



## School and home connections and children's kindergarten achievement gains: The mediating role of family involvement

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### ABSTRACT

Children's home and school are the most influential contexts in which learning and development occur, especially during early childhood. This paper builds on Bronfenbrenner's ecological theory and Epstein's theory of overlapping spheres of influence to examine school and family connections and their relationships to family involvement and students' achievement gains. We used a nationally representative sample of kindergartners (16,425 students from 864 schools) and found that schools' efforts to communicate with and engage families predicted greater family involvement in school and higher levels of student achievement in reading and math at the end of kindergarten. We also found that, on average, family involvement at school and parents' educational expectations were associated with gains in reading and math achievement in kindergarten. We discuss the implications of our findings for policy makers, researchers, and practitioners.

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One way to ensure that all students succeed and graduate from high school is to ensure that they get off to a strong start. A child's experiences in the early years of schooling may set her or him on a learning trajectory that affects an entire school career (Rimm-Kaufman & Pianta, 2001). Studies indicate, for example, that children's performance in kindergarten is predictive of their later achievement (Alexander, Entwisle, & Dauber, 1993; Gutman, Sameroff, & Cole, 2003). Also, children construct their identity as students in the early years of schooling, which impacts their later academic experiences (Farkas & Beron, 2004; Rouse, Brooks-Gunn, & McLanahan, 2005). It is vital, then, that researchers identify and understand the influences and support that help all students experience academic success at the beginning of their school careers.

The two most influential contexts in which young children's learning and development occur are home and school. According to Bronfenbrenner and Morris (1998), children's behavior and development are influenced by their interactions within each context, as well as the connections between settings, including joint participation, communication, and the existence of information in each setting about the other. Epstein (2001) argues that the home and school constitute "overlapping spheres of influence" on children's development and academic achievement, and that the degree to which educators and family members maintain positive

relationships with one another helps determine children's academic success. She argues that schools implementing practices that promote strong school, family, and community partnerships should be better able to help children succeed academically because these outreach activities create greater consistency between children's home and school contexts (Epstein, 2001).

Decades of studies, reviews, and syntheses confirm this and have concluded that parents and family members are powerful influences on student achievement across grades (Epstein & Sheldon, 2006; Henderson & Mapp, 2002; Jeynes, 2005; Snow, Burns, & Griffin, 1998; Wang, Haertel, & Walberg, 1993). Not only does each context uniquely influence child development and learning, but the nature and quality of interactions among parents, teachers, and children have consequences for a variety of outcomes (Epstein, 2001).

We drew from ecological and sociological theories, as well as prior research on family involvement, to guide our analyses of the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) database estimating the extent to which schools' outreach to families was associated with three indicators of family involvement – involvement at home, involvement at school, and parents' educational expectations. We then estimated whether family involvement was related to students' math and reading gains between the fall and spring of kindergarten. Finally, we investigated whether school outreach efforts were associated with children's achievement gains and whether family involvement was a mediating mechanism by which school efforts to engage families translate

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into children's academic gains. Together, these analyses tested our hypotheses that school outreach relates to gains in achievement in kindergarten by getting their parents more engaged.

### 1. Family involvement theory and children's academic achievement

This study adopted a multidimensional definition of involvement, consistent with current research and theory. These definitions include Epstein's (2001), framework of six types of family and community involvement (parenting, communication, volunteering, learning at home, decision making, and collaborating with the community) and Grolnick's (Grolnick, Benjet, Kurowski, & Apostoleris, 1997; Grolnick & Slowiaczek, 1994) three dimensions of involvement (cognitive, affective, and school-based). Others distinguish between family involvement at home and at school, focusing on the location in which parent–teacher or parent–child interactions occur (e.g., Fantuzzo, Tighe, & Childs, 2000; Green, Walker, Hoover-Dempsey, & Sandler, 2007; Hoover-Dempsey et al., 2005; McWayne, Campos, & Owsianik, 2008; Zellman & Waterman, 1998). All of these conceptualizations share the understanding that family involvement is multidimensional, and that researchers cannot use omnibus measures or any single type of involvement to fully understand how families shape children's education and development.

For this study, we distinguished between family involvement at home, family involvement at school, and parental expectations to test whether each type of engagement was differentially related to kindergarteners' gains in reading and math achievement. This conceptualization is most closely aligned with studies that have distinguished forms of involvement based on the locale of the parenting behaviors (e.g., Hoover-Dempsey et al., 2005). The distinctions are also consistent with other studies that have used large national databases focused on older students which have shown that family practices such as PTA/PTO membership, attending school events, monitoring behavior, and homework completion are associated with students' higher academic achievement, behavior, and attendance (Domina, 2005; Keith et al., 1998; McNeal, 1999; Muller, 1993; Simon, 2001).

Studies of young children have demonstrated that parent–child interactions at the home are a strong influence on children's cognitive development. Fantuzzo, McWayne, Perry, and Childs (2004) found that family involvement at home was associated with children's school readiness competencies. On reading, there is a significant body of literature demonstrating that children from homes with more books and who experience more reading with parents tend to perform higher on literacy assessments and reading achievement tests than do children from less reading-rich environments (Faires, Nichols, & Rickelman, 2000; Ginsburg-Block, Manz, & McWayne, 2009; Scarborough & Dobrich, 1994; Sénéchal & LeFevre, 2002).

Although less is known about whether and how family involvement affects young children's math skill development or achievement, studies are emerging that suggest parent–child interactions with board and counting games are associated with stronger numeracy skills (Ginsburg-Block et al., 2009; LeFevre et al., 2009). We also know that young children generally spend less time at home in math activities, and that parents view math as less important, compared to reading (Musun-Miller & Blevins-Knabe, 1998; Sonnenschein, Baker, Moyer, & LeFevre, 2005; Tudge & Doucet, 2004). Additionally, parents may conceptualize math instruction as teachers' responsibility, whereas reading is perceived to be a family–teacher shared responsibility (Sonnenschein et al., 2005). Family involvement at home, then, may be an important way in which outside-of-school experiences affect children's academic

performances in school, promoting reading and math achievement differently.

Studies have also shown that family involvement at school can have a positive influence on young children's education and cognitive development. Dearing, Kreider, Simpkins, and Weiss (2006) found that, after controlling for students' achievement in kindergarten, families more involved at their children's school from kindergarten to fifth grade had children with higher literacy performance in fifth grade. Moreover, they found that an increase in family involvement at school from kindergarten to the upper elementary grades was associated with an increase in literacy performance in fifth grade. Their study provides strong evidence of the longitudinal benefits for young children when their parents are involved at the school.

Additionally, consistent with prior research on this topic (Fan & Chen, 2001; Suizzo & Stapleton, 2007), we included parental expectations as an aspect of family involvement. Parental expectations serve as an indicator of the family norms and values associated with schooling that pervade children's family life (Rimm-Kaufman, Pianta, Cox, & Bradley, 2003), making expectations a salient aspect of children's home environments. Studies have consistently found that these parental beliefs about their children's educational futures predict student achievement (Davis-Kean & Sexton, 2009; Englund, Luckner, Whaley, & Egeland, 2004; Entwisle, Alexander, & Olson, 1997), across families with diverse racial and ethnic backgrounds (Fan & Chen, 2001; Goyette & Xie, 1999; Hong & Ho, 2005; Yan & Lin, 2005).

### 2. School outreach to families and students and families outcomes

Researchers have shown that schools are critical influences on family involvement. Parents are more likely to be involved in their child's education when the school or teachers make a stronger effort to engage them in their children's learning (Deslandes & Bertrand, 2005; Epstein, 2001; Green et al., 2007; Hoover-Dempsey et al., 2005; Sheldon & Van Voorhis, 2004). When educators foster stronger links with families by being responsive to and communicative with parents, families are expected to feel more welcome at school and become more involved in their children's education. Additionally, outreach to, and engagement of, families are important aspects of early childhood educators' professional roles. In a survey of more than 3000 kindergarten teachers across the nation, Pianta, Cox, Taylor, and Early (1999) found that the vast majority reported using at least some practices to facilitate children and families' transition into school. The researchers noted, however, that the most frequent practices tended to take place after the school year began and were "low-intensity generic contacts," such as sending home brochures, fliers, or invitations to school events. Their study, however, did not examine the degree to which these practices predicted parental behaviors or student outcomes.

Other studies show that the close relationships between parents and schools are important for student success. Research indicates a positive association between school outreach to involve families and school levels of math proficiency (Sheldon, Epstein, & Galindo, 2010). Also, studies have shown that school efforts to communicate with and engage families is related to higher levels of student attendance, lower levels of chronic absenteeism, and lower levels of student behavior problems (Epstein & Sheldon, 2002; Sheldon, 2007; Sheldon & Epstein, 2002). Together, these studies demonstrate an important connection between school outreach to families and important student outcomes.

The studies that examine school outreach as a predictor of family and student outcomes have important limitations. Sheldon and his colleagues (Sheldon, 2007; Sheldon & Epstein, 2005; Sheldon

et al., 2010), for example, relied on measures of school practices as predictors of student outcomes (i.e., attendance, achievement, disciplinary incidents), but aggregated to the school level. As a result, the associations found cannot be taken as evidence that school outreach to involve families is related to the actions of individual families or outcomes of individual students. Other studies investigating the effect of school outreach on students and families have relied on parent perceptions of school outreach as predictors of family involvement behaviors (Anderson & Minke, 2007; Deslandes & Bertrand, 2005; Green et al., 2007). These studies are limited because connections between school outreach and family involvement may be over-estimated as a result of the fact that family members are reporting on school outreach and their own family involvement at the same time. Although the prior studies provide important clues that school outreach is predictive of family involvement, additional research that measures school outreach and parental involvement independently is needed.

In particular, research is needed that collects data about schools, families, and children. One such study by Schulting, Malone, and Dodge (2005), used the national Early Childhood Longitudinal Study – Kindergarten Cohort Database (ECLS-K), and showed that schools that implemented more activities to help families make a successful transition into kindergarten had students who scored higher on achievement tests by the spring of kindergarten. Moreover, they demonstrated that this effect was partially mediated by parents' involvement at school, and that the effect was stronger for families with lower-incomes.

The study by Schulting and her colleagues, however, was limited in several important ways. First, by focusing on the implementation of transition activities for families, their study could not account for the effects of school and teachers' on-going efforts to engage families in their children's education. Effects attributed to transition activities, therefore, may be an artifact of the home-school communication and family involvement practices that schools implement throughout the school year. Also, Schulting et al. (2005) focused only on the effects of school transition practices on involvement in school and the degree to which this one type of involvement mediates the effect of school outreach on student achievement. By not accounting for the multidimensional nature of family involvement, the effects of other types of family involvement on students may have been attributed to involvement at school.

The present study builds upon existing family involvement research in a number of ways. First, this study focused on the extent to which school outreach to families *during the school year* was predictive of family involvement and student outcomes. A family's relationship with the school is dynamic and evolves throughout the school year. Children's adjustment and performance in kindergarten may be influenced by the on-going efforts of schools and teachers to communicate and maintain positive relationships with families. We also focused on students' academic gains between the fall and spring of kindergarten to improve upon previous results derived from cross-sectional data (See Henderson & Mapp, 2002). Third, we relied on independently collected measures of family involvement and school outreach, using principal reports of school outreach and parent reports of family involvement to predict student achievement through kindergarten. By addressing these limitations in prior research on family involvement, the analyses conducted filled important gaps in our understanding of how school practices to engage families in their children's education are related to student achievement through kindergarten.

### 3. Research questions and hypotheses

This study built on previous research to analyze the influences of practices designed to engage families in their children's education

on parental behaviors and students' academic gains. Three research questions and hypotheses guided this study:

- 1) To what extent is school outreach to families associated with family involvement (family involvement at home, in school, and parents' educational expectations)? Based on prior research, we hypothesized that school outreach would be positively associated with family involvement at home and at school (Dauber & Epstein, 1993; Green et al., 2007; Schulting et al., 2005). Given that school outreach may provide parents information and resources about educational activities to use at home or may encourage parents to participate more actively in school activities, we expected to observe a positive association between school outreach and family involvement at school and at home. In contrast, we did not expect to see an association between school outreach and parents' educational expectations. Educational expectations are indicative of family norms and values (Rimm-Kaufman et al., 2003; Yan & Lin, 2005), have been shown to be less malleable in the first few years of children's schooling (Goldenberg, Gallimore, Reese, & Garnier, 2001), and are expected to be stable through children's year of kindergarten.
- 2) To what extent is family involvement associated with students' math and reading gains in kindergarten? Based on previous research, we expected to see a significant association between family involvement and children's achievement gains (Dearing et al., 2006; Schulting et al., 2005). Specifically, family involvement at home and parental expectations were expected to have stronger relationships with children's gains in achievement than involvement at school (Fan & Chen, 2001; Jeynes, 2003, 2005). Additionally, we expected to observe different associations between family involvement indicators and math and reading gains. Math achievement tends to be more sensitive to teacher and school effects, so we expected to find stronger associations between family involvement and children's achievement gains for reading than for math (Rimm-Kaufman, Fan, Chiu, & You, 2007).
- 3) To what extent is school outreach to families associated with children's math and reading gains in kindergarten? Is the relationship between outreach to families and achievement gains mediated by family involvement? Consistent with prior studies of school outreach to families (Schulting et al., 2005; Sheldon & Epstein, 2005), we expected to find a statistically significant positive relationship between school outreach and achievement gains, indicating that schools implementing more practices to engage families had students that made greater gains in reading and math through kindergarten. However, we also expected to find that the relationship between school outreach and students' achievement gains would be mediated by family involvement at home and at school. Parents' educational expectations were not hypothesized to mediate the relationship between school outreach and student achievement.

### 4. Method

The data came from the Early Childhood Longitudinal Study (ECLS-K) Kindergarten Class of 1998–1999, sponsored by the National Center of Education Statistics. ECLS-K focused on young children's cognitive and non-cognitive growth and collected information from students, parents, teachers, and administrators. Using a multistage probability sampling design, ECLS-K included a nationally representative sample of about 21,000 kindergarteners in over 1000 schools. For more details of the ECLS-K study, including the sampling frame and data structure, see National Center for Education Statistics (2001). In this article, we analyzed information from kindergarten (fall 1998 and spring 1999).

#### 4.1. Sample and missing cases

The study sample for the math analysis included 16,430 students from 870 schools and the reading analysis included 15,960 students from 860 schools. The unweighted sample sizes were rounded to the nearest 10 because of restricted license requirements. Each sample was defined by a two-step process. We first applied the ICE (Imputation by Chained Equations) algorithm in STATA to derive multiple imputation of missing values using the entire kindergarten sample. ICE handles complex data structures by fitting a sequence of chain equations to impute variables in order of increasing “missingness,” that is, the variable with the least missing values is imputed first and so on (Royston, 2005). Following Downey, Von Hippel, and Broh (2004), we imputed student – and school – level information, separately, for missing data. To the best of our knowledge, a procedure to impute missing values with nested data has yet to be developed. The imputation procedure resulted in five plausible data sets that were analyzed with HLM 6.08 software. Table 1 shows the percentage of missing cases, means or percentages, and standard deviations for all variables before applying multiple imputation procedures.

After conducting multiple imputation procedures, we dropped students from the original ECLS-K sample who did not have math (1610 students) or reading test scores (2320 students) at spring of kindergarten (time 2 or outcome variable), changed schools between fall and spring of kindergarten (510 students), or did not have any school-level information (2720 students). About 150 schools did not answer the principals' survey in the spring of kindergarten. The study sample for the math analysis included 16,430 students from 870 schools and the reading analysis included 15,960 students from 860 schools.

The sample for this study included 60% native non-Latino Whites, 14% native non-Latino Blacks, 18% Latinos of any race; 5% Asians, and 3% other race/ethnicities. Most of the students in the sample were born in the U.S. (82%) and English was the main language spoken at home (89%). About 66% of the students lived in homes with two biological parents and the average number of siblings at home was 1.43.

#### 4.2. Key variables in the study

##### 4.2.1. Students' math and reading achievement

These variables were measured using individually administered two-stage adaptive math and reading tests, with content areas and domains based on the National Assessment of Educational Progress (NAEP) framework (National Center for Education Statistics, 2001). The same tests were administered across schools, although not every child received the same items. All students responded to the same routing questions (first set of common questions) and they answered questions at one of three levels of difficulty (high, medium, and low) based on their performance in the routing portion of the test. The math tests measured number sense, properties and operations; measurement; geometry and spatial sense; data analysis, statistics, and probabilities; and patterns, algebra, and functions. The reading tests measured basic skills (print familiarity, letter recognition, beginning and ending sounds, rhyming sounds, word recognition); receptive vocabulary; and reading comprehension skills (initial understanding, developing interpretation, personal reflection, and demonstrating critical stance). The reliability estimates for the reading and math test scores in the spring of kindergarten were 0.95 and 0.94, respectively. For more details on the ECLS-K assessments and the psychometric properties of ECLS-K assessment instruments, see National Center for Education Statistics (2001) and Rock and Pollack (2002).

In this study, we used the item response theory (IRT) scale scores obtained from the “Base Year Code Book” (C2MSCALE and

C2RSSCALE). These scale scores are criterion-reference measures of achievement that place students' performance within a common and continuous scale (64-point scale for math and 92-point scale for reading). IRT procedures estimate patterns of responses for questions based on patterns of right, wrong, and omitted responses and on item parameters of – difficulty, discriminating ability, and “guess-ability” (Rock & Pollack, 2002).

Two additional variables were the foci of analyses: Family involvement and school outreach efforts to involve families. We created two ordinal scales of family involvement: family involvement at school and family involvement in educational activities at home. We also included parents' educational expectations as an indicator of family involvement. To create the scales, we first imputed missing data for each item and then calculated the scales. All scale reliabilities are estimated on the study sample and the alpha coefficients are based on the non-imputed values. Similar scales from the ECLS-K have been used in many published articles (see Cheadle, 2008; Crosnoe & Cooper, 2010; Schulting et al., 2005).

##### 4.2.2. Family involvement at school

This variable was measured using the average of a 7-item scale (0 = no and 1 = yes,  $\alpha = 0.58$ ) on parents' reports in the spring of kindergarten of their participation in school-related activities including attending open house or back-to-school nights; meetings of PTA, PTO, or parent–teacher–student organization; meetings of the parent advisory group or policy council; regularly-scheduled parent–teacher conferences or meeting with teachers; school or class events; acting as a volunteer at the school or serving on a committee; and fundraising for school.

##### 4.2.3. Family involvement in educational activities at home

This variable was the average response (1 = never to 4 = everyday,  $\alpha = 0.75$ ) to 11 items on the frequency of participation of parent and child on the following activities collected in the fall of kindergarten: read books, tell stories, sing songs, do art and crafts, do chores, play games or do puzzles, talk about nature or do science projects, play sports, child looked at picture books outside of school, child read or pretended to read, and build things together or play with construction toys.

##### 4.2.4. Parents' educational expectations for their children

As another indicator of family involvement, we included this ordinal variable indicating how far in school parents believed their child would go (1 = receive less than a high school diploma to 6 = get a PhD, MD, or other higher degree). The correlations between family involvement indicators were small ( $r = 0.24$  between involvement at home and school;  $r = 0.14$  between involvement at home and parents' educational expectations; and  $r = 0.12$  between involvement at school and parents' educational expectations), suggesting that they were modestly related, but largely independent aspects of family involvement.

##### 4.2.5. School outreach efforts

Additionally, we used an 8-item scale to measure school outreach efforts to involve families based on principals' reports in the spring of kindergarten (1 = never to 5 = seven or more times a year,  $\alpha = 0.64$ ) of how often the following activities were conducted by the school: PTA, PTO, or parent–teacher–student organization meetings; written reports (report cards) of child's performance sent home; teacher–parent conferences; home visits to do one-on-one parent education; school performances to which parents are invited; classroom programs like class plays, book nights, or family math nights; fairs or social events planned to raise funds for the school; and workshops for teachers that focus on parent involvement.

**Table 1**  
Weighted descriptive statistics for the ECLS-K sample.

	Mean or %	SD	% of missing
Key analytical variables			
Math IRT wave 1	19.48	7.26	9.33
Math IRT wave 2	27.55	8.76	0.07
Reading IRT wave 1	22.28	8.31	13.14
Reading IRT wave 2	32.07	10.22	2.89
Family involvement in school	0.54	0.23	6.72
Family involvement at home	2.84	0.48	12.70
Parents' educational expectations	4.05	1.11	13.09
School outreach efforts	3.07	0.57	1.27
Level-1 control variables (students and families)			
Race/ethnicity (%)			0.33
White	56.99		–
Black	16.71		–
Latino	18.91		–
Asian	2.99		–
Other	4.40		–
Gender: female (%)	48.27		0.06
Generational status (%)			19.18
First generation	3.00		–
Second generation	17.09		–
Third-plus generation	79.91		–
Non-English speaking homes (%)	13.03		0.01
Kindergarten status: first time (%)	95.24		12.70
Family type (%)			3.43
Two biological parents	64.05		–
Two parents, one biological	8.86		–
Single-parent	23.09		–
Other	4.00		–
Age at kindergarten entry (months)	68.62		8.26
Parents' educational level (2 = high school diploma and 3 = some college)	2.98	1.16	3.43
Family income	51,891.40	55,348.37	3.43
Number of siblings	1.43	1.12	3.43
Level-2 control variables (schools)			
Kindergarten enrollment	55.04	46.52	2.77
School year length	177.30	24.54	4.86
Sector (%)			0
Public	65.16		–
Catholic	9.62		–
Other religious	14.23		–
Other private	10.99		–
Composition-race			0
Mean White non-Latino	0.64	0.33	–
Mean Black non-Latino	0.12	0.23	–
Mean Latino	0.13	0.20	–
Mean Asian	0.05	0.11	–
Composition-parents' education	3.15	0.74	0.23

Note:  $N = 16,440$  students and 870 schools. % = percentages and  $SD$  = standard deviation. Percentages of missing data were calculated based on 16,440 students or 870 schools. All descriptive statistics were computed using ECLS-K cross-sectional weights: "c2cw0" for student level variables and "s2saqw0" for school level variables.

#### 4.3. Background and control variables

We included several student, family, and school variables in our models to statistically control for important background factors. *Family type* was measured as two biological parents – the reference group; two parents with one biological; only one biological parent at home; all other structures, including guardian and adoptive parents. *Number of siblings at home* was a continuous variable. *Parents' highest educational level* was an ordinal variable with values from 1 = some high school to 5 = graduate studies. *Family income* was a continuous variable (in 1000s). Student's *race* was identified as White non-Latino – the reference group, Black non-Latino, Latino of any race, Asian, and Other. Other race includes native Hawaiian, Other Pacific Islander, American Indian, Alaska native, and more than one race. Student's *generational status* was measured as first generation, non-U.S. born students to non-U.S. born parents; second generation, U.S. born students to non-U.S. born parents; and third-plus generation, U.S. born students to U.S.-born parents (the reference group). Additional controls were *age at kindergarten entry* (continuous), whether the student was a *second-time* kindergartener (dummy); whether student was *female* (dummy); and

whether a *non-English language* was spoken at home (dummy). All variables except for dummies were treated as continuous variables in our regression models.

At the school level, we controlled for sector, racial/ethnic composition, average educational level of parents, enrollment size, and length of the school year. School *sector* was represented by four categories: public – the reference category, Catholic, other religious, and other private. School *racial composition* (i.e., percent of Hispanic students and percent of African American students) was measured by aggregating student racial/ethnic information at the school level. The school *educational average* was measured by aggregating parents' highest education attained at the school level. *Length of school year (number of days)* and school *enrollment* were continuous variables. For a detailed description of all the ECLS-K variables see National Center for Education Statistics (2001).

#### 4.4. Data analyses

We used two-level hierarchical linear modeling (HLM) with students representing the level-1 units and schools representing the

level-2 units. HLM gives valid and accurate estimates when dealing with nested data (as in this case where students are nested within schools) because it takes into account the complex structure of the error terms (Raudenbush & Bryk, 2002). With nested data, Ordinary Least Squares analyses tend to overestimate the levels of significance given that the assumption of independence of variables is violated. Individuals within social contexts – such as in schools, tend to be more alike than if the sample of students was randomly selected.

We used two-level models because the focus of this study was on student- and school-level effects. Additionally, HLM requires at least two units per cluster (i.e. two teachers per school), and there were several schools in the ECLS-K data with only one kindergarten teacher. It was not possible, then to use three-level models (i.e., students nested within classrooms and classrooms nested within schools) with these data.

To analyze whether school outreach to parents was associated with family involvement, we estimated three models (Models 1, 2, and 3), to examine each of the family involvement measures (i.e., family involvement at school, family involvement in educational activities at home, and parents' educational expectations) as dependent variables. These models statistically controlled student, family, and school background variables, including a measure of prior math achievement from the fall of kindergarten. We included a measure of prior math achievement in these models to control for the possibility that family involvement could be a reaction to parents' perceptions of their children's academic skills. All family involvement variables were treated as continuous variables in the HLM regression models.

To analyze whether family involvement was associated with students' achievement gains from fall to spring of kindergarten, we estimated four models for each achievement outcome – math (Models 4, 5, 6, and 7) and reading (Models 8, 9, 10, and 11). The first three models included each of the family involvement measures separately whereas the fourth model included all three family involvement measures simultaneously. To capture gains in achievement, we included in our regression models the IRT scale scores from the fall assessment as a control variable and the IRT scale scores from the spring assessment as the dependent variable. These models included student and family background variables as controls.

We also re-estimated all the cognitive outcomes' models using "difference scores." In these models, rather than having achievement at time 2 as the dependent variable and achievement at time 1 as a variable predictor, we specified the difference between time 2 and time 1 as the dependent variable. Overall, our results were robust. Regardless of model specification, we observed similar patterns of association between different specifications. All of the tests statistically controlled for student, family, and school background variables.

Then, to analyze whether school's outreach efforts were associated with students' gains and whether these relationships were mediated by family involvement, we estimated two models for each achievement outcome. One model included the school outreach measure only to estimate the association of outreach and student achievement gains prior to adjusting for potential influences of family involvement (Models 12 and 14 for math and reading, respectively). Then, we added all three measures of family involvement (Models 13 and 15 for math and reading). All of the tests statistically controlled for student, family, and school background variables. We followed Kenny, Kashy, and Bolger (1998) to study an *upper level mediation* (when the association between level-2 variable and level-1 outcome is mediated by level-1 variables) and we used the Sobel test to formally test the mediation model (Sobel, 1982).

The most exhaustive HLM model is specified as follows. Between-student equation

$$\begin{aligned} \text{Level-1 Model : (Test score wave 2)}_{ij} \\ = \beta_{0j} + \beta_{1j} (\text{test score wave 1}) \\ + \beta_{2j} (\text{family involvement indicators}) \\ + \beta_{3j} \sum (\text{individual and family background}) + r_{ij} \end{aligned} \quad (1)$$

Between-school equation

$$\begin{aligned} \text{Level-2 Model : } \beta_{0j} = \gamma_{00} + \gamma_{01} (\text{school outreach}) \\ + \gamma_{02} \sum (\text{school background}) + \mu_{0j} \end{aligned} \quad (2a)$$

$$\beta_{1j} = \gamma_{10} \quad (2b)$$

$$\beta_{2j} = \gamma_{20} \quad (2c)$$

where the overall average achievement score (by subject) in the spring of kindergarten for a student "i" in school "j" ( $Y_{ij}$  – test score wave 2) is a function of student-level variables ( $\beta_{1j}$ ,  $\beta_{2j}$ , and  $\beta_{3j}$  represent the effect of previous achievement, family involvement indicators, and individual and family controls, respectively) and school-level variables ( $\gamma_{01}$  represents the effect of school outreach on the average achievement level in school  $j$ , and  $\gamma_{02}$  represents the effects of school-level controls).

For parsimony, only the level-1 model and the level-2 model intercept were set as random, whereas all level-2 slopes were fixed so that the effects of all level-1 variables were constrained to be the same across schools. In every model, the level-1 and level-2 continuous and dichotomous variables were centered around the grand mean (Enders & Tofghi, 2007). Thus, the estimated parameters applied to the average student in the sample. All statistical analyses were computed using ECLS-K cross-sectional weights: *c2cw0* for student level variables and *s2saqw0* for school level variables.

All regression estimates are reported as unstandardized coefficients in the tables. Given the extensive research base on the association between school outreach and family involvement, as well as family involvement and student achievement, we used a more conservative alpha of 0.01 for discussing statistically significant relationships. Far fewer studies have been conducted analyzing the association between school outreach and student achievement, or the mediating role of family involvement to explain why school outreach might predict student achievement. Thus, we chose to use an alpha of 0.05 when analyzing the association between school outreach and achievement measures. As a result, our analyses are able to extend the current body of research on the role of school-family connections for student achievement, while also guarding against Type I errors (where we find associations between variables by chance when there no relationship exists) that stem from the fact that our study contains a large number of analyses with a large sample.

Also, to measure the magnitude of importance or effect sizes for the variables of interest, we divided the standardized version of the coefficient by level-specific standard deviation of the outcome variable. For example, to estimate the effect size of the association between school outreach (a level-2 variable) and family involvement, we divided the standardized version of the school outreach coefficient by the level-2 standard deviation of the unconditional model (i.e., models without predictors). To estimate the effect size for family involvement at school (a level-1 variable), we divided the standardized version of the family involvement measure by the level-1 standard deviation of the model with only math test score at time. These standardized estimates are equivalent to effect sizes (Galindo & Fuller, 2010).

**Table 2**  
HLM regression fixed and random estimates of family involvement from school outreach efforts.

	PI school Model 1	PI home Model 2	Education expectations Model 3
Fixed effect coefficients			
Intercept	0.55** (0.00)	2.84** (0.01)	4.09** (0.01)
Level-2 key variable (schools)			
School outreach efforts	0.02** (0.01)	0.01 (0.01)	0.04 (0.02)
Level-1 control variables (students and families)			
Math score at wave 1	0.00** (0.00)	0.00 (0.00)	0.02** (0.00)
Age at kindergarten entry	-0.00 (0.00)	-0.01** (0.00)	-0.01** (0.00)
Black	-0.04** (0.01)	0.00 (0.02)	0.30** (0.05)
Latino	-0.01 (0.01)	-0.01 (0.02)	0.23** (0.04)
Asian	-0.07** (0.01)	-0.05 (0.03)	0.17** (0.06)
Other	-0.03** (0.01)	0.03 (0.02)	0.09 (0.05)
Female	0.01 (0.00)	0.04** (0.01)	0.08** (0.02)
First generation	-0.08** (0.01)	-0.06 (0.04)	0.28** (0.07)
Second generation	-0.03** (0.01)	-0.04 (0.02)	0.27** (0.04)
Non-English speaking homes	-0.04** (0.01)	-0.16** (0.02)	0.32** (0.05)
First time kindergartener	0.04** (0.01)	0.10 (0.03)	0.29** (0.06)
Two parents, one biological	-0.05** (0.01)	-0.02 (0.02)	-0.00 (0.04)
One single parent	-0.06** (0.01)	-0.01 (0.01)	0.08** (0.03)
Other type of family	-0.04** (0.01)	0.03 (0.03)	-0.13 (0.06)
Number of siblings	-0.00 (0.00)	0.01** (0.00)	-0.05** (0.01)
Educational level	0.04** (0.00)	0.05** (0.01)	0.20** (0.01)
Income	0.00** (0.00)	-0.00 (0.00)	0.00** (0.00)
Level-2 control variables (schools)			
Kindergarten enrollment	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
School year length	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Catholic	0.07** (0.01)	-0.03 (0.02)	0.05 (0.04)
Other religious	-0.00 (0.02)	-0.07** (0.02)	0.08 (0.05)
Other private	-0.09** (0.02)	-0.03 (0.03)	0.16** (0.06)
Mean black	-0.03 (0.02)	-0.03 (0.03)	0.23** (0.07)
Mean Latino	0.07** (0.02)	0.01 (0.03)	0.32** (0.07)
Mean Asian	-0.00 (0.03)	0.03 (0.05)	0.25 (0.12)
Mean education	0.03** (0.01)	-0.00 (0.01)	0.10** (0.02)
Random effect coefficients			
Level-1 variance (between students)	0.038	0.207	1.046
Level-2 variance (between schools)	0.004**	0.005**	0.022**

Note: Robust standard errors in parentheses. *p*-values are based on estimations with robust standard errors. For parsimony only the level-1 equation and the level-2 intercept were included as random (all other level-2 slopes were fixed). Patterns and trends did not change when using reading test scores as control variable instead of math test scores for these models. We estimated all statistics models using appropriate ECLS-K cross-sectional weights.

\*\*  $p \leq 0.01$ .

## 5. Results

### 5.1. Association between school outreach to parents and involvement

Table 2 includes the three models that give attention to different indicators of family involvement: family involvement in educational activities at home, family involvement in school-related activities, and parents' educational expectations. The main independent variable of interest in all these models is: principals' report of school outreach to parents. Regression estimates are reported as unstandardized coefficients in the table. Level-1 (student and family variables) and level-2 (school variables) controls were included in all models. Analyses of the intracluster correlations of the unconditional models (i.e., models without predictors) revealed that 21% of the variance in family involvement in school-related activities was between schools. A smaller proportion of the variances in parents' educational expectations and family involvement in educational activities at home were between schools, 9% and 4%, respectively.

In Table 2, Model 1 shows that school outreach efforts had a positive association with family involvement at school, suggesting that school efforts to encourage families to participate in school activities "paid off" in terms of getting parents to interact at and with the school. All things being equal, each unit increase on school outreach was associated with a 0.02 point increase of family involvement in school activities. In contrast, the associations between school outreach efforts and parents' educational expectations and family involvement at home were positive but not statistically significant (Models 2 and 3).

In standard deviation units, we observed that the magnitude of the associations between school outreach and the three family involvement indicators were modest (0.07 of a standard deviation for parents' expectations; 0.08 for involvement at home; and 0.12 for involvement at school). These effect sizes corresponded to school-level effect sizes, which are not comparable to level-1 (family and students) effect sizes. The school-level effect sizes reflect the 'effect' on the outcome (i.e., parents' educational expectations, involvement in school and involvement at home) of moving a school by one standard deviation on a school-level variable (in this case on the school outreach efforts) relative to the standard deviation of the outcome variable between schools. These net effect sizes take into account all of the covariates, including students' math achievement.

Table 2 indicates additional student and family characteristics that were associated with family involvement. Other things being equal, students' math achievement and parents' educational levels had positive and statistically significant associations with all three family involvement indicators. Patterns of association changed with different family involvement measures. For instance, students living with immigrant parents and in non-English speaking homes had lower levels of family involvement at school, but higher educational expectations than their counterparts living in non-immigrant families and English speaking homes, respectively. Parents of racial/ethnic minority students, specifically Asian and Black parents, reported higher educational expectations than did White students, but lower levels of family involvement at school. Also, parents' educational expectations decreased as the number of siblings at home increased, but family involvement at home increased as the number of sibling increased.

At the school level, some school characteristics (e.g., mean educational level of students' parents and racial/ethnic composition of schools) further explained differences in family involvement at school and parents' educational expectations, although fewer effects were observed for parents' involvement at home. This suggested that school and family mechanisms related differently to the

family involvement measures. Such differential patterns of association should be analyzed in future work.

### 5.2. Family involvement and math and reading achievement gains

Table 3 reports four models for each achievement outcome: reading and math. The first three models tested each of the family involvement measures separately, whereas the last model included all three measures of involvement to check their simultaneous, independent effects. The results show the significant associations of family involvement at school and parents' educational expectations with math and reading gains, even after controlling all covariates (Models 4, 6, 8, and 10). Students whose parents were more involved at school or had higher educational expectations demonstrated greater gains in reading and math skills at the end of kindergarten. Each unit increase in family involvement in school activities was associated with a 1.10 and 0.97 points increase in math and reading achievement, respectively. Similarly, each unit increase in parents' educational expectations was associated with a 0.17 and 0.18 points increase in these achievement measures. In contrast, family involvement at home was not significantly associated with reading or math gains (Models 5 and 9).

In standard deviation units, we observed modest associations between family involvement and cognitive gains. Overall, effect sizes of family involvement at school for reading and math gains were 0.05 and 0.04, respectively. Smaller effect sizes were observed for parents' educational expectations (0.04 for both math and reading gains) and family involvement at home (0.01 and 0.02 for math and reading gains, respectively). These net effect sizes take into account all of the covariates, including students' previous achievement level in reading or in math.

When all family involvement measures were included in the math model (Model 7 and 11), school involvement and parents' expectations coefficients remained statistically significant, and family involvement at home remained non-significantly associated with math and reading achievement gains. This suggests that the associations to achievement gains of parent involvement in school and parents' educational expectations are independent and robust, yet small.

To have a better sense of the relative importance of the family involvement indicators, we compared their effect sizes to the effect size of parents' own educational attainment for students' reading and math gains. Numerous studies have shown that parents' educational attainment is a consistent predictor of children's achievement, as well as parental behaviors and educational expectations (Davis-Kean, 2005; Hill et al., 2004; Lareau, 2003; Luster, Rhoades, & Haas, 1989). In standard deviation units, the effect sizes of parents' education were 0.09 for both reading and math gains. So, although the absolute effect size of our family involvement measures seemed small (0.04–0.05), in relative terms these variables are moderately important predictors of students' achievement gains in kindergarten.

In addition, Table 3 indicates that several family and individual characteristics included as covariates in these analyses had important effects on reading and math gains in kindergarten. Gains in math across kindergarten were positively associated with students' age, parents' educational levels, and parents' educational expectations. Compared with White students, Black students had lower math gains, but Asian students had higher math gains in kindergarten. There was no statistical difference in math gains between Latino and White students. Children living in non-English speaking homes had lower math gains than children living in English-speaking homes.

The results were similar for reading, although some differences are worth noting. For instance, student's gender and the number of



**Table 3**  
HLM regression fixed and random estimates of students' achievement from family involvement.

	Math				Reading			
	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
<b>Fixed effect coefficients</b>								
Intercept	27.94** (0.07)	27.93** (0.07)	27.93** (0.07)	27.94**** (0.07)	32.50** (0.11)	32.50** (0.11)	32.50** (0.11)	32.50** (0.11)
<b>Level-1 key variables (students and families)</b>								
Involvement at school	1.10** (0.24)			1.03** (0.25)	0.97** (0.29)			0.85** (0.29)
Involvement at home		0.13 (0.11)		0.01 (0.12)		0.26 (0.12)		0.14 (0.12)
Educational expectations			0.17** (0.05)	0.15** (0.05)			0.20** (0.05)	0.18** (0.06)
<b>Level-1 control variables (students and families)</b>								
Test score at wave 1	0.92** (0.01)	0.92** (0.01)	0.92** (0.01)	0.91** (0.01)	0.93** (0.01)	0.93** (0.01)	0.93** (0.01)	0.92** (0.01)
Age at kindergarten entry	0.06** (0.01)	0.06** (0.01)	0.06** (0.01)	0.06** (0.01)	0.05** (0.01)	0.05** (0.01)	0.05** (0.01)	0.05** (0.01)
Black	-1.32** (0.17)	-1.37** (0.17)	-1.42** (0.17)	-1.37** (0.17)	-0.80** (0.21)	-0.84** (0.21)	-0.90** (0.21)	-0.85** (0.21)
Latino	-0.38 (0.18)	-0.39 (0.18)	-0.44 (0.18)	-0.42 (0.18)	0.03 (0.21)	0.02 (0.21)	-0.03 (0.21)	-0.02 (0.21)
Asian	0.68** (0.25)	0.60 (0.25)	0.57 (0.25)	0.65** (0.25)	1.28** (0.33)	1.21** (0.33)	1.16** (0.33)	1.24** (0.33)
Other	-0.49 (0.24)	-0.52 (0.24)	-0.53 (0.24)	-0.50 (0.24)	-0.36 (0.26)	-0.40 (0.26)	-0.40 (0.26)	-0.38 (0.26)
Female	-0.03 (0.09)	-0.03 (0.09)	-0.04 (0.09)	-0.04 (0.09)	0.72** (0.10)	0.71** (0.10)	0.71** (0.10)	0.70** (0.10)
First generation	0.54 (0.35)	0.46 (0.36)	0.41 (0.35)	0.49 (0.35)	-0.27 (0.47)	-0.34 (0.47)	-0.41 (0.47)	-0.33 (0.47)
Second generation	0.11 (0.16)	0.08 (0.16)	0.03 (0.16)	0.07 (0.16)	0.10 (0.21)	0.08 (0.21)	0.02 (0.20)	0.06 (0.20)
Non-English speaking home	-0.69** (0.20)	-0.71** (0.20)	-0.78** (0.20)	-0.74** (0.20)	-0.06 (0.28)	-0.05 (0.28)	-0.16 (0.28)	-0.10 (0.29)
First time kindergartener	0.58 (0.25)	0.61 (0.25)	0.57 (0.25)	0.54 (0.25)	1.47** (0.32)	1.48** (0.32)	1.45** (0.32)	1.41** (0.32)
Two parents, one biological	-0.36 (0.16)	-0.42** (0.16)	-0.42** (0.16)	-0.36 (0.16)	-0.31 (0.18)	-0.36 (0.18)	-0.36 (0.18)	-0.31 (0.18)
One single parent	-0.08 (0.14)	-0.15 (0.14)	-0.16 (0.14)	-0.10 (0.14)	-0.37 (0.16)	-0.42** (0.15)	-0.44** (0.15)	-0.39 (0.16)
Other type of family	-0.73** (0.24)	-0.78** (0.24)	-0.76** (0.24)	-0.72** (0.24)	-0.95** (0.28)	-0.10** (0.28)	-0.97** (0.28)	-0.94** (0.28)
Number of siblings	-0.03 (0.04)	-0.03 (0.04)	-0.02 (0.04)	-0.02 (0.04)	-0.15** (0.05)	-0.15** (0.05)	-0.14** (0.05)	-0.14** (0.05)
Educational level	0.31** (0.05)	0.35** (0.05)	0.32** (0.05)	0.28** (0.05)	0.38** (0.05)	0.41** (0.05)	0.38** (0.05)	0.34** (0.05)
Income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
<b>Random effect coefficients</b>								
Level -1 variance (between students)	22.502	22.538	22.514	22.480	30.997	31.009	30.987	30.963
Level -2 variance (between schools)	2.478**	2.503**	2.498**	2.477**	5.890**	5.942**	5.918**	5.884**

Note: Robust standard errors in parentheses. *p*-values are based on estimations with robust standard errors. For parsimony only the level-1 equation and the level-2 intercept were included as random (all other level-2 slopes were fixed). We estimated all statistical models using appropriate ECLS-K cross-sectional weights. The level-1 and level-2 variances of the base math model (i.e., with only math in the fall of kindergarten as a predictor) were 2.753 and 22.981, respectively. The level-1 and level-2 variances of the base model for reading were 6.108 and 31.735.

\*\* *p* ≤ 0.01.

siblings at home were related to students' reading gains, but not to math gains. Female students had higher reading gains than did male students, but students' reading gains decreased as the number of siblings at home increased. Children who were retained in kindergarten had lower reading gains than did first time kindergarteners. Additionally, there was no statistical difference in reading gains between children living in non-English speaking homes and in English speaking homes. Students who were not English proficient did not take the reading test, thus the estimated reading scores for non-English speaking students in kindergarten were based only on students who were proficient in oral English (Reardon & Galindo, 2009).

Overall, results in Table 3 show positive effects of family involvement on achievement gains in kindergarten, even after controlling other influential background measures. On average, students whose parents were more involved at school and who had

higher educational expectations had higher math and reading gains during kindergarten, regardless of their initial skills in the fall.

### 5.3. School outreach to parents and math and reading achievement gains

Whereas this study confirms that involvement is important for student achievement gains in math and reading, it takes questions about involvement further than prior studies by exploring whether school outreach and students' achievement in kindergarten are associated. Table 4 presents four models that give attention to this exploration. The main independent variable of interest in these models is principals' report of *school outreach to parents*. In addition to student, family, and school covariates, Models 13 and 15 included parents' educational expectations, involvement in school, and involvement at home to analyze the mediating power of the

**Table 4**  
HLM regression fixed and random estimates of students' achievement from school outreach efforts.

	Math		Reading	
	Model 12	Model 13	Model 14	Model 15
<b>Fixed effect coefficients</b>				
Level-2 key variables (schools)				
School outreach efforts	0.40** (0.15)	0.37* (0.15)	0.41* (0.19)	0.38* (0.18)
Level-1 key predictors (students and families)				
Involvement at school		1.03** (0.25)		0.74** (0.27)
Involvement at home		0.01 (0.12)		0.06 (0.11)
Educational expectations		0.15** (0.05)		0.19** (0.05)
<b>Random effect coefficients</b>				
Level-1 variance (between students)	22.537	22.476	31.573	31.518
Level-2 variance (between schools)	2.496**	2.472**	5.699**	5.677**

Note: Robust standard errors in parentheses. *p*-values are based on estimations with robust standard errors. For parsimony only the level-1 equation and the level-2 intercept were included as random (all other level-2 slopes were fixed). We estimated all statistical models using appropriate ECLS-K cross-sectional weights. The level-1 and level-2 variances of the base math model (i.e., with only math in the fall of kindergarten as a predictor) were 2.753 and 22.981, respectively. The level-1 and level-2 variances of the base model for reading were 6.108 and 31.735. Level-1 (student and family variables) and level-2 (school variables) controls are not shown but were included in all models.

\*  $p \leq 0.05$ .

\*\*  $p \leq 0.01$ .

family involvement variables. All models included student, family, and school variables as controls. These background controls are not shown in Table 4 but were included in all models. Analyses of the intra-cluster correlations of the unconditional models (i.e., models without predictors) revealed that 22% and 23% of the variance in math and reading achievement were between schools.

Table 4 shows positive and significant associations between school outreach and students' achievement gains in reading and math (Models 12 and 14). After controlling for previous achievement and all other covariates, each unit increase on principals' report of school outreach was associated with a 0.40 and 0.41 point increase in reading and math achievement, respectively. Regardless of their starting skills in the fall, students had greater gains in math and reading, on average, if they attended schools that provided more opportunities for family and school communications and interactions. In standard deviation units, we observed modest effects of principals' report of school outreach on math and reading achievement in kindergarten (0.12 of a standard deviation for math and 0.09 for reading). These effect sizes correspond to school-level effect sizes on the school-level variables.

In models 13 and 15, we added the family involvement indicators to analyze whether these variables mediated the relationship between school outreach to parents and cognitive gains, by comparing differences in coefficients before and after accounting for family involvement. After including family involvement indicators in the models, the association between school outreach activities and cognitive outcomes in reading and math remained statistically significant, although the magnitude of the school outreach coefficient decreased slightly. After including all family involvement measures, the associations between outreach and math and reading achievements decreased by 10% and 8%, respectively.

To formally test for mediation, we followed Kenny et al. (1998) steps of associations and estimated a Sobel test for each achievement outcome (Sobel, 1982). We first analyzed the relationship between the level-2 variable (school outreach) and the level-1 outcomes (see Models 12 and 14 for math and reading in Table 4, respectively). We then analyzed whether the level-2 variable was associated with the mediator variables of family involvement (see results presented in Table 2). Finally, we analyzed whether the mediator variables (family involvement measures) were associated with the outcome variable in a model already including the school outreach measure (see Models 13 and 15 for math and reading in Table 4, respectively).

After analyzing the required models to fulfill the steps necessary for testing mediation, we found that principal's report of outreach only predicted family involvement at school and not parents' educational expectations and family involvement at home. As a result, we only used the Sobel test to determine the extent to which family involvement at school mediated the relationship between school outreach and children's achievement gains. After running separate tests for reading and math, the Sobel test indicated that family involvement at school was a significant mediator of the influence of school outreach efforts on achievement gains for reading and math (Sobel test statistic = 2.03,  $p = 0.04$  for math and Sobel test statistic = 1.96,  $p = 0.05$  for reading). We concluded that the association between outreach and achievement in kindergarten was partially mediated by family involvement at school, and that outreach had an independent and positive relationship with children's achievement gains in kindergarten above and beyond family involvement.

## 6. Discussion

Researchers and policy makers have debated whether educational disparities are intrinsically related to the home environment or to the quality of the school a child attends. This study aimed to contribute to this discussion by examining the extent to which school outreach to parents and family involvement are associated with reading and math achievement gains in kindergarten, and the extent to which family involvement explains the relationship between school outreach to involve families and student achievement. The findings support the theoretical assumptions guiding the study that the interactions of people across the home and school contexts help explain children's achievement gains in reading and math through kindergarten. The relationship can be explained only in part by the fact that family involvement at school tends to be higher in schools that implement more practices to engage families in their children's learning. The main findings of the paper are discussed within the context of the research questions that guided this study.

### 6.1. School outreach to parents and involvement

The results of this study demonstrate partial support for hypothesis 1. The analyses showed that, after controlling for family and student background variables including students' prior achievement as a measure of student ability, schools that conducted

more activities to engage families tended to have parents who reported higher levels of involvement at school but not higher involvement at home nor higher educational expectations. This finding is consistent with established theory and research about the importance of school invitations and encouragement of family involvement as predictors of parental behaviors (Epstein, 2001; Hoover-Dempsey et al., 2005; Walker, Wilkins, Dallaire, Sandler, & Hoover-Dempsey, 2005). When schools use planned activities that increase school and teacher communications and connections with their students' families, greater overlap of the home and school contexts can be facilitated and family involvement can occur.

The fact that we did not find a significant relationship between school outreach and family involvement at home or parents' educational expectations, however, suggests important caveats related to the way school outreach predicts family involvement. Specifically, the results suggest that the nature of school outreach is key in determining whether or not these efforts have an effect on particular kinds of parental involvement. The measure of school outreach in this dataset largely included activities that aimed to increase parents' participation at meetings and events at school. It is not surprising, therefore, that no significant association was found between school outreach and parental involvement at home or parents' educational expectations. It is also plausible that involvement at home and parents' educational expectations were less sensitive to school interventions than family involvement at school, given that we observed a higher between-school variance for school involvement than for the other family involvement indicators.

### 6.2. Family involvement and math and reading achievement gains

Consistent with previous research using national datasets of students in older grades, as well as studies using smaller samples of young children, we found that family involvement is associated with children's early achievement gains (Catsambis, 2001; Davis-Kean, 2005; Dearing et al., 2006; Ho & Willms, 1996; Muller, 1993). On average, children whose parents were more involved in school activities and had higher educational expectations tended to outperform their peers who did not have this support and encouragement from family members. These results were significant even after controlling for influential student and family covariates, including students' previous achievement. In contrast to Fan and Chen (2001) and Jeynes (2005), we did not find that home involvement had stronger effects than school involvement on learning.

On average, family involvement at school and parent's educational expectations were associated with students' math and reading gains. Involvement at home, however, was not related to achievement gains. It is important to note that the home involvement measure largely focuses on quantitative indicators of involvement as a set of basic activities, rather than on the quality of experiences and interactions that a student has at home. So while our study does suggest that children who experience more family involvement at home are not more likely to experience achievement gains in kindergarten than students who interact less often with family members, our analyses could not determine the extent to which all family involvement at home is related to children's achievement gains in kindergarten.

### 6.3. School outreach to parents and students' math and reading achievement gains

We examined the extent to which school outreach was related to children's achievement gains after controlling for critical covariates and found that principals' reports of school outreach to involve

families in their children's education was associated with greater student's reading and math gains over the course of kindergarten (hypothesis 3). As Bronfenbrenner and Morris (1998) and others (Epstein, 2001; Rimm-Kaufman & Pianta, 2001) have emphasized, individual behaviors, academic achievement, and child development are the consequence of the interactions among people within and across different settings, in this case between students and their families and schools. Neither the students, nor their families, nor their schools are exclusively responsible for explaining students' educational outcomes.

However, family involvement did not completely mediate the relationship between school outreach efforts and children's math and reading achievement gains. Only family involvement at school was a partial mediator of the influence of school outreach efforts on achievement gains for reading and math. One explanation for this finding is that schools with stronger reported outreach efforts have, on average, students that make stronger gains in math and reading because the schools create a more positive school climate where parents feel more welcomed and students are immersed in a more supportive learning environment. Students in these schools, then, could be exposed to a more positive instructional climate and greater academic support for learning. Future studies should investigate the relationship between school outreach and classroom and instructional climate within classrooms to better understand additional mechanisms by which school outreach may indirectly affect student learning.

Another possible explanation for why outreach is directly associated with student achievement in these analyses may be that schools with more outreach to families have greater family and school consensus about appropriate academic behaviors (Hill & Taylor, 2004; McNeal, 1999). With more shared information and greater consensus about students' work in school, there should be greater consistency in the messages students hear at school and at home about the importance of learning and behavior. Students exposed to more consistent messages about math and reading may internalize these attitudes and work harder in school and on school tasks, even in kindergarten. This suggests that student motivation and academic engagement may be mediating factors that explain why school outreach translates into student achievement. It is clear that further research is needed to investigate and validate various mechanisms underlying the relationship between school outreach to engage families, families' responses that influence their children, and student achievement.

A third possible explanation is that the relationship between school outreach and student achievement is an artifact of how the measure of school outreach was collected from principals. Because this measure of school outreach was based on principals' reports, they may reflect principals' perceptions of the school or personal values about family involvement, rather than actual practices implemented. Principals in schools with more supportive families, for instance, may perceive the school as conducting more outreach when this is not the case. Future studies are needed to investigate this possibility. We believe, however, that the advantages of having independent measures of school outreach, family involvement, and student achievement outweigh the potential bias that results from using principal perceptions to measure school outreach to families.

This study addressed several gaps in the literature on parent involvement and early education, making an important contribution by showing that children's early academic achievement is, in part, a function of schools' efforts to engage families and parents' efforts to help their children achieve and succeed in school. These findings suggest that, at least in the beginning years of children's schooling, teachers and administrators should implement practices to engage, involve, and inform student's families and create opportunities for family involvement in reading-related and math-

related activities at school and at home. By establishing stronger relationships and connections with families, parents are more likely to get involved at the school and students are more likely to make greater gains in reading and math skills.

The present study has implications for educators and educational practice. The findings confirm the importance of family involvement on students' reading and math achievement from the beginning of children's school careers. They also suggest that schools and educators can increase the frequency of family involvement at school by extending invitations to and communicating with families more frequently, and that this form of involvement contributes to students' growth in reading and mathematics achievement during kindergarten.

Also, this study shows that parental expectations are predictive of cognitive gains and achievement in kindergarten. This form of involvement, however, did not appear to be influenced by the wide range of efforts schools made to engage families. Nevertheless, the findings that parental expectations for their children predict reading and math achievement in kindergarten suggests that educators need to maintain a strong relationship with parents and help raise or maintain expectations regarding their children's educational attainment. Parents who did not envision their children going to college appear less likely to have kindergarteners who learn as much in their first year of schooling. To make this happen, educators need to go beyond the "low-intensity" contacts (Pianta et al., 1999) and begin to have more rich conversations with families about what and how their children are doing in school.

#### 6.4. Limitations and future directions

Because we used survey data and did not conduct a randomized experiment, we were not able to estimate a causal relationship between school outreach and family involvement or students' achievement gains. It is possible that the observed associations between key variables and achievement gains are driven by differential selection of students into schools with particular levels of school outreach. It also may be that this study omitted key variables that are also associated with the outcomes of interest or with the nature and extent of school outreach. Also, as we stated previously, it is possible that the school outreach variable represented other school variables such as principals' leadership or attitudes about family involvement that affect student outcomes and family involvement. Although we included schools' concentration of minority students and aggregate levels of education as indicators of school quality and access to resources, and we modeled changes in achievement from fall to spring of the school year, future studies should strive to directly measure additional variables in order to identify the independent, unbiased impact of school outreach on students' achievement and family involvement.

Future studies should also take advantage of the longitudinal nature of the ECLS-K data set by analyzing whether and to what extent school outreach and family involvement vary across grade levels during the elementary grades. The data also can be used to study the effects of time-varying family involvement models on children's cognitive growth over time. Because this study analyzed only two waves of achievement data, we were not able to capture "true growth" in student achievement in reading and math (Rogosa, 1995). To confirm that our estimates using models with achievement in the fall of kindergarten as control were robust, we also estimated analytical models using "difference scores," where the dependent variable was the difference between spring achievement scores and fall scores. Our analyses found similar levels and patterns of statistical significance to the findings presented here. As a result, our estimates do appear robust and reliable.

Future studies are needed that include stronger measures of school outreach and family involvement. Cronbach's alphas of the

family involvement at school and school outreach scales (0.58 and 0.64, respectively) were somewhat low suggesting that the internal consistency of the items was weak. It is possible that the reliability of the scales would have been stronger with targeted measures of family involvement at school that separated different kinds of school involvement. Also, the school outreach measure used in this paper mainly focused on the extent to which principals believed teachers were working to get parents to events or volunteer at the school and promote teacher–parent communication, but did not ask principals the extent to which school personnel were supporting or encouraging parent–child interactions at home. In the same way we need research that examines how different forms of involvement affect different outcomes, we also need studies that will identify how different forms of school outreach activities influence specific family attitudes and actions.

Finally, although the results are based on a national sample and the findings are representative of all kindergarteners and their families, more work is needed on this topic. The findings here are based on average effects and should not be taken to mean that the interactions and influence processes are equally valid for different groups. Several research studies have shown that family involvement levels and processes differ across socioeconomic and ethnic/racial sub-groups (Davis-Kean, 2005; Hill et al., 2004; Hill & Craft, 2003; McWayne et al., 2008), making it vital that the findings of the present study be examined across different sub-groups of families. Continued analyses are needed to examine variations in the relationships among family involvement, school outreach, and children's achievement, for families from different racial and socioeconomic groups, and at different grade levels.

The findings from this study provide new evidence that school outreach is effective at getting more families involved at school and that these activities are related to students' reading and math achievement gains during kindergarten. Analyses suggested that the effect sizes of the school outreach and family involvement variables were modest, yet encouraging. By comparing this study's effect sizes for key variables to the effect sizes of other highly influential variables (i.e., parents' educational attainment), we found that, in relative terms, family involvement and school outreach had noticeable associations with students' achievement gains in reading and math in kindergarten.

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