Focus on K2* curriculum, an extension of the *Focus on K1* model that aims to align with and build on the content and mode of instruction that children received in K1. See more information about these curricula in McCormick et al., (2020).

[3]At the district level in BPS, public schools are 35 percent Hispanic, 34 percent Black, 16 percent White, 12 percent Asian, 3 percent multiracial or some other race, 53 percent dual-language learner status, and 69 percent FRL-eligible. Broadly, this aligns with the wider public school sample participating in this study. However, because of sample restrictions, it was not possible to compare the students enrolled in the in-sample CBOs to the broader population of students enrolled at CBOs in the BPS system (for details on how public school and CBO samples compared, see Weiland et al., 2022).

schools in the broader district offering the public prekindergarten program (of these, 21 agreed to participate, with one serving as a pilot school for developing measures and training). We also randomly selected 10 of the 11 CBOs in Boston implementing the BPS prekindergarten model to participate in the study (of these, all 10 agreed to participate).[4] We asked all prekindergarten teachers assigned to general education or inclusion classrooms (i.e., classrooms enrolling children with and without an individualized education program) in each of the 20 public schools and all the CBO teachers working with 4-year-old students to participate in the study in the fall of 2016. Ninety-six percent (n = 51) of teachers across public schools (n = 41) and CBOs (n = 10) agreed to participate in the study activities, including allowing children in their classroom to participate in direct assessments with the research team. We then followed sample children into public kindergarten programs, with 95 percent of kindergarten teachers agreeing to participate in study activities.

After recruiting schools and classrooms, we attempted to collect active consent for all prekindergarten students enrolled in participating classrooms. Recruitment activities began in late September 2016 and were completed by late November 2016. Eighty-one percent of all children in participating classrooms consented to enroll in the study. However, resource constraints did not allow the research team to enroll the total pool of consenting students; we opted to instead randomly select half to participate in student-level data collection activities during the 2016–2017 school year and subsequently followed these students into kindergarten.

We limit our analytic sample to those with valid assessment data in at least one domain in prekindergarten and kindergarten (n = 325). The students in the analytic sample are representative of the broader group of students who consented to the study (and to the broader group of prekindergarten students enrolled in the BPS system; McCormick et al., 2021).

Outcome Measures

Over the course of the students' prekindergarten and kindergarten years, the research team collected direct assessments of academic and executive functioning skills and teacher reports of social-emotional skills. The team collected these data in both the fall (September-December) and the spring (April-June) of each year. Because assessments were conducted twice per year, we are able to estimate the growth in academic, executive functioning, and social-emotional skills separately for the school year and summer breaks by comparing the growth from fall to spring and from spring to the next fall.

Language and math skills. We measure language skills using the Peabody Picture Vocabulary Test-IV (PPVT; Dunn and Dunn 2007) and math skills using the Woodcock Johnson Applied Problems (WJAP; Woodcock et al. 2001) subtest. Both of these tests have been widely used in early childhood assessments and provide age-appropriate measures of skills in each domain. The PPVT assessments ask children to identify pictures that best represent a given stimulus word, which gives an indication of receptive language skills and skill growth. The WJAP assessment measures early mathematics skills (e.g., simple calculations and arithmetic problems). For more details on each, see Authors (2021). Whereas PPVT assessments were conducted in English, WJAP assessments were conducted using both English and Spanish versions, depending on the primary language spoken by the student.[5] Our use of these measures mirrors other similar studies, including McCormick et al. (2021), who also examined skill development over the course of prekindergarten and kindergarten. Robustness checks (see Appendix Tables A6 and A7) examine the extent to which the inclusion of Spanish-language assessments shaped results; results remained substantively similar when Spanish-language WJAP assessments were excluded. The PPVT tests are included as raw scores, whereas the WJAP assessments are interval-scaled *W* scores.

Executive functioning. Executive functioning skills are a set of cognitive processes important to the emerging self-regulation of behavior and the development of social and cognitive competence in young children (Blair 2002). To measure children's executive functioning skills, we used the Hearts and Flowers assessment (see Moffett et al., 2023). More specifically, children were asked to push a key on one side of the screen if a heart appears and the other side of the screen if a flower appears. Children participated in both incongruent (only flower) and mixed (both hearts and flowers) trials; we use the mixed assessments as a measure of cognitive flexibility and executive functioning (Authors 2022). This measure has previously been validated as a measure of executive functioning (Davidson et al. 2006; Shing et al. 2010). Students were given a practice assessment before completing the full assessment, and students who could not pass the practice test were not given a full assessment (with these assessments marked as missing for these students). In addition, as with the WJAP assessments, students who did not pass a language assessment were

[4]The broader study was developed as a part of a longstanding research-practice partnership in collaboration with the school district. To do so, the district and researchers required a robust sample of both CBOs and public school programs. These sample sizes reflect a need to balance answering research questions with study resources.

[5]We used the Prelas Assessment Scale (Duncan and De Avila 1998) to assess proficiency in English. Of the 401 children in the overall sample, 43 (11 percent) completed a subset of assessments in Spanish in fall 2016, 16 (2 percent) in spring 2017, 3 (<1 percent) in fall 2017, and 0 in spring 2018.

administered a Spanish-language version of the assessment. We conducted additional analyses to examine the extent to which Spanish versions of the Hearts and Flowers assessments shaped results (see Appendix Table A8); results are substantively similar when including Spanish-language assessments.

Social-emotional and behavioral skills. Social-emotional skills were measured using teacher-completed assessments of the Social Skills Improvement System (SSIS; Gresham and Elliott 2008). This measure asked teachers to complete a battery of Likert-scale questions that have been previously validated to form constructs. From the SSIS, we measured students' cooperation, engagement, self-control, externalizing behavior, and internalizing behavior (Gresham and Elliott 2008). These constructs have demonstrated high levels of reliability and validity in other work with similar populations of young children and early childhood teachers (Ansari et al. 2021; Burchinal et al. 2022). Given high correlations between the subscales for cooperation, engagement, and self-control (rs = .82–.89), we combined these three subscales to create one overall composite score to describe students' positive assessed social skills in both the fall ($\alpha = .92$) and the spring ($\alpha = .94$). The three final SSIS constructs—internalizing behavior, externalizing behavior, and (positive) social skills—are all pairwise moderately correlated both in the fall and spring (externalizing behavior and social skills, $r = -.70$ in the fall and $r = -.72$ in the spring; externalizing and internalizing behavior, $r = .50$ in the fall and $r = .50$ in the spring; internalizing behavior and social skills, $r = .54$ in the fall and $r = .53$ in the spring). Importantly, externalizing behavior constructs measure negative externalizing behaviors such that a higher score indicates a higher level of behavioral problems. Likewise, internalizing behavior constructs measure negative behaviors such as being withdrawn.

Classroom Processes

Classroom Assessment Scoring System. We use the Classroom Assessment Scoring System (CLASS) to measure classroom processes. This observation tool is perhaps the most widely used observational measure of classroom process quality for early learning environments (Pianta et al. 2016; Weiland and Guerrero-Rosada 2022). We focus on the three domains of the CLASS subscales: emotional support, classroom organization, and instructional support. Each of these processes is included separately in analyses, given their distinct contributions to classroom outcomes. For CLASS subscales measured in prekindergarten, the correlation between emotional support and classroom organization was $r = .88$, the correlation between emotional support and instructional support was $r = .66$, and the correlation between classroom organization and instructional support was $r = 0.70$. CLASS scores were coded from videotaped observations by trained and reliable researchers (for more details, see Guerrero et al. 2021).

Content-rich and cognitively demanding instruction. We used ratings from live classroom observations to measure content-rich instruction and cognitively demanding practices. Instructional coaches from BPS observed each classroom for a 2- to 3-hour long period on two separate days. After each observation, they rated the classrooms overall on indicators of cognitive demand and content-rich instruction. An example of content-rich instruction might be a teacher connecting new content to a specific background lesson (i.e., learning letter sounds while connecting examples to a focal unit on seasons; Maier et al., 2022). An example of cognitively demanding instruction might be the use of challenging questions and back-and-forth conversation about the topic of interest (for additional examples, see Maier et al., 2022).

The team conducted psychometric analyses to validate these measures and determine their reliability (see more in Maier et al., 2022) before creating overall classroom-level scores by averaging across the two observations. Both domains demonstrated high levels of interitem reliability (αs = .90 and .90 for content-rich instruction and cognitively demanding instruction, respectively). Through these efforts, the team found that even after controlling for the domains of CLASS, content-rich instruction predicted gains in children's math skills during prekindergarten, and cognitive demand was associated with math gains for children's entering prekindergarten with higher scores on math assessments (see Maier et al., 2022).

Individualizing Student Instruction math and language. Individualizing Student Instruction (ISI) measures contain detailed information on the overall time spent in math and language instruction (Connor et al. 2009). These come from child-level videotaped observations and are aggregated to the classroom level to give an indication of classroom time spent on each of the subjects. For more details on the collection and coding procedures, see Weiland et al., (2023). ISI measures are not a measure of quality but, rather, show the amount of time that an individual child is exposed to different learning environments. In this study, we specifically focus on instructional time spent in math and language.

Additional covariates. We also include a number of child- and parent-level covariates drawn from administrative records. These include children's race/ethnicity (based on parent report), eligibility for free and reduced-price lunch (FRL), gender, whether the student is a dual-language learner (DLL), and age at prekindergarten entry. We use FRL eligibility as a proxy for students' SES backgrounds. Although an imperfect and coarse measure of family income, FRL eligibility captures aspects of educational disadvantage that are not captured by family income alone and, due to its universality in public education, is the standard definition of economic

Table 1. Descriptive Statistics of Analytic Student Sample ($n = 325$).

	Mean/ Proportion	SD
Student age	4.65	.30
Free/reduced-price lunch eligible (FRL)	.65	
Female	.50	
Dual-language learner	.48	
Student race/ethnicity, Asian	.16	
Student race/ethnicity, Black	.28	
Student race/ethnicity, White	.22	
Student race/ethnicity, Hispanic	.29	
Student race/ethnicity, multiracial/other race	.05	
Mother age at first birth	26.97	6.97
Household size	4.19	1.28
At least one household adult works full-time	.92	
Parents married	.53	
Parent age	37.04	7.44
Parent education, high school/GED or less	.29	
Parent education, 2-year degree	.29	
Parent education, 4-year degree	.19	
Parent education, advanced degree	.23	

Note: All descriptive statistics, including student race/ethnicity, are parent reported.

disadvantage used by researchers (Domina et al. 2018; Greenberg, Blagg, and Rainer 2019). We also include parent-level covariates, which include mother's age at first child's birth, whether the child's parents are married, parents' ages, whether at least one adult in the household works full-time, household size, and parental education.

Descriptive statistics characterizing participating students are presented in Table 1. As noted in McCormick et al. (2021), the study sample is generally representative of the broader population of students enrolled in the BPS prekindergarten program. Table A10 in the Appendix also includes additional descriptive statistics by race/ethnicity. Importantly, there are meaningful differences in SES and DLL status by race/ethnicity. For example, 22 percent of the White students in the sample are eligible for FRL, and 21 percent are classified as DLL. Among Black students, 91 percent are FRL eligible, and 22 percent are classified as DLL. Sixty-six percent of Asian students in the sample are FRL eligible, and 87 percent are classified as DLL. Finally, 85 percent of Hispanic students in the sample are FRL eligible, and 75 percent are classified as DLL.

Analytic Strategy

We estimate school year and summer changes in skills using a three-level model. Because students were nested within schools, we fit multilevel models that partition variance at both the school and child levels (with tests nested within individual children). Although some of the measures are collected at the classroom level (therefore nesting students within classrooms within schools), we found that models partitioning variance at the individual, classroom, and school levels did not converge and instead opted to focus on individual- and school-level random effects. Each child in the study sample participated in (up to) four assessment sessions over the course of prekindergarten and kindergarten (i.e., fall and spring of each year), and these assessment scores are nested within individual students. Following prior studies estimating the impacts of school and summer exposure (see e.g., Downey et al. 2019; McCormick et al. 2021; von Hippel et al. 2018), we take into account differences across students in the number of months of schooling or summer that each child had been exposed to up to the time of the test. Overall, the BPS data have very little missingness on outcomes (for a review, see Maier et al., 2022; McCormick et al., 2021), with evidence that data were missing at random conditional on prekindergarten attendance. However, some students were missing parent covariate data (although none were missing child-level covariates). As such, consistent with prior studies using this data set, we used imputed parent covariates but did not impute test outcomes.

The base growth model follows the following general form:

$$Y_{ijt} = \beta_0 + \beta_1 P_{ijt} + \beta_2 S_{ijt} + \beta_3 K_{ijt} + age_{ij} + \boldsymbol{X}\nu + \mu_i + \gamma_j + \varepsilon_{ijt} \quad (1)$$

where Y_{ijt} is the test taken at time t by student i in school j and P_{ijt}, S_{ijt}, and K_{ijt} indicate the number of months (30-day periods) that the student had been exposed to prekindergarten (P), the summer after prekindergarten (S), and kindergarten (K) at the time of the test taken at time t. We also include error terms to partition variance at the child (μ_i) and school[6] (γ_j) levels. We control for age at prekindergarten entry (age_{ij}) and a vector of additional individual-level covariates ($\boldsymbol{X}$). To examine how these growth models vary across race/ethnicity or SES, we add interaction terms to the base model on the coefficients for prekindergarten, summer, and kindergarten time points using student-level indicators for race/ethnicity or SES. This allows us to estimate the changes in racial/ethnic and SES disparities that occurred over the course of the school years and summers.

Next, we also estimate the increase or decrease in the gap, comparing changes during the school year to the summer. To do so, we test the null hypothesis that the change in a given gap trend associated with the summer break (β_2) period is equal to the average of the gap trend associated with the prekindergarten (β_1) and kindergarten (β_3) years $[H_0 : \beta_2 = \frac{1}{2}(\beta_1 + \beta_3)]$. This allows us to test whether skill inequality grew more in the summer or during the average of the prekindergarten and kindergarten school years. For example, if β_2 is larger than the average of β_1 and β_3, this

[6]School-level random effects were included as unique prekindergarten-kindergarten grouped IDs to account for both prekindergarten and kindergarten school environments.

suggests that a given disparity grew more during the summer than it did in the school year. Although we focus on comparisons between historically advantaged and historically marginalized groups, we do not intend this as meaning that we consider White students and students who are not FRL eligible as the standard. Rather, we hope to shed light on the processes of inequality that might advantage these students at the disadvantage of others, which drives our choice of comparison groups.

In an additional stage of our analytic strategy, we also estimate differences in exposure to high-impact classroom processes and examine which differences might help to explain skill growth over the prekindergarten and kindergarten years. To determine if there are racial/ethnic or SES differences in access to classroom processes, we fit multilevel models predicting classroom processes (separately by race/ethnicity and SES) with error terms partitioning variance at the child and school levels. Like the previous models, we also include a vector of individual-level covariates.

Finally, to determine if there is suggestive evidence that classroom processes may have had differential effectiveness in promoting test score gains by race/ethnicity or FRL eligibility, we add terms to the base model (Equation 1) to estimate interactions between each of the indicator measures, each of the time points, and each of the classroom processes. For ease of interpretation, we present figures illustrating the point estimates of the average marginal effects (AME) of a 1 SD increase in each of the classroom processes on each of the gaps. For example, these models allow us to estimate the AME of a 1 SD increase in cognitively demanding classroom instruction on the difference in skill gains between Black and White students. However, as with all of the analyses presented in this study, AMEs are not meant to indicate a causal relationship and reflect descriptive associations between measures. Given the exploratory nature of this study, we follow recommendations from Bloom and Michalopoulos (2013) in presenting subgroup analyses without multiple comparison corrections and recommend that readers interpret results with caution given the number of groups being examined in this work.

Results

Initial Disparities

We begin by reviewing the magnitude of disparities at the start of prekindergarten (fall 2016) by race/ethnicity and FRL eligibility. Predicted disparity magnitudes on Day 0 of prekindergarten are shown in Table 2. Note that all test score assessments have been standardized for comparability across skill domains and are presented as standard deviations and control for children's individual- and parent-level covariates. For language and math skills, we find that Black, Asian, and Hispanic students have lower average initial assessment scores than White students at the beginning of prekindergarten (with language assessments differences of −0.4 SD, −0.7 SD, and −0.4 SD and math assessment differences of −0.05 SD, −0.05 SD, and −0.07 SD, respectively), net other factors. The same is not true for social-emotional skills. Scores at the beginning of prekindergarten were largely similar across race/ethnicity, with only one exception: Predicted scores at the beginning of prekindergarten suggest that Asian students scored 0.5 SD higher than White students on assessments measuring negative internalizing behaviors (teacher-reported). When considering SES initial prekindergarten entry disparities, we find that students eligible for FRL tended to score lower on academic assessments than students who were not FRL eligible (with language assessment differences of −0.6 SD and math differences of −0.09 SD, respectively). Measures of negative internalizing and externalizing behaviors were statistically similar across SES groups, as were assessed executive functioning skills.

In sum, we observe disparities at the start of prekindergarten in assessed academic skills. With the exception of the differences between White and Asian students in teacher-reported negative internalizing behaviors, students entered prekindergarten with statistically similar social-emotional assessed skills. Likewise, executive functioning at prekindergarten entry was statistically similar across racial/ethnic and SES groups. This suggests that students' early out-of-school experiences played a role in shaping prekindergarten entry patterns in academic skills.

Gains during School Year and Summer

We next turn to examining how skill patterns changed over the course of school years and summers by race/ethnicity and SES (see Tables 3–5). For each of the respective skill domains, Table 3 shows changes by subgroup over the course of prekindergarten, kindergarten, and the summer in between those years in standard deviation units. Table 4 shows the contrasts for each of the disparities, which is the difference in test score gains between subgroups for the racial/ethnic and SES disparities (i.e., the change in the Black-White language test score disparity). Finally, Table 5 summarizes these patterns and indicates if the disparity grew the fastest (or shrunk the slowest) in the summer compared to the school year. Conclusions from Table 5 are suggestive of whether early schooling (defined as prekindergarten and kindergarten enrollment) is compensatory or neutral or exacerbates inequality across skill domains. We also summarize these patterns in Figure 1, which show graphs of changing assessment scores across fall and spring assessments over the two-year study period. Taken together, these tables and figures provide a full picture of how assessment scores change over the course of early schooling years. We begin with a discussion of academic racial/ethnic disparities, followed by executive functioning and social-emotional racial/ethnic disparities, academic SES disparities, and

Table 2. Predicted Gap Magnitudes at the Start of Prekindergarten (in Standard Deviations).

Gap Magnitudes	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
White-Black	−0.37*	−0.05*	−0.09	−0.03	−0.12	0.01
	(0.16)	(0.02)	(0.16)	(0.18)	(0.19)	(0.18)
White-Asian	−0.69***	−0.05*	−0.12	−0.24	0.51*	0.05
	(0.17)	(0.02)	(0.18)	(0.21)	(0.22)	(0.20)
White-Hispanic	−0.40*	−0.07**	−0.14	−0.18	−0.14	0.14
	(0.16)	(0.02)	(0.16)	(0.18)	(0.19)	(0.18)
Non FRL-FRL	−0.69***	−0.09***	−0.14	−0.17	−0.13	−0.02
	(0.13)	(0.02)	(0.13)	(0.15)	(0.16)	(0.15)

Note: Standard errors are in parentheses. Coefficients indicate predicted racial/ethnic and socioeconomic disparities in skills at prekindergarten entry (Day 0). All models additionally include student and school random effects and control for individual-level characteristics ($n = 325$). Note that both internalizing and externalizing behaviors are negatively coded such that higher values report less desirable behaviors. FRL = free and reduced-price lunch eligible.
*$p < .05$. **$p < .01$. ***$p < .001$.

executive functioning and social-emotional SES disparities in the following sections.

Academic racial/ethnic disparities. In general, students tended to improve over the course of prekindergarten and kindergarten in academic domains. However, the extent to which these gains were shared equally depends on both test domain and timing. For example, both White and Black students experienced gains in language skills over the course of the prekindergarten year (at predicted monthly rates of 0.06 SD and 0.08 SD in prekindergarten, respectively, $p < .001$). Likewise, both White and Black students had similar gains over the course of kindergarten (0.06 SD and 0.07 SD, respectively, $p < .001$). However, White students continued to improve in assessment scores over the summer in between prekindergarten and kindergarten (at predicted rates of 0.1 SD/month), whereas Black students on average did not experience improvements on these assessments over the course of the same time period. Because the White-Black disparity in language skills shrank over the school years, despite slight growth over the summer, we conclude that exposure to early schooling was associated with a reduction in inequality for this disparity because summer is associated with more inequality than the school year (for a summary, see Table 5). Both White and Hispanic students improved in language assessments over the course of prekindergarten, kindergarten, and the summer in between these years. In general, contrary to the pattern for the White-Black disparity, growth rate did not differ significantly by group from year to year. That is, exposure to early schooling did not appear to be associated with either increasing or decreasing inequality in language skills between White and Hispanic students (see Table 5). The White-Asian disparity in language skills shows a pattern more similar to the White-Black disparity. This suggests that schools served an equalizing function for both White-Black and White-Asian disparities in that they slowed inequality over the course of prekindergarten and kindergarten relative to stagnant or growing gaps over the summer. These gaps appeared to shrink at statistically similar rates in prekindergarten and kindergarten. Importantly, however, the majority of both Hispanic (75 percent) and Asian students (87 percent) in the sample are classified as DLL, whereas only 21 percent of White students and 22 percent of Black students held this classification.

In addition to considering the rate of growth over the school year, it is also useful to compare these trends to the size of the disparities at school entry. For example, the predicted magnitude of the White-Black disparity in language skills on Day 0 of prekindergarten was more than 0.4 SD, so small growth rates on the order of 0.02 SD/month during the school year were unlikely to make a meaningful change in the magnitude of the overall gap, particularly given the increased rate at which gaps widened during the summer. This is also true for both the White-Hispanic and White-Asian language disparities, which were 0.4 SD and 0.7 SD, respectively, at the start of prekindergarten for the students in the sample.

For children's math skills, children of all racial/ethnic subgroups improved on assessments over the course of the school year and remain relatively stagnant over the course of the summer. However, these gains and stagnation patterns were similar by race, which suggests that exposure to prekindergarten and kindergarten neither facilitated nor impeded racial/ethnic equity in math skills.

Executive functioning and social-emotional racial/ethnic disparities. Schooling appeared to serve the compensatory function of reducing White-Black disparities in social skills and negative externalizing behaviors. In contrast, schooling was not associated with changing disparities between White and Asian or Hispanic students on any social/behavioral measures. For these measures, students tended to improve in their assessed skill development during the school year, but the gains were relatively even across groups such that the magnitude of disparities in teacher-reported social and emotional skills tended to remain roughly equivalent over the years.

In summary, we find that exposure to early schooling was associated with a reduction in (1) White-Asian and White-Black

Table 3. Predicted Monthly Child Gains across Academic, Executive Functioning, and Social-Emotional Skills.

	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
Prekindergarten gain						
White	0.06***	0.01***	0.07***	0.02	0.01	0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.01)
Black	0.08***	0.01***	0.05**	0.04*	0.03	0.02
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.01)
Asian	0.09***	0.01***	0.02	0.04	−0.03	−0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.02)
Hispanic	0.07***	0.01***	0.03*	0.02	0.01	−0.00
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.01)
Non FRL	0.07***	0.01***	0.06***	0.02	−0.00	0.00
	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)
FRL	0.08***	0.01***	0.03***	0.03**	0.01	0.01
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Summer gain						
White	0.10**	0.01	0.05	0.02	−0.09	−0.11*
	(0.03)	(0.00)	(0.05)	(0.05)	(0.06)	(0.05)
Black	0.01	0.00	0.00	−0.21***	0.02	0.04
	(0.03)	(0.00)	(0.05)	(0.05)	(0.06)	(0.05)
Asian	−0.02	0.01*	0.04	0.02	−0.05	−0.06
	(0.04)	(0.01)	(0.06)	(0.07)	(0.08)	(0.06)
Hispanic	0.05	0.00	0.03	−0.01	0.01	−0.01
	(0.03)	(0.00)	(0.05)	(0.05)	(0.06)	(0.04)
Non FRL	0.05	0.01*	0.02	0.03	−0.11	−0.11**
	(0.03)	(0.00)	(0.04)	(0.05)	(0.05)	(0.04)
FRL	0.03	0.00	0.04	−0.09**	0.02	0.01
	(0.02)	(0.00)	(0.03)	(0.03)	(0.04)	(0.03)
Kindergarten gain						
White	0.06***	0.01***	0.02	0.03	−0.00	0.00
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.01)
Black	0.07***	0.01***	0.06***	0.05**	−0.01	−0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.02)
Asian	0.10***	0.01***	0.07***	0.03	−0.00	0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.02)
Hispanic	0.07***	0.01***	0.04**	0.01	−0.01	−0.01
	(0.01)	(0.00)	(0.01)	(0.02)	(0.02)	(0.01)
Non FRL	0.06***	0.01***	0.03*	0.03	−0.00	0.00
	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)
FRL	0.08***	0.01***	0.05***	0.03*	−0.01	−0.00
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)

Note: Standard errors are in parentheses. All models additionally include student and school random effects and control for individual-level characteristics ($n = 325$). Note that both internalizing and externalizing behaviors are negatively coded such that higher values report less desirable behaviors. FRL = free and reduced-price lunch eligible.
*$p < .05$. **$p < .01$. ***$p < .001$.

disparities in language and (2) White-Black disparities in social skills and externalizing behavior assessments but was largely neutral in shaping White-Hispanic language disparities, racial/ethnic math disparities, and other racial/ethnic executive functioning and social-emotional disparities.

Academic SES disparities. For disparities between students who are and are not FRL eligible, a different pattern emerges. We find that disparities in academic domains between students who are and are not eligible for FRL follow similar trajectories during the school year and summer.

Executive functioning and social-emotional SES disparities. Turning to executive functioning and social-emotional skills, we find that schools were associated with closing SES inequality in externalizing behavior problems but no other nonacademic domains. Note that in the coding of externalizing behaviors, a higher score indicates less desirable behaviors.

Table 4. Contrasts of Predicted Monthly Gains across Prekindergarten, Summer, and Kindergarten (by Race/Ethnicity and Socioeconomic Status).

	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
Prekindergarten						
White-Black	0.02	0.00	−0.02	0.02	0.02	0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.03)	(0.02)
White-Asian	0.03*	−0.00	−0.05	0.02	−0.04	−0.02
	(0.02)	(0.00)	(0.03)	(0.03)	(0.03)	(0.02)
White-Hispanic	0.01	0.00	−0.04	0.00	0.00	−0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.03)	(0.02)
Non FRL-FRL	0.01	0.00*	−0.03	0.01	0.01	0.00
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.02)
Summer						
White-Black	−0.09*	−0.01	−0.05	−0.23**	0.11	0.16*
	(0.04)	(0.01)	(0.07)	(0.07)	(0.09)	(0.07)
White-Asian	−0.12*	0.01	−0.01	0.01	0.04	0.05
	(0.05)	(0.01)	(0.08)	(0.08)	(0.10)	(0.07)
White-Hispanic	−0.04	−0.00	−0.02	−0.03	0.10	0.10
	(0.04)	(0.01)	(0.07)	(0.07)	(0.09)	(0.06)
Non FRL-FRL	−0.02	−0.01	0.02	−0.12*	0.13	0.12*
	(0.03)	(0.00)	(0.05)	(0.06)	(0.07)	(0.05)
Kindergarten						
White-Black	0.01	0.00	0.04	0.02	−0.00	−0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.03)	(0.02)
White-Asian	0.04*	−0.00	0.05*	0.00	0.00	0.01
	(0.02)	(0.00)	(0.02)	(0.03)	(0.03)	(0.02)
White-Hispanic	0.00	0.00	0.02	−0.02	−0.00	−0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.03)	(0.02)
Non FRL-FRL	0.02	0.00	0.02	−0.00	−0.01	−0.01
	(0.01)	(0.00)	(0.02)	(0.02)	(0.02)	(0.02)

Note: Standard errors are in parentheses. All models additionally include student and school random effects and control for individual-level characteristics ($n = 325$). Note that both internalizing and externalizing behaviors are negatively coded such that higher values report less desirable behaviors. FRL = free and reduced-price lunch eligible.
*$p < .05$. **$p < .01$.

Table 5. Summary of Associations between Exposure to Schooling and Skill Disparities.

Gap Grows Fastest (or Shrinks Slowest) in:	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
White-Black	Summer	NS	NS	Summer	NS	Summer
White-Asian	Summer	NS	NS	NS	NS	NS
White-Hispanic	NS	NS	NS	NS	NS	NS
Non FRL-FRL	NS	NS	NS	NS	NS	Summer

Note: See Tables 3 and 4 for gains and contrasts displayed in this table. NS = not significant.

Neither FRL nor non-FRL students experienced much change in their externalizing behavioral skill development over the course of kindergarten or prekindergarten, but non-FRL students experienced more improvement in these behaviors over the summer than did FRL-eligible students.

Classroom Processes and Skill Development

Next, we examine the extent to which changing skill disparities can be linked to differences in exposure to different classroom processes. We first display results from models

Figure 1. Changing academic, executive functioning, and social-emotional skills over prekindergarten and kindergarten.

predicting race/ethnicity and SES differences in average exposure to classroom processes across prekindergarten and kindergarten for the students in the sample (Table 6). As illustrated, exposures to high-impact classroom processes were roughly similar across racial/ethnic and SES groups, with a few exceptions. Asian students experienced lower exposure to cognitively demanding instruction and content-rich instruction in prekindergarten than White students (cognitive demand: $\beta = -0.27$, $p < .001$; content-rich instruction: $\beta = -0.20, p < .05$); other racial/ethnic subgroups were similar to White students on both indicators of classroom quality. Across all measures captured during prekindergarten, students who were FRL eligible experienced similar levels of classroom quality as their peers who were not eligible for FRL.

Turning to kindergarten classroom quality, we found that classroom global quality and time spent on math (ISI math) measures were similar across racial/ethnic and SES groups. However, Asian students were exposed to more time spent on language/literacy instruction (ISI language) on average ($\beta = 8.73$, $p < .01$) relative to White students. In addition, relative to White students, Hispanic students were enrolled in classrooms with lower levels of cognitively demanding instructional practices and content-rich instruction (cognitive demand: $\beta = -0.31$, $p < .05$; content-rich instruction: $\beta = -0.31$, $p < .05$). There were no statistically significant differences in indicators of kindergarten classroom quality across SES groups. Although it is important to note the exceptions to these general patterns, these results suggest

Table 6. Racial/Ethnic and Socioeconomic Variation in Exposure to Classroom Processes in Prekindergarten and Kindergarten.

	Emotional Support	Classroom Organization	Instructional Support	Cognitive Demand	Content-Rich Instruction	Time Spent on Language/Literacy	Time Spent on Math
Prekindergarten							
Student race/ethnicity (reference = White)							
Black	−0.07	−0.08	0.02	0.03	0.15	−2.32	0.87
	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(3.21)	(1.37)
Asian	−0.11	−0.01	0.10	−0.27***	−0.20*	2.05	1.70
	(0.09)	(0.08)	(0.09)	(0.08)	(0.10)	(3.30)	(1.40)
Hispanic	−0.14	−0.11	−0.05	0.07	0.09	0.44	1.44
	(0.08)	(0.07)	(0.09)	(0.07)	(0.09)	(3.06)	(1.30)
FRL	0.10	0.09	0.04	−0.06	−0.01	3.61	1.65
	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)	(2.58)	(1.09)
Kindergarten							
Student race/ethnicity (reference = White)							
Black	−0.12	−0.13	−0.11	−0.15	−0.12	−4.77	−0.92
	(0.09)	(0.11)	(0.09)	(0.16)	(0.15)	(4.46)	(1.59)
Asian	−0.14	−0.13	0.02	−0.12	−0.23	8.73*	−1.57
	(0.09)	(0.10)	(0.09)	(0.16)	(0.14)	(4.31)	(1.52)
Hispanic	0.00	−0.06	−0.02	−0.31*	−0.31*	−3.38	−0.58
	(0.08)	(0.10)	(0.09)	(0.15)	(0.14)	(4.08)	(1.44)
FRL	−0.01	0.02	−0.03	−0.12	−0.19	−2.05	0.07
	(0.07)	(0.08)	(0.07)	(0.13)	(0.11)	(3.39)	(1.19)

Note: Standard errors are in parentheses. All models additionally include student and school random effects and control for individual-level characteristics ($n = 325$). FRL = free and reduced-price lunch eligible.
*$p < .05$. ***$p < .001$.

that, in general, all BPS students, no matter their background, are exposed to similar classroom processes and indicators of classroom quality in early childhood.

An important question, then, is whether students' exposure to higher quality classrooms in early childhood—measured in different ways—was associated with more equitable learning and development for children from racially/ethnically and socioeconomically marginalized groups. Figure 2 displays the relationship between improvements in indicators of classroom quality and changes in disparities in academic, executive functioning, and social-emotional skills over time by race/ethnicity. Figure 3 displays this relationship by FRL eligibility. Each of the coefficients represents the AME of a 1 SD increase in the given indicator of classroom quality on the difference in test scores between groups (e.g., Black students relative to White students, or the Black-White test score gap), net of other factors in the model. Positive AMEs indicate a decreasing disparity, whereas negative AMEs suggest a growing disparity. Table A9 in the Appendix also displays the point estimates associated with Figures 2 and 3.

We begin by focusing on the academic assessments. We do not find consistent evidence that classroom processes were related to changes in academic disparities, with a few exceptions. For language disparities, we find that increased classroom organization is associated with an increasing SES disparity ($\beta = -0.46$, $p < .01$) and that increased instructional time in language and literacy is associated with a slightly increased White-Asian disparity ($\beta = -0.01$, $p < .05$), net other factors. In math, we find that increases in exposure to content-rich instruction appear to have small but statistically significant associations with a decreasing White-Black ($\beta = 0.03$, $p < .05$) and White-Hispanic ($\beta = .05$, $p < .01$) disparity in math achievement (due to the fact that Black and Hispanic students appear to have had a more positive associated increase from this exposure than do White students). Furthermore, increased instructional support is associated with an increased White-Asian math disparity ($\beta = -0.05$, $p < .05$). In other words, some classroom processes are associated with specific academic gains, but these gains are not consistent across racial/ethnic subgroups or assessment domains, so high process quality co-occurs with both increasing and decreasing gaps.

We next consider measures of executive functioning and social-emotional assessments. We first found that improvements in instructional support were associated with an increase in the White-Black gap in executive functioning ($\beta = -0.51$, $p < .05$) and that higher levels of cognitively demanding instruction were associated with an increased White-Hispanic disparity ($\beta = -0.29$, $p < .05$).

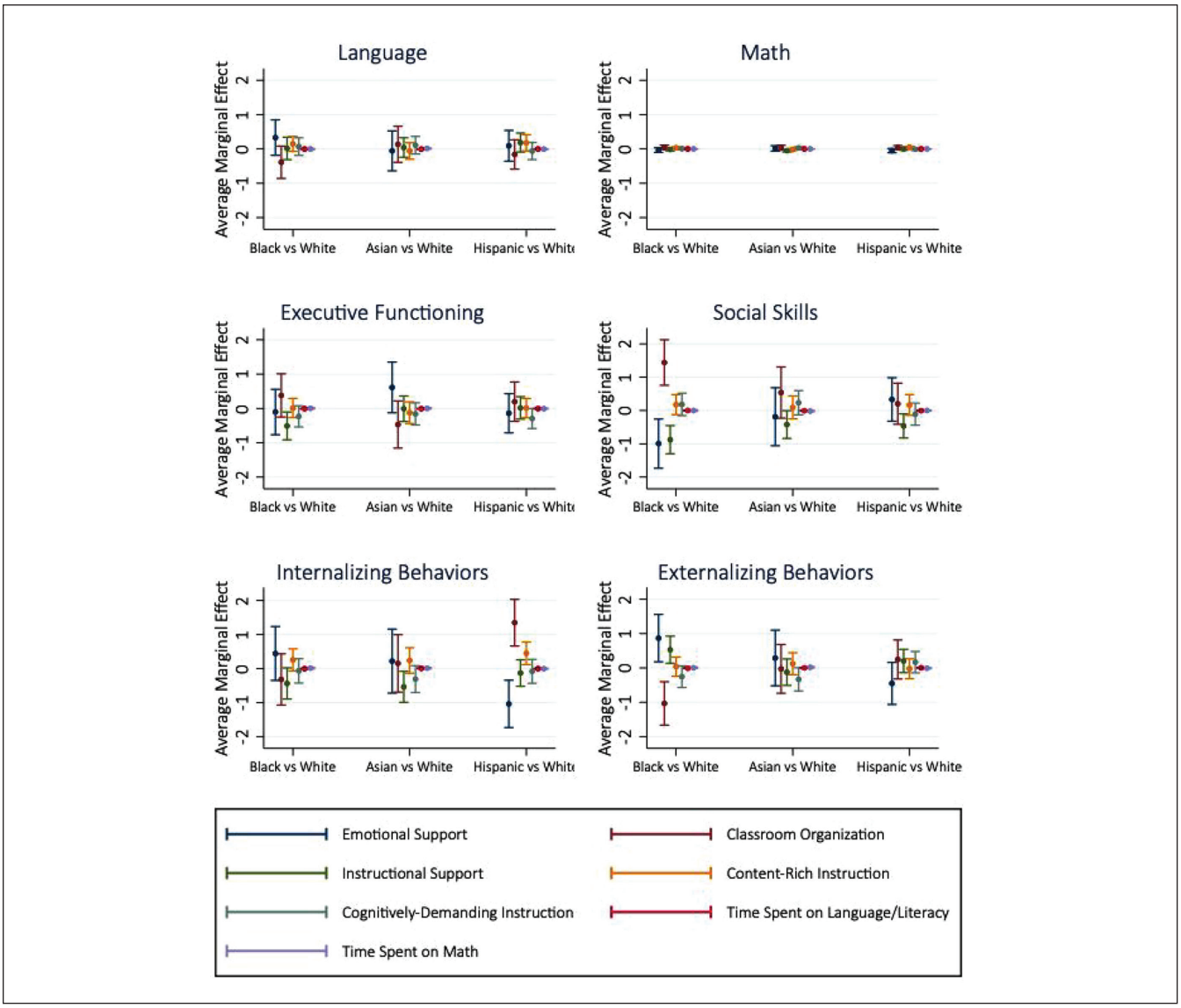

Figure 2. Average marginal effect of classroom processes on racial/ethnic disparities.

In addition, higher levels of classroom emotional support were associated with higher social skills for White students but lower social skills for Black students, thus widening the racial/ethnic gap in that skill domain ($\beta = -1.0$, $p < .01$). In contrast, an increase in classroom organization was associated with a decreased White-Black disparity ($\beta = 1.44$, $p < .001$). Increases in instructional support were associated with increases in the White-Black ($\beta = -0.88$, $p < .001$), White-Asian ($\beta = -0.42$, $p < .05$), and White-Hispanic ($\beta = -0.46$, $p < .05$) disparities in assessed social skills, holding all else equal. For the SES disparity in assessed social skills, we find that an increase in instructional support was associated with an increase in the social skill disparity between FRL-eligible and non-FRL-eligible students ($\beta = -0.32$, $p < .05$) due to the fact that FRL-eligible students appear to experience declines in social skills as instructional support increases. Other measures of classroom processes were not associated with differences in social skills.

We next turn to considering how classroom processes are associated with disparities in internalizing behaviors. As in prior models, it should be noted that higher values of both internalizing and externalizing behaviors indicate more negative behavioral problems. Increases in emotional support were associated with a decreased White-Hispanic disparity ($\beta = -1.04$, $p < .01$) and a decreased SES disparity ($\beta = -0.61$, $p < .05$). Furthermore, average marginal increases in classroom organization were associated with an increased White-Hispanic disparity ($\beta = 1.35$, $p < .001$), increases in instructional support were associated with an decreased White-Asian disparity ($\beta = -0.54$, $p < .05$), and

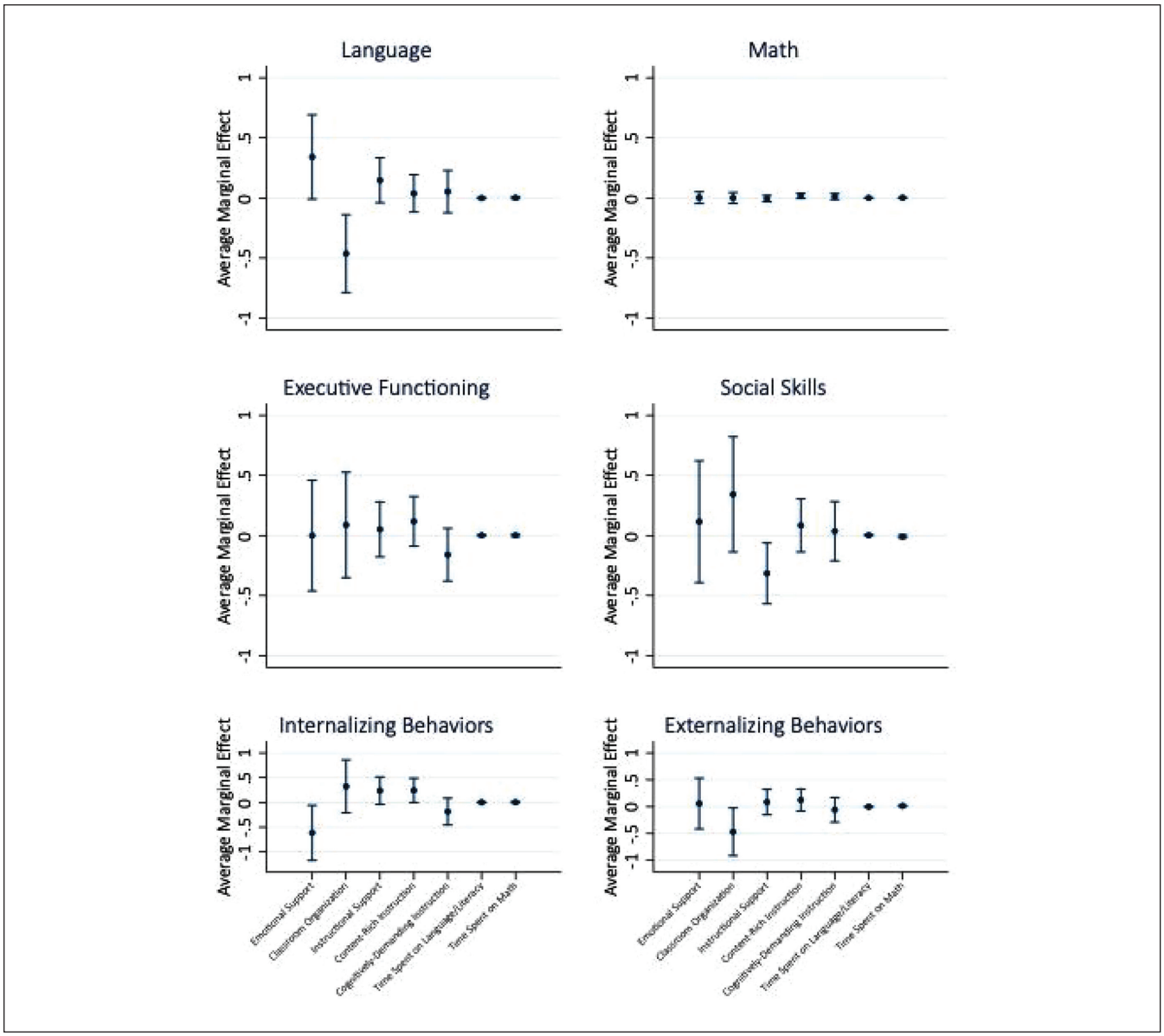

Figure 3. Average marginal effect of classroom processes on socioeconomic disparities.

increases in content-rich instruction were associated with an increased White-Hispanic disparity ($\beta = 0.45, p < .01$).

Finally, we consider how classroom processes are associated with racial/ethnic and socioeconomic disparities in negative externalizing behaviors. Increases in emotional and instructional support were both associated with more negative behavioral problems among Black students, leading to an increase in the White-Black disparity ($\beta = 0.87, p < .05$ and $\beta = 0.53, p < .01$, respectively), whereas increases in classroom organization were associated with a decrease in the gap ($\beta = -1.04, p < .01$), holding all else equal. In addition, we find that increases in classroom organization were associated with a decreased SES disparity ($\beta = -0.47, p < .05$) and that increases in instructional time in math was associated with an increased White-Asian ($\beta = 0.02, p < .05$) and SES ($\beta = 0.01, p < .05$) disparity.

Taken together, some—but not all—classroom processes are associated with increasing or declining inequality. In general, the process domains of emotional and instructional support are associated with *increasing* inequality between groups, but classroom organization and increased content-rich instruction tended to be associated with *decreasing* inequality. However, these patterns are neither universal nor entirely consistent, which suggests that the impact of classroom processes on skill development gaps is specific to certain domains and student subgroups. In addition, given that

we do not observe consistent evidence that exposure to classroom processes differs by race/ethnicity or SES in the first place, it is likely that any process domains that are associated with decreasing inequality are negated by process domains that are associated with increasing inequality.

Robustness Checks

Finally, to better understand how our analytic strategy and methodological choices might have affected our results, we also examined several alternate specifications for our models. These are included in the Appendix. First, we examined the extent to which the covariates that we included shaped our interpretation of the magnitude of the initial prekindergarten entry gaps and changes in these gaps. Models without any demographic child- or parent-level covariates are shown in Tables A4 and A6, although these models still account for age at prekindergarten entry and time between tests. Next, we examined the extent to which our results were sensitive to missingness in our data sample. Substantive conclusions remain the same when we include all students with viable data for a given test (n = 419) rather than restricting the sample to those with at least one valid assessment in one domain in both prekindergarten and kindergarten (see Appendix Tables A5 and A7). Likewise, we examined whether our results were sensitive to the language of assessment given that math and executive functioning were assessed in both Spanish and English. Appendix Table A8 includes patterns among students who were assessed using the English-language assessments. As shown in the tables, substantive conclusions on the relationship between schooling and changing inequality remain similar across models. Although we observe a few differences in the compensatory or neutral nature of early schooling when comparing Tables A6, A7, or A8 to Table 5 of the main text, in general, we observe a steadfast pattern: Schools are mostly compensatory and at times neutral but under no circumstances appear to exacerbate inequality.

Discussion

In this study, we have examined growth in academic, executive functioning, and social-emotional inequality across prekindergarten, kindergarten, and the summer between these years. These results extend prior studies examining the function of schooling in kindergarten and beyond by adding a focus on earlier childhood experiences for students attending prekindergarten programs. Our results differ for racial/ethnic and SES disparities: We find that schools are associated with a compensatory function for racial/ethnic academic disparities in language domains but are largely neutral in shaping racial/ethnic math and social/behavioral disparities (with the exception of White-Black disparities in social skills and externalizing behaviors). In contrast, academic disparities between SES groups remain constant over the time periods observed, but disparities in social-emotional domains diminish during the school year more than the summer. To better understand how these patterns develop, we also investigate how classroom processes might be associated with these trends. We do not find systematic evidence of racial/ethnic or SES differences in exposure to high-impact classroom processes, although we observe suggestive evidence that the relationship between classroom processes and assessment scores may differ across subgroups. However, these patterns are largely inconsistent when considering whether a given classroom process is associated with increasing or declining inequality in assessed skills. From this, we conclude that more research is needed to better understand the process by which schools facilitate closing disparities.

These results align with prior studies focusing on later grades that have shown that schools mostly serve a compensatory function and are associated with lower levels of inequality than might have been otherwise expected in the absence of schooling (Condron, Downey, and Kuhfeld 2021; Downey 2020; Downey et al. 2004; McCormick et al. 2021). Whereas the bulk of similar prior studies have focused on kindergarten or later, we add to this conversation by documenting trends in inequality for prekindergarten and kindergarten in both academic and social/behavioral domains. Importantly, none of our estimates suggest that schools are associated with increased inequality by either race/ethnicity or FRL eligibility; thus, although prekindergarten programs may not eliminate or even reduce all the large racial/ethnic and SES disparities with which children enter school, they are generally associated with better outcomes. However, given that these analyses focused on a small group of students and a specific set of assessments, we caution readers against making broad conclusions about learning and inequality on the basis of this study alone (see also Workman, von Hippel, and Merry 2023). Furthermore, an important limitation of the data is that only the math assessments are interval scaled. SCDs are sensitive to measurement and scaling (von Hippel and Hamrock 2019). Future work should reexamine these patterns using interval-scaled tests to better establish the relationship between learning and exposure to schooling. In addition, results for assessments that are not interval-scaled should be interpreted with caution.

Although our study focuses on a specific group of students attending high-quality programs in Boston and thus is not generalizable to the wider population of prekindergarten students in the United States, the efficacy of these programs in lowering levels of inequality suggests that early childhood education can play an important role in shrinking inequality before students enter later kindergarten and elementary school programs. The promise of prekindergarten programs in lowering levels of inequality is important, particularly given that gaps shrink only moderately over the course of later schooling years (von Hippel et al. 2018). However, given the size of these disparities at prekindergarten entry and the comparatively smaller shrinkage of assessment score

disparities over the school year, it is also clear that one year of prekindergarten alone—even a program that is high quality in nature—is not enough to solve our national educational inequality problem. Our results also align with prior findings that suggest that schools' compensatory functions may be more related to language skills than to math skills (Condron et al. 2021), although more research is needed to fully disentangle these patterns. These results are also consistent with prior work using the BPS data (McCormick et al. 2021), which we build on by including nonacademic outcomes and outcomes that are disaggregated by race. Finally, assessments used in this study may include bias that shape our evaluation of the development of inequality, particularly for those that are teacher reported.

A key implication of this study is the role of out-of-school factors in creating and maintaining inequality among even very young children. Students enter prekindergarten with large disparities in both academic and social-emotional skills, consistent with other studies on kindergarten readiness (Reardon and Portilla 2016)—the result of cumulative historical, economic sociopolitical, and moral debts owed to these students by the American educational and political systems (Ladson-Billings 2006). In addition, these gaps either grow slightly or remain stagnant over the course of the summer, when students are out of school. As such, increasing exposure to early childhood schooling and access to resources that lower inequality in child development at home are likely to have meaningful impacts on children's academic and social/behavioral trajectories. Although our study was not designed to adjudicate between competing policy implications on how schools can best serve students, we can conclude that schooling does matter for equity-related outcomes given that most inequality forms before formal schooling begins (and is exacerbated over the summer, when children are not at school). In addition, a stronger policy focus on summertime inequality may significantly slow the development of social inequality in these skills (see also McCormick et al. 2021).

Importantly, students in the BPS system are exposed to relatively standardized curricula and classroom processes. However, we do not find evidence that any differences in exposure to curricula and classroom processes are related to systematic inequality in skill development. Although in some cases some students appear to benefit more from exposure to certain classroom processes relative to other students, these patterns are specific both to the skill domain and the gap in question. Patterns are relatively stable for instructional practices such as content-rich instruction, which appears to boost math assessment scores of Black and Hispanic students more than White students (which corresponds to a decrease in the size of the White-Black and White-Hispanic gaps). In general, we find that the CLASS domains of emotional and instructional support are associated with increasing inequality between groups, but classroom organization tends to be associated with decreasing inequality. However, these patterns are not consistent across all student subgroups or skill domains, suggesting that future research is needed to understand not just if schools compensate for inequality but also how they do so. This is particularly important given inconsistent patterns for different groups across years. Furthermore, given overall compensatory or neutral patterns for the relationship between schooling and skill development, it appears classroom processes that increase inequality are largely balanced out by the classroom processes that decrease it. As such, more research is needed to develop better measures of classroom processes that are both equity focused and can identify malleable factors to promote equitable early learning outcomes (Curenton et al. 2020).

In conclusion, although high-quality prekindergarten and kindergarten programs such as those provided by BPS can generate large gains in children's readiness to profit from the more formal instruction of the elementary school grades, greater attention is needed to ensure that such programs decrease rather than perpetuate social inequalities. The findings reported here suggest some specific areas in which troubling social disparities are diminished during the school year, but much more needs to be done to establish how these patterns function.

Appendix

Table A1. Descriptive Statistics of Baseline Spring and Fall Test Outcomes (Unstandardized; $n = 325$).

	M	SD
PPVT fall 2016	72.17	28.10
PPVT spring 2017	85.23	26.95
PPVT fall 2017	92.61	26.62
PPVT spring 2018	106.78	25.79
Applied problems fall 2016	403.87	26.93
Applied problems spring 2017	418.18	23.90
Applied problems fall 2017	425.22	24.79
Applied problems spring 2018	439.56	22.27
Hearts and Flowers fall 2016	.59	.17
Hearts and Flowers spring 2017	.66	.21
Hearts and Flowers fall 2017	.71	.21
Hearts and Flowers spring 2018	.79	.21
Social skills fall 2016	3.05	.51
Social skills spring 2017	3.14	.50
Social skills fall 2017	3.13	.57
Social skills spring 2018	3.22	.53
Externalizing behaviors fall 2016	1.54	.47
Externalizing behaviors spring 2017	1.56	.50
Externalizing behaviors fall 2017	1.51	.54
Externalizing behaviors spring 2018	1.52	.55
Internalizing behaviors fall 2016	1.44	.43
Internalizing behaviors spring 2017	1.46	.43
Internalizing behaviors fall 2017	1.42	.47
Internalizing behaviors spring 2018	1.41	.45

Note: PPVT = Peabody Picture Vocabulary Test-IV.

Table A2. Descriptive Statistics of Baseline Spring and Fall Test Outcomes, by Race/Ethnicity and FRL Eligibility (Unstandardized; $n = 325$).

	White		Black		Asian		Multiracial/ Other Race		Hispanic		Non FRL		FRL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
PPVT fall 2016	90.96	27.10	67.83	22.25	61.84	26.43	92.88	19.69	63.22	27.45	89.46	25.13	62.71	25.01
PPVT spring 2017	101.97	26.03	81.70	22.70	77.74	25.82	109.50	20.65	75.18	24.71	102.47	23.26	75.81	24.04
PPVT fall 2017	113.30	20.05	87.42	22.39	82.65	27.85	114.50	19.72	82.99	24.33	110.56	21.32	82.87	24.05
PPVT spring 2018	124.57	21.22	102.44	22.89	100.27	24.88	131.53	17.49	94.69	22.45	123.12	21.13	96.40	22.99
Applied problems fall 2016	417.04	28.26	395.39	22.93	407.23	19.56	422.94	22.50	396.25	27.76	418.24	23.09	395.93	25.63
Applied problems spring 2017	431.60	18.01	409.85	21.65	419.92	22.07	436.69	16.52	411.35	25.86	430.92	17.52	411.19	24.09
Applied problems fall 2017	440.51	15.91	415.89	20.25	428.75	25.07	445.69	13.93	416.60	27.50	439.97	15.98	417.31	25.09
Applied problems spring 2018	451.74	16.19	432.29	19.04	440.50	22.52	456.00	11.44	431.33	24.19	451.09	15.49	432.26	22.85
Hearts and Flowers fall 2016	.66	.21	.56	.15	.60	.18	.65	.22	.53	.13	.65	.20	.55	.15
Hearts and Flowers spring 2017	.79	.20	.63	.19	.63	.23	.78	.21	.60	.18	.76	.21	.60	.18
Hearts and Flowers fall 2017	.85	.17	.66	.20	.68	.22	.86	.16	.64	.20	.82	.19	.65	.20
Hearts and Flowers spring 2018	.89	.15	.77	.20	.80	.19	.89	.16	.70	.22	.87	.16	.74	.22
Social skills fall 2016	3.15	.49	2.99	.50	3.04	.49	3.26	.43	2.99	.55	3.15	.47	2.99	.52
Social skills spring 2017	3.21	.50	3.13	.53	3.14	.45	3.31	.39	3.06	.52	3.22	.50	3.09	.50
Social skills fall 2017	3.26	.54	2.90	.62	3.30	.38	3.52	.48	3.06	.57	3.32	.51	3.02	.57
Social skills spring 2018	3.37	.49	3.05	.57	3.34	.48	3.50	.30	3.09	.51	3.40	.45	3.10	.53
Externalizing behaviors fall 2016	1.49	.43	1.59	.53	1.47	.39	1.49	.40	1.57	.51	1.51	.42	1.56	.50
Externalizing behaviors spring 2017	1.52	.50	1.67	.61	1.46	.35	1.40	.37	1.57	.47	1.50	.47	1.59	.52
Externalizing behaviors fall 2017	1.38	.43	1.77	.67	1.34	.36	1.23	.19	1.55	.56	1.35	.44	1.60	.58
Externalizing behaviors spring 2018	1.38	.43	1.76	.68	1.41	.50	1.35	.35	1.54	.54	1.36	.39	1.62	.61
Internalizing behaviors fall 2016	1.41	.40	1.45	.49	1.57	.47	1.46	.34	1.37	.36	1.46	.43	1.42	.43
Internalizing behaviors spring 2017	1.43	.41	1.53	.48	1.52	.47	1.38	.35	1.41	.39	1.44	.42	1.48	.44
Internalizing behaviors fall 2017	1.33	.41	1.60	.59	1.40	.37	1.18	.27	1.42	.45	1.29	.38	1.50	.50
Internalizing behaviors spring 2018	1.30	.33	1.59	.54	1.41	.50	1.31	.37	1.39	.41	1.31	.37	1.48	.48

Note: FRL = free and reduced-price lunch eligible; PPVT = Peabody Picture Vocabulary Test-IV.

Table A3. Descriptive Statistics of Classroom Processes in Prekindergarten and Kindergarten, by Race/Ethnicity and FRL Eligibility (Unstandardized; $n = 325$).

	White		Black		Asian		Multiracial/ Other Race		Hispanic		Non FRL		FRL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Emotional support (prekindergarten)	5.86	.49	5.31	.49	5.48	.58	5.77	.67	5.48	.66	5.71	.61	5.44	.58
Emotional support (kindergarten)	5.95	.45	5.51	.66	5.78	.41	5.85	.43	5.76	.46	5.86	.48	5.71	.52
Classroom organization (prekindergarten)	5.66	.51	5.08	.49	5.35	.53	5.54	.57	5.38	.70	5.50	.62	5.29	.58
Classroom organization (kindergarten)	6.06	.55	5.48	.76	5.84	.45	5.97	.56	5.91	.68	5.96	.59	5.80	.67
Instructional support (prekindergarten)	3.35	.62	2.98	.58	3.14	.68	3.37	.80	3.34	.64	3.29	.69	3.17	.63
Instructional support (kindergarten)	2.65	.71	2.22	.34	2.50	.49	2.36	.46	2.69	.76	2.57	.67	2.51	.62
Cognitively demanding (prekindergarten)	2.96	.76	2.66	.67	2.72	.77	3.26	.60	2.83	.68	2.96	.71	2.74	.71
Cognitively demanding instruction (kindergarten)	3.17	.76	2.99	.84	3.03	.79	3.09	.88	3.05	.87	3.14	.78	3.02	.84
Content-rich instruction (prekindergarten)	3.00	.83	3.20	.61	2.89	.85	3.36	1.03	3.06	.78	3.04	.85	3.09	.74
Content-rich instruction (kindergarten)	3.05	.62	2.94	.89	3.18	.77	2.97	.59	2.89	.80	3.09	.64	2.95	.84
Total instructional time, language and literacy (prekindergarten)	48.07	17.35	49.21	18.84	52.85	22.34	46.24	29.46	53.79	20.54	47.02	20.61	52.70	19.98
Total instructional time, language and literacy (kindergarten)	79.72	18.74	68.52	20.97	90.06	25.34	74.26	18.20	81.21	21.90	79.58	18.03	80.21	25.13
Total instructional time, math (prekindergarten)	20.86	13.60	16.61	9.16	20.41	8.77	18.18	12.55	25.66	14.48	20.91	13.04	20.82	12.11
Total instructional time, math (kindergarten)	24.27	8.40	25.25	11.30	30.41	11.66	27.15	11.30	23.83	8.87	26.02	10.20	25.46	10.21

Note: FRL = free and reduced-price lunch eligible; PPVT = Peabody Picture Vocabulary Test-IV.

Table A4. Predicted Unconditional Gap Magnitudes at the Start of Prekindergarten.

Gap Magnitudes	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
White-Black	−0.81***	−0.11***	−0.45**	−0.26	0.01	0.17
	(0.15)	(0.02)	(0.15)	(0.18)	(0.18)	(0.17)
White-Asian	−1.07***	−0.07**	−0.25	−0.28	0.44*	0.04
	(0.17)	(0.02)	(0.17)	(0.20)	(0.21)	(0.19)
White-Hispanic	−1.00***	−0.12***	−0.47**	−0.28	−0.11	0.17
	(0.14)	(0.02)	(0.15)	(0.17)	(0.18)	(0.16)
Non FRL-FRL	−1.02***	−0.14***	−0.44***	−0.32*	−0.10	0.08
	(0.11)	(0.01)	(0.11)	(0.13)	(0.13)	(0.12)

Note: Standard errors are in parentheses. All models additionally include student and school random effects ($n = 325$). Note that both internalizing and externalizing behaviors are negatively coded such that higher values report less desirable behaviors. FRL = free and reduced-price lunch eligible.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table A5. Predicted Gap Magnitudes at the Start of Prekindergarten (Using All Students with Viable Data for Each Assessment; $n = 419$).

Gap Magnitudes	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
White-Black	−0.42**	−0.06**	−0.11	−0.08	−0.10	0.06
	(0.16)	(0.02)	(0.16)	(0.18)	(0.19)	(0.17)
White-Asian	−0.69***	−0.05*	−0.12	−0.24	0.53*	0.07
	(0.18)	(0.02)	(0.18)	(0.20)	(0.22)	(0.19)
White-Hispanic	−0.43**	−0.07***	−0.16	−0.20	−0.14	0.17
	(0.16)	(0.02)	(0.16)	(0.18)	(0.19)	(0.17)
Non FRL-FRL	−0.65***	−0.08***	−0.13	−0.08	−0.16	−0.13
	(0.13)	(0.02)	(0.13)	(0.15)	(0.16)	(0.14)

Note: Standard errors are in parentheses. Coefficients indicate predicted racial/ethnic and socioeconomic disparities in skills on Day 0 of prekindergarten. All models additionally include student and school random effects and control for individual-level characteristics. Note that both internalizing and externalizing behaviors are negatively coded such that higher values report less desirable behaviors. FRL = free and reduced-price lunch eligible.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table A6. Summary of Associations between Exposure to Schooling and Skill Disparities (Unconditional; $n = 325$).

Gap Grows Fastest (or Shrinks Slowest) in:	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
White-Black	Summer	NS	NS	Summer	NS	Summer
White-Asian	Summer	NS	NS	NS	NS	NS
White-Hispanic	NS	NS	NS	NS	NS	NS
Non FRL-FRL	NS	NS	NS	Summer	NS	Summer

Note: FRL = free and reduced-price lunch eligible; NS = not significant.

Table A7. Summary of Associations between Exposure to Schooling and skill Disparities (Using All Students with Viable Data for Each Assessment; $n = 419$).

	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
White-Black	Summer	NS	NS	Summer	NS	NS
White-Asian	Summer	NS	NS	NS	NS	NS
White-Hispanic	NS	NS	NS	NS	NS	NS
Non FRL-FRL	NS	Summer	NS	Summer	NS	Summer

Note: FRL = free and reduced-price lunch eligible; NS = not significant.

Table A8. Summary of Associations between Exposure to Schooling and Skill Disparities (Excluding Spanish-Language Assessments).

Gap Grows Fastest (or Shrinks Slowest) in:	Math	Executive Functioning
White-Black	NS	NS
White-Asian	NS	NS
White-Hispanic	NS	NS
Non FRL-FRL	NS	NS

Note: FRL = free and reduced-price lunch eligible; NS = not significant.

Table A9. Average Marginal Effects of Increases in Classroom Processes on Skill Disparities.

	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
Emotional support						
White-Black	0.33	−0.03	−0.10	−1.00**	0.44	0.87*
	(0.26)	(0.04)	(0.34)	(0.38)	(0.40)	(0.35)
White-Asian	−0.06	0.02	0.61	−0.19	0.22	0.29
	(0.30)	(0.04)	(0.38)	(0.44)	(0.48)	(0.41)
White-Hispanic	0.09	−0.05	−0.14	0.33	−1.04**	−0.45
	(0.23)	(0.03)	(0.29)	(0.33)	(0.35)	(0.31)
Non FRL-FRL	0.34	0.00	−0.00	0.11	−0.61*	0.06
	(0.18)	(0.02)	(0.23)	(0.26)	(0.28)	(0.24)
Classroom organization						
White-Black	−0.39	0.04	0.38	1.44***	−0.32	−1.04**
	(0.24)	(0.03)	(0.32)	(0.35)	(0.38)	(0.32)
White-Asian	0.13	0.03	−0.47	0.54	0.15	−0.03
	(0.27)	(0.04)	(0.35)	(0.39)	(0.43)	(0.36)
White-Hispanic	−0.16	0.04	0.20	0.20	1.35***	0.25
	(0.22)	(0.03)	(0.29)	(0.31)	(0.35)	(0.29)
Non FRL-FRL	−0.46**	0.00	0.09	0.34	0.32	−0.47*
	(0.17)	(0.02)	(0.22)	(0.24)	(0.27)	(0.23)
Instructional support						
White-Black	0.02	−0.01	−0.51*	−0.88***	−0.44	0.53**
	(0.17)	(0.02)	(0.21)	(0.22)	(0.23)	(0.20)
White-Asian	0.04	−0.05*	−0.01	−0.42*	−0.54*	−0.12
	(0.15)	(0.02)	(0.19)	(0.21)	(0.23)	(0.20)
White-Hispanic	0.19	−0.00	0.02	−0.46*	−0.13	0.20
	(0.14)	(0.02)	(0.17)	(0.18)	(0.20)	(0.17)
Non FRL-FRL	0.15	−0.01	0.05	−0.32*	0.24	0.09
	(0.10)	(0.01)	(0.12)	(0.13)	(0.14)	(0.12)
Content-rich instruction						
White-Black	0.15	0.03*	0.01	0.18	0.25	0.04
	(0.11)	(0.01)	(0.14)	(0.15)	(0.17)	(0.14)
White-Asian	−0.06	−0.02	−0.12	0.09	0.23	0.12
	(0.12)	(0.02)	(0.16)	(0.18)	(0.19)	(0.16)
White-Hispanic	0.18	0.05**	0.01	0.16	0.45**	−0.02
	(0.12)	(0.02)	(0.14)	(0.16)	(0.17)	(0.15)
Non FRL-FRL	0.04	0.02	0.12	0.08	0.24	0.12
	(0.08)	(0.01)	(0.11)	(0.11)	(0.12)	(0.10)
Cognitively demanding instruction						
White-Black	0.07	0.01	−0.23	0.18	−0.07	−0.26
	(0.13)	(0.02)	(0.16)	(0.17)	(0.18)	(0.16)
White-Asian	0.11	0.03	−0.16	0.23	−0.31	−0.33
	(0.13)	(0.02)	(0.16)	(0.19)	(0.20)	(0.17)
White-Hispanic	−0.06	−0.01	−0.29*	−0.11	−0.08	0.17
	(0.13)	(0.02)	(0.15)	(0.17)	(0.18)	(0.16)

(continued)

Table A9. (continued)

	Language	Math	Executive Functioning	Social Skills	Internalizing Behaviors	Externalizing Behaviors
Non FRL-FRL	0.05	0.01	−0.16	0.04	−0.18	−0.06
	(0.09)	(0.01)	(0.11)	(0.13)	(0.14)	(0.12)
Total instructional time, language and literacy						
White-Black	−0.00	−0.00	−0.01	−0.00	−0.01	−0.01
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
White-Asian	−0.01*	−0.00	−0.01	−0.01	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
White-Hispanic	−0.00	0.00	−0.00	−0.01	−0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Non FRL-FRL	−0.00	−0.00	0.00	0.00	0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total instructional time, math						
White-Black	−0.00	0.00	0.00	−0.00	0.01	0.00
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
White-Asian	0.01	0.00	0.00	−0.02	0.01	0.02*
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
White-Hispanic	−0.01	0.00	−0.01	−0.00	−0.01	−0.01
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Non FRL-FRL	0.00	0.00*	0.00	−0.01	0.00	0.01*
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)

Note: Standard errors are in parentheses. All models additionally include student and school random effects and control for individual-level characteristics ($n = 325$). Each column includes average marginal effects from a separate regression predicting outcomes for a given assessment. Note that both internalizing and externalizing behaviors are negatively coded such that higher values report less desirable behaviors. FRL = free and reduced-price lunch eligible.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table A10. Additional Descriptive Statistics of Analytic Student Sample, by Race/Ethnicity ($n = 325$).

	White		Black		Asian		Multiracial/Other Race		Hispanic	
	M	SD	M	SD	M	SD	M	SD	M	SD
Student age	4.61	.28	4.66	.32	4.69	.31	4.56	.31	4.65	.30
Free/reduced-price lunch eligible	.22		.91		.66		.00		.85	
Female	.49		.56		.40		.56		.49	
Dual-language learner	.21		.22		.87		.31		.75	
Mother age at first birth	31.00	6.44	23.72	5.35	29.19	5.08	32.44	3.41	23.95	7.18
Household size	4.33	1.03	4.01	1.61	4.27	1.25	3.88	.50	4.23	1.27
At least one household adult works full-time	.96		.90		.90		1.00		.88	
Parents married	.78		.27		.78		.94		.33	
Parent age	39.65	6.49	36.36	8.59	38.75	6.52	39.32	4.13	34.03	7.06
Parent education, high school/GED or less	.07		.36		.35		.00		.44	
Parent education, 2-year degree	.18		.41		.16		.00		.40	
Parent education, 4-year degree	.29		.14		.24		.44		.09	
Parent education, advanced degree	.47		.10		.24		.56		.07	

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