An Investigation of Language-Minority Children: Demographic Characteristics, Initial Performance, and Growth in Achievement

CSE Technical Report 686

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June 2006

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The work reported herein was supported under the National Center for Education Statistics, Institute of Education Sciences, Award Number Q3036031101, as administered by the American Institutes for Research, Office of English Language Acquisition, Language Enhancement, and Academic Achievement for Limited English Proficient Students, U.S. Department of Education.

Review Process

This report is a product of the Language Minority Children Analysis Project and was independently peer reviewed by scholars from the National Center for Education Statistics (NCES) and from the National Center for Research on Evaluation, Standards and Student Testing (CRESST). The reviewers with the background to match the content of the manuscript were selected by both organizations and were anonymous to the authors.

AN INVESTIGATION OF LANGUAGE-MINORITY CHILDREN: DEMOGRAPHIC CHARACTERISTICS, INITIAL PERFORMANCE, AND GROWTH IN ACHIEVEMENT

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Abstract

Research on language-minority (LM) children has generally focused on language as the primary mediator of student achievement without considering other student demographic characteristics. This is unfortunate, as studies that approach language-minority children as a homogeneous group will misestimate relationships between language status and academic achievement. Moreover, extant research is often hampered by its lack of focus on language-minority students' cognitive growth over time. Using data from the Early Childhood Longitudinal Study, Kindergarten Cohort of 1998-1999 (ECLS-K) and growth curve analyses within a three-level hierarchical framework, this report examines the academic skills of LM children as they enter kindergarten and progress through first grade.

This report defines language-minority children as those having a primary home language other than English. A further distinction is made between language-minority children who are English proficient (LM/P) and those who are not proficient (LM/NP), although examinations of LM/NP children using the regular ECLS-K cognitive assessments are limited to mathematics and Hispanic (Spanish-speaking) LM/NP children.

Descriptive findings stress the diverse socio-demographic and academic backgrounds of language-minority children. Many LM children have highly-educated and affluent parents, while others come from families with few social or economic resources. Some LM children enter school with well-developed literacy and numeracy skills, while others exhibit few initial academic competencies. Despite this considerable variability, one theme that permeates this report is the socioeconomic and academic disadvantage among Hispanic LM children.

Unsurprisingly, Hispanic LM/P children enter kindergarten with fewer English skills than non-LM children. However, Hispanic LM/P children's initial literacy skills also lag behind those of other LM/P children. Much of this initial disadvantage is explained by the relative socioeconomic disadvantage of Hispanic LM/P children. Not coincidentally, non-Hispanic LM/P students and their non-LM peers share similar

socioeconomic and academic backgrounds. In terms of literacy learning, during kindergarten, Asian LM/P children erase the small literacy gap that separates them from non-LM children. The Hispanic LM/P literacy disadvantage, however, remains relatively constant during kindergarten and first grade and actually *increases* during the intervening summer months.

As with literacy, Hispanic LM/P children enter kindergarten with fewer mathematics skills than their non-LM peers. An even larger mathematics skills gap separates Hispanic LM/NP and non-LM children. For both groups, a substantial proportion of these initial achievement differences can be explained by their socioeconomic disadvantage compared to non-LM children. Although Hispanic LM/P children gain mathematics skills at rates comparable to Hispanic non-LM children, Hispanic LM/NP children fall even further behind during kindergarten (but learn at similar rates during the summer and first grade). Non-Hispanic LM/P children enter kindergarten and end first grade with mathematics skills equal to non-LM children.

Introduction

The number of language-minority children in the U.S. has doubled over the last 20 years (NCES, 2003). Despite their increasing numbers, there is still much we do not know about their cognitive development, particularly the social and academic factors influencing that development. This report presents findings from an analysis of the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K). These analyses examine the academic skills of language-minority (LM) children across two dimensions: as they enter kindergarten (initial status) and as they progress through the end of first grade (academic growth).

Both socioeconomic and sociocultural perspectives have traditionally guided research into the links between language status and student achievement (Rumberger & Larson, 1998). This paper draws from both traditions, recognizing that each dimension may play a role in initial academic achievement and subsequent cognitive growth. The primary goal of this report is to clarify the extent to which language status influences student learning directly or is simply a proxy for other socio-demographic characteristics associated with both language status and academic ability.

The Challenge of Classification

Educational classifications provide schools a way to organize students and provide services. Students are described using a primary characteristic, and then interventions are developed that are assumed to be oriented toward that

characteristic. The recent history of American schooling is replete with examples. In special education alone, 13 categories are used to describe various disabilities; talented and gifted programs are based on a classification; economic background identifies Title I children; and language-minority students are organized by degree of English proficiency. The logic of this approach has roots in aptitude-treatment interactions (Snow, 1977) and permeates much of our educational decision-making. Students are classified on the basis of defining characteristics (a priori aptitude, proficiency, or some other characteristic) and then a treatment is prescribed that is viewed as uniquely suited to that group of students. Thus, the term "interaction": the treatment is designed only for that group and viewed as inert for students without the defining aptitude, proficiency, or characteristic. Indeed, most educational labels describe student characteristics in an effort to prescribe treatment.

For language-minority children, this approach has considerable appeal, but little empirical validation. Recently, increasing resistance to this logic has become noticeable. In fact, one of the most vexing problems in education has been organizing students into groups to reflect specific aptitudes, proficiencies, or characteristics that are useful for developing potentially effective programs. Special education has a 30-year history of attempts to resolve this problem (see Research Report 100 from the Institute for Research on Learning Disabilities: Ysseldyke et al., 1982). Similar problems may be developing in research on language status, as LM children vary socially and academically, and functional treatment classifications are elusive. In general, research on LM children can be characterized as inadequately accounting for the myriad differences beyond language status between LM and non-LM children (Willig, 1985). This paper focuses on language classification more broadly by also considering children's socio-demographic backgrounds. It also moves beyond "snapshot" portraits of LM children by employing longitudinal growth modeling to better understand the relationship between student characteristics and cognitive growth.

Language Status and Student Demographics

Policymakers and researchers often mistakenly view language status as the "cause" of low achievement, rather than as a correlate with other socio-demographic characteristics that are themselves related to achievement (see Macias, 1993). However, sparse research describes this population with reference to these characteristics and their relationship to academic growth over time. Moreover, LM children are *themselves* a diverse group, differing widely in terms of socioeconomic

background and the educational and familial contexts in which they develop cognitively. For example, the parents of Hispanic immigrant children tend to have less education than those of European or Asian immigrant children (McArthur, 1993). Indeed, "we do English language learners [ELLs] a disservice if we think of them as one-dimensional on the basis of their limited English proficiency. ELLs have diverse backgrounds, languages, and education profiles…Many come from middle-class families with high levels of literacy; others live in poverty without books in their homes" (Short & Echevarria, 2005, p. 9-10). Considering the vast amount of variability that exists among *native* English speakers, these differences among language-minority children should come as no surprise.

The potential influences of this socio-demographic variability on children's development are many. For example, lower socioeconomic status (SES) immigrant children are more likely to live in ethnically homogenous neighborhoods, while higher-SES immigrants—who are socially and geographically more mobile—are more likely to live in heterogeneous communities where English is required in daily life (Portes & Rumbaut, 1990). Although all immigrant children face a certain period of adjustment, some children adapt to U.S. social and educational contexts faster than others (see Rumbaut, 1995). Positive social networks play an important role in these socio-cultural transitions, and access to such networks is often associated with familial socioeconomic resources (Stanton-Salazar, 2001).

One source of socioeconomic variability among immigrant families are the vastly disparate circumstances under which families immigrate to the United States. Some immigrant families bring considerable social, human, and economic capital to this country, while many others come with few resources. Lee's (1996) work on Asian-American youth and the "model minority" stereotype highlights the considerable social chasm that often separates Asian youth whose parents immigrated to the U.S. for high-skill jobs (often with advanced academic training) and Asian families who came from war-torn nations in Southeast Asia during the 1970s and early 1980s. In addition to socioeconomic differences, families who arrive in the U.S. with the aim of improved economic conditions—immigration to obtain a positive—may bring a different outlook than families who arrive out of political necessity—immigration to flee a negative (e.g., war-related violence; see Ogbu, 1978).

Clearly, it is difficult to group or classify students homogeneously, whether in reference to their language status or other personal characteristics. Another

approach that is more viable is to evaluate learning as a function of personal characteristics *and* initial performance with outcomes measured longitudinally. Rather than simply comparing LM and non-LM children, a more functional approach is to consider other personal characteristics (e.g. race/ethnicity, SES) while conceptualizing learning as a process composed of both initial performance and change over time (see Greene, 1997; Slavin & Cheung, 2003; Willig, 1985).

Data

The ECLS-K Data

This study uses data drawn from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), sponsored by the National Center for Education Statistics (NCES). These data are ideal for studying the relationship between language status and young children's learning, particularly with the statistical methods employed here. The ECLS-K base-year (1998) data collection had a stratified design structure. The primary sampling units were geographic areas consisting of counties or groups of counties from which about 1,000 public and private schools offering kindergarten programs were selected. A target sample of about 24 children was then drawn from within each school. ECLS-K collected data on the same children in the fall and spring of kindergarten, the fall and spring of first grade (with a random sub-sample in the fall), and in the spring of third and fifth grades. Achievement data were collected at each wave through adaptive, individually-administered, un-timed, cognitive tests. Data were also collected from parents through structured telephone interviews, and from each child's teacher and school through written surveys. This paper focuses on the reading and mathematics assessments and data from the first four waves—the beginning of kindergarten through the end of first grade.

Measuring Language Status

Central to any examination of language-minority children is the conceptualization of "language-minority" itself. How should researchers operationalize language status? One could take a circular approach by defining LM children as those having limited English skills. Among the many problems with this solution is that some children whose first language *is* English also have limited literacy skills. Moreover, other children are perfectly fluent in English, but their primary home language is not English. Relying on school records presents other challenges. Some schools do not offer LM services, and therefore do not identify

children as such. Conversely, schools that do provide LM services sometimes underestimate or overestimate children's language skills, especially among young children new to school; some LM children are not identified, whereas children who are English proficient are labeled LM. In short, definitions of LM status based on English proficiency can be quite misleading.

This report takes a straight-forward, two-stage approach. First, children are considered "language-minority" (LM) if their primary home language is not English. Second, because home language is not necessarily an indicator of English fluency, these analyses distinguish between language-minority children who are and who are not English proficient. ECLS-K administered a language-screening assessment to children who were identified by teachers or school records as having a primary home language other than English. The language screening assessment sought to determine whether these children had sufficient English skills to participate in the cognitive assessments. The assessment employed three of six scales from the Pre-LAS 2000, a language assessment for use with pre-kindergarten through first graders (NCES, 2002). ECLS-K refers to this assessment as the Oral Language Development Scale (OLDS), which measured children's "listening comprehension, vocabulary, and ability to understand and produce language" (NCES, 2001, p. 2-3).

Children scoring 37 or above (out of a possible 60) on the OLDS were labeled "English proficient." Roughly half (50.3%) of children who were administered the OLDS passed and subsequently completed the full literacy and mathematics cognitive assessments. This report considers such children "language-minority/proficient" (LM/P). Language-minority children who did not pass the OLDS were labeled "language-minority/non-proficient" (LM/NP). Non-Spanish-speaking LM/NP did not participate in the cognitive assessments. However, Spanish-speaking LM/NP children were given a Spanish version of the mathematics assessment. As such, analyses of literacy learning in this paper include only non-LM and LM/P children, while the mathematics analyses include non-LM, LM/P and Spanish-speaking LM/NP children. Of the 1,347 children who did not pass the OLDS at the start of kindergarten, virtually all were retested in the spring. Of these, roughly one-third (37.1%) passed it the second time, and were administered the full set of cognitive assessments. This report considers such children to be English proficient (LM/P). In order to capture the unique intersections of race/ethnicity and language status, the analyses further distinguish among Hispanic LM/P, Hispanic LM/NP, Asian LM/P, and Other race/ethnicity LM/P children.

Descriptive Findings

Academic Skills.

Table 1 examines the relationship between language-minority status and children's cognitive abilities during kindergarten and first grade. Children are organized into five groups based on language status: 1) children for whom English is the primary home language ("non-language-minority" [non-LM]); 2) Hispanic children for whom Spanish is the primary home language, but who are English proficient (Hispanic "language-minority/proficient" [LM/P]); 3) Hispanic children for whom Spanish is the primary home language and who are not English proficient (Hispanic "language-minority/non-proficient" [LM/NP]); 4) Asian children for whom English is not the primary home language, but who are English proficient (Asian LM/P), and; 5) White, Black, Native American and multi-racial children for whom English is not the primary language, but who are English proficient (Other LM/P).

The most striking finding in Table 1 is the considerable academic difference that distinguishes Hispanic LM children (all differences $p < .05$). On average, Hispanic LM/P children enter kindergarten with a 0.43 standard deviation (SD) disadvantage in literacy skills compared to non-LM children (19.68 vs. 23.25; $8.31_{\text{pooled SD}}$). This gap narrows during kindergarten to 0.32 SD, despite increasing variability in children's literacy abilities (30.18 vs. 33.48; $10.36_{\text{pooled SD}}$). The gap then remains stable during the summer at 0.34 SD (34.89 vs. 39.11; $12.25_{\text{pooled SD}}$) and during first grade at 0.31 SD (52.83 vs. 56.78; $12.78_{\text{pooled SD}}$). In short, Hispanic LM/P children enter kindergarten with considerably fewer English skills, close the gap with non-LM children somewhat during kindergarten, but learn at rates comparable to non-LM children through the end of first grade.

The mathematics gap distinguishing Hispanic LM/P from non-LM children is equally large. Hispanic LM/P children begin kindergarten at a 0.59 SD mathematics disadvantage compared to non-LM children (16.24 vs. 20.39; $7.01_{\text{pooled SD}}$). As with literacy, Hispanic LM/P students narrow the initial mathematics gap somewhat to 0.54 SD during kindergarten (24.04 vs. 28.62; $8.47_{\text{pooled SD}}$). The gap narrows even further during the summer to 0.37 SD (30.30 vs. 33.71; $9.24_{\text{pooled SD}}$), but remains relatively stable through the end of first grade at 0.41 SD (40.83 vs. 44.29; $8.45_{\text{pooled SD}}$).

Recall that Hispanic LM/NP children were not administered the literacy assessment, but did complete a Spanish-equivalent version of the mathematics assessment. As Table 1 suggests, the mathematics gap between Hispanic LM/NP and non-LM children at kindergarten entry is almost *twice* as large as that between Hispanic LM/P and non-LM children. An initial one-standard deviation gap separates Hispanic LM/NP children from non-LM children (13.04 vs. 20.39; $7.01_{\text{pooled SD}}$), which remains stable through the end of the summer. During first grade, the gap narrows somewhat to 0.86 SD (36.87 vs. 44.29; $8.61_{\text{pooled SD}}$).

Unlike the lower-levels of achievement among Hispanic LM children, the academic abilities of non-Hispanic LM/P and non-LM children are comparable; indeed, in most instances, identical. One exception is found among Asian LM/P children, who learn somewhat more than non-LM children during kindergarten, resulting in a 0.40 SD advantage (36.83 vs. 33.48; $8.47_{\text{pooled SD}}$; $p<.05$). However, non-LM children close this gap over the summer months to begin first grade with comparable skills. But again, Asian LM/P children learn at a slightly faster rate during first grade to finish the year with a 0.43 SD advantage (60.61 vs. 56.78; $8.61_{\text{pooled SD}}$; $p < .05$).

Because few cognitive differences exist between Asian LM/P, Other LM/P, and non-LM children, the remainder of this report focuses on the lower levels of academic achievement among Hispanic LM children relative to all other children—*including other LM/P children*. One potential explanation for these academic differences between Hispanic LM/P and non-Hispanic LM/P children is that although all LM/P children passed the OLDS language screening test, considerable variability in English fluency remains among LM/P children. Specifically, Hispanic LM/P children are the least fluent LM/P group. A 0.26 SD gap on the OLDS separates Hispanic LM/P from Asian LM/P children ($p < .05$) and an even larger 0.44 SD gap separates Hispanic LM/P from Other-LM/P children ($p < .05$).

But more substantive explanations may exist as well. In addition to language status, Hispanic LM/P and LM/NP children may differ socio-demographically from other children. In this sense, language-minority status may simply be a proxy or an indicator of other factors that are themselves related to cognitive ability and cognitive growth. The remainder of this report seeks to untangle these unique associations between language status, academic performance, and other child characteristics that correlate with academic development.

Socio-Demographic Background

Table 2 examines the relationship between language status and children's social and academic backgrounds. How do language-minority children and native English speakers differ across dimensions other than language status? As with academic achievement, the greatest disparities are found between Hispanic LM and all other children. Most prominent is the socioeconomic disadvantage that characterizes Hispanic LM/P and LM/NP children. Compared to native English speakers, Hispanic LM/P children are over three times as likely to come from low-SES families (42.5% vs. 13.5%; $p < .05$), while Hispanic LM/NP children are over *five* times as likely as non-LM children to come from low-SES homes (71.1% vs. 13.5%; $p < .05$). Viewed cumulatively, almost nine out of ten Hispanic LM/NP children can be counted among the nation's least-advantaged 40%.

The absence of socioeconomically advantaged Hispanic LM/P and LM/NP children is equally apparent. Although 21.6% of non-LM children live in high-SES families, less than 7% of Hispanic LM/P and less than 2% of Hispanic LM/NP children are so fortunate ($p < .05$). Unlike their Hispanic LM counterparts, Asian LM/P and Other LM/P children are *over*-represented among socioeconomically advantaged families: almost 30% of Asian and Other LM/P children come from high-SES homes ($p < .05$). This socioeconomic variability among LM children highlights the fact that some families immigrate with considerable social, human, and economic capital, while many others bring few resources to assist their transitions. These considerable socioeconomic differences may further explain why Asian LM/P and Other LM/P children outperform their Hispanic LM peers, who are a much more uniform group, sharing the common tie of socioeconomic disadvantage.

Nativity, citizenship, and home language patterns. LM children are less likely than non-LM children to have been born in the U.S. or to be U.S. citizens, although the differences are less than one might expect. Virtually all non-LM children were born in the U.S. or are U.S. citizens. Hispanic LM/NP children are the least likely to have been born in the U.S. or to be U.S. citizens (83.8% and 84.9%, respectively). By definition, language patterns also differ between homes in which English is and is not the primary language. However, home language patterns also vary *among* LM children. Between one-third and one-half of LM/P children have a parent who regularly speaks English to them, compared to only 12.5% of Hispanic LM/NP

children. Between one-half and two-thirds of LM/P children regularly speak English to at least one parent, while only 13.6% of Hispanic LM/NP children do so.

Across the three LM/P groups, LM/P children are more likely to speak English to a parent than to have a parent reply in English. This would suggest that on average, LM/P children have greater English facility than their parents (although again, this pattern varies across LM/P groups). Conversely, Hispanic LM/NP children and their parents appear to be equally non-fluent. For Hispanic LM/NP children, these lower levels of parental English fluency—combined with reduced familial human and financial capital—may serve as additional challenges to achieving at levels comparable to their non-LM and even LM/P peers.

Other socio-demographic characteristics. On average, Hispanic LM/NP and Asian LM/P children are over a month younger than non-LM children at kindergarten entry ($p < .05$). Asian LM/P children are also almost half as likely as non-LM children to live in a single-parent home (11.4 vs. 21.0%; $p < .05$). Compared to non-LM children, Hispanic LM/P, Hispanic LM/NP, and Asian LM/P children are slightly less likely to receive full-day kindergarten instruction ($p < .05$). Interestingly, Hispanic LM/P children are almost twice as likely to be kindergarten repeaters as non-LM children (7.3% vs. 3.8%; $p < .05$), which may partly explain their elevated performance on the OLDS assessment. Put simply, their designation as "proficient" may reflect this additional year of kindergarten instruction.

ESL instruction. The focus of this report is the relative academic performance of LM and non-LM children. As such, it does not examine the effectiveness of various types of ESL instruction, which is noted here for descriptive purposes only. Unsurprisingly, Hispanic LM/NP children are far more likely than LM/P children to receive ESL instruction. Roughly three-quarters of Hispanic LM/NP children receive in-class ESL instruction in kindergarten, while almost 10% receive ESL instruction outside the regular classroom. Slightly more Hispanic LM/NP children receive pull-out instruction in first grade. The fact that Other LM/P children are the most fluent LM group (as indicated by the OLDS assessment) likely explains their lower rates of ESL participation.

Multivariate Findings

The statistical analyses in this section focus on two primary issues. First, the models estimate entering academic differences between LM and non-LM children and then determine the extent to which these disparities are related to children's

socioeconomic rather than linguistic backgrounds. Second, the models go beyond simple cross-sectional approaches to explore the *learning* rates of LM and non-LM children from the beginning of kindergarten through the end of first grade. Explorations of cognitive *growth* rather than cognitive *status* offer a more powerful view of children's intellectual experiences in school.

For three reasons, the analytic results presented in this section differ slightly from the descriptive results presented above. First, the relationships discussed above are across all children, regardless of the school attended. These multivariate analyses, however, provide within-school estimates that compare the average academic performances of LM and non-LM children *within the same school*. Second, the descriptive statistics in Tables 1 and 2 compared LM to non-LM children of all races and ethnicities. Here, in order to identify the unique associations between language status and race/ethnicity, the comparison group is White, non-LM children. As such, the LM/non-LM differences tend to be somewhat smaller. Third, on average, the cognitive assessments were administered between one and two months after school started and before school ended. The scores presented in Table 1 thus represent only a portion of the learning that actually occured during the school year. The estimates here, however, more accurately capture learning from the very beginning of the school year to the very end.

Initial status: literacy. As the descriptive statistics suggested, LM and non-LM children differ across many dimensions other than language status. Moreover, LM children are *themselves* a diverse group. Model 1 in Table 3 presents the unadjusted literacy gaps separating Hispanic LM/P, Asian LM/P and Other LM/P children from non-LM children as they enter kindergarten. The intercept in Model 1 (20.28 points) is the predicted entering score for a White, non-LM child. The presence of the Hispanic*LM/P and Asian*LM/P interaction terms requires careful interpretation of each predictor. The Asian and Hispanic coefficients are the effects for non-LM Asian and Hispanic children respectively, while the Black and Other Race/Ethnicity coefficients represent effects *controlling* for LM status. Note that the LM/P first order term, which is the LM/P effect only for the smaller number of White, Black, and Other-Race/Ethnicity LM/P children, is non-significant. The focus is therefore on the LM/P effect for Asian and Hispanic children.

On average, Asian non-LM children enter kindergarten with a 4.07 point literacy advantage over their White peers, while Asian LM/P children enter 4.73 points below Asian non-LM children (or 0.66 points below non-LM children; $p <$

.05). As the descriptive statistics in Table 1 indicated, the entering skills of Hispanic LM/P children differ markedly from those of Asian LM/P children. On average, Hispanic non-LM children start kindergarten 2.34 points *below* White non-LM children, while Hispanic LM/P children enter an additional 2.49 points below Hispanic non-LM children ($p < .05$). This represents an almost five-point entering literacy gap between White non-LM and Hispanic LM/P children. In other words, Asian LM/P children enter kindergarten with more advanced literacy skills than Hispanic *non*-LM children. However, considerable socio-demographic differences separate Asian and Hispanic children which the models have not yet taken into account. Models 2 and 3 examine the extent to which these entering achievement gaps are related to language status, or to other socio-demographic characteristics related to both language status *and* academic achievement.

Model 2 incorporates socioeconomic status, revealing a consistent relationship between SES and entering achievement. Even after controlling for language status and race/ethnicity, low-SES children begin kindergarten 2.79 points below their middle-SES peers, while high-SES children enter with a 3.86 point advantage over middle-SES children ($p < .05$). Central to the focus of this paper, once SES is taken into account, the gap between Hispanic non-LM and Hispanic LM/P children is eliminated; the Hispanic*LM/P interaction term is no longer statistically significant. Thus, the entering literacy gap between Hispanic non-LM and Hispanic LM/P children is an artifact of socioeconomic difference, not language status, per se. However, the gap between Asian non-LM and Asian LM/P children is reduced only slightly once SES is taken into account (from -4.73 to -4.40). This is unsurprising, as the SES gap separating Asian non-LM and LM/P children is much smaller than that between Hispanic non-LM and LM/P children.

Model 3 takes into account additional child characteristics, including gender, whether the child was repeating kindergarten, age, and single-parent status. Incorporating these measures into the model does not substantially alter the effects for Hispanic and Asian LM/P children. Children's place of birth and citizenship status, the extent to which parents and children spoke English to one another, and the number of siblings were non-significant predictors of either initial status or growth in either literacy or mathematics. To increase model parsimony, subsequent models do not include these predictors.

Initial status: mathematics. In two respects, the mathematics models presented in Table 4 differ from the literacy models in Table 3. First, the mathematics models

now include Hispanic LM/NP children, who completed a Spanish version of the mathematics assessment. Second, the math models do not include Asian*LM/P interaction terms, as no entering mathematics differences were detected between Asian non-LM and LM/P children (see Table 1).

The intercept in Model 1 (18.29) is the predicted entering math score for the average White, non-LM child. Mirroring the descriptive information in Table 1, the non-significant LM/P coefficient—the predicted entering score for non-Hispanic LM/P children—suggests no entering math differences between non-LM children and non-Hispanic LM/P children. Moreover, Hispanic non-LM and LM/P children enter kindergarten with similar skills. However, on average, Hispanic LM/NP children enter 3.46 points below Hispanic non-LM children ($p < .05$). This again suggests an even larger 5.86 point gap between Hispanic LM/NP and non-LM children.

The lower level of initial mathematics ability among Hispanic LM/NP children is related to their relatively disadvantaged socioeconomic backgrounds. Accounting for SES in Model 2 explains roughly one-third of the gap between Hispanic non-LM and LM/NP children (the coefficient is reduced from -3.46 to -2.40). In Model 3, which incorporates the remaining child-level characteristics, the Hispanic LM/P coefficient remains non-significant, and the Hispanic LM/NP coefficient is reduced only slightly.

Literacy learning trajectories. Table 5 presents growth curve estimates of children's literacy learning in kindergarten, summer, and first grade. All coefficients are in a "points per month" metric. The intercept for kindergarten literacy learning in Model 1 suggests that on average, White, non-LM children gain 1.67 points per month ($p < .05$). Asian LM/P children tend to experience some "catch-up" in literacy during kindergarten, gaining 0.42 points more per more than Asian non-LM children. However, Hispanic LM/P, Other LM/P and non-LM children learn at the same rates during kindergarten. Importantly, this suggests that the initial gap separating Hispanic LM/P and non-LM children remains constant throughout kindergarten. This estimate closely mirrors the descriptive findings from Table 1. In Model 2, which accounts for the additional child-level covariates, these learning rates remain parallel, while the Asian LM/P advantage is sustained.

Unsurprisingly, children gain fewer literacy skills during the summer months when they are not in school. As the first summer learning model suggests, the

average White, non-LM child gains 0.15 points per month ($p < .05$) compared to the much larger 1.67 points-per-month learning rate during kindergarten. However, unlike kindergarten, during the summer months Hispanic LM/P children gain almost two points *less* per month than Hispanic non-LM children ($p < .05$), thus widening the achievement gap. During the school year, literacy development among Hispanic LM/P children is likely supported, but during the summer months, when they are less likely to experience English-speaking contexts, their learning rates are lower than those of their Hispanic non-LM peers.

As with kindergarten, first-grade children gain literacy skills quickly (an average of 2.60 points per month; $p < .05$). Importantly, non-LM and LM/P children gain skills at comparable rates during first grade. For Hispanic LM/P children, this can be interpreted as a "glass is half full" or "glass is half empty" finding. Although it is welcome news that the initial Hispanic LM/P literacy achievement gap does not *widen* during kindergarten and first grade, it does not *narrow* either.

Table 5 includes other important findings as well. Even after controlling for the other covariates, Black children gain fewer literacy skills than White children during kindergarten (0.26 points less per month during kindergarten, and 0.15 points less during first grade; $p < .05$). Similarly, low-SES children gain 0.07 points less each month during kindergarten than their middle-SES peers and 0.11 points less per month less during first grade ($p < .05$). These lower learning rates exacerbate the already considerable literacy gaps that exist at kindergarten entry (see Table 3). Kindergarten repeaters gain 0.20 points less each month during both kindergarten and first grade ($p < .05$). This finding supports extant research suggesting that kindergarten retention is an ineffective remediation strategy. Also supporting existing research, these models suggest that children receiving full-day kindergarten gain roughly one-quarter point more per month than those attending half-day kindergarten, although their full-day peers make up considerable ground during first grade ($p < .05$).

Mathematics growth trajectories. Table 6 presents the growth curve estimates for mathematics learning. From the beginning of kindergarten through the end of first grade, the learning rates of Hispanic non-LM and Hispanic LM/P children are indistinguishable. However, as Model 1 suggests, Hispanic LM/NP children gain approximately one-quarter points less per month of kindergarten than Hispanic non-LM children, who themselves gain 0.07 points less per month than

non-LM students ($p < .05$). These learning gaps are reduced only slightly once SES is accounted for in Model 2.

As with literacy learning, Black children fall even further behind White children during kindergarten, while other-race/ethnicity children experience reduced summer mathematics learning compared to their White peers. It is important to again stress that these slower learning rates compound already sizable entering cognitive differences. With first grade mathematics learning, however, there is some "catch up" among particular groups of children: children who did not receive full-day kindergarten, middle-SES (compared to high-SES), and White (compared to Asian) children.

Summary and Conclusions

Examining Language Status

This examination of LM children's cognitive growth leaves one fundamental question that is independent of its findings: on what criteria should schools (or researchers) determine children's language status? Among very young children—including those participating in ECLS-K—determining language status based solely on literacy incorrectly captures a large proportion of children for whom English is the primary language, but who have not yet developed literacy skills. In this sense, one can certainly argue that *all* five-year-olds are "English language learners." Conversely, many children with well-developed literacy skills may speak English fluently, although it is a second language. The approach taken in this paper—conceptualizing language-minority children as those for whom English is not the primary home language—also has conceptual difficulties. Foremost among our concerns is that such a typology includes children who are fluent in more than one language. Moreover, our results suggest that even in homes where English is not the primary home language, many parents regularly speak English to their child. Perhaps more importantly, the children in such homes tend to be more fluent than their parents, with from one-third to one-half regularly speaking English to a parent.

This raises questions regarding research approaches to language-minority status. The focus of such research is certainly not high-achieving children who speak non-English at home. Rather, its concern is with the relationship between English fluency and other social and academic outcomes of schooling. Indeed, the results of this report suggest that language-minority children are not inherently low achieving. Just as race and ethnicity are conceptualized as "markers" of academic

achievement, language status may (or may not) be related to student learning. Therefore, we contend that concern with language-minority children should be tied to a concern about academic performance.

Yet another challenge inherent in statistical analyses of LM children (once defined) is their social and academic heterogeneity. Research that does not recognize the socio-demographic and cognitive variability among LM children will certainly misestimate the relationship between language status and student learning. Many LM children have affluent and highly-educated parents, while others come from families with limited social and economic resources. For example, in the work presented in this paper, treating Hispanic, Asian, and other-race/ethnicity LM children as a unitary group would have radically reduced the relationship between language status and both initial achievement and growth. Compared to Asian LM/P and Other LM/P children, Hispanic LM/P and LM/NP children enter kindergarten with considerably fewer literacy and mathematics skills. Importantly, this initial gap is maintained through at least the end of first grade. Thus, combining these quite disparate LM populations would radically reduce the relationship between LM status, initial achievement and cognitive growth.

Hispanic LM Children's Unique Achievement Patterns

Among the most important findings of this study are the disparate levels of academic achievement between Hispanic LM/P, Hispanic LM/NP and non-Hispanic LM children. Although Hispanic LM/P and LM/NP children enter kindergarten with considerably fewer academic skills than non-LM children, Asian LM/P and Other LM/P children enter kindergarten with comparable cognitive skills. These academic differences may be related to *cultural* differences between Hispanic and non-Hispanic LM children—differences that survey data cannot capture. A more quantifiable explanation offered by the available data is the socioeconomic gulf that isolates Hispanic LM children. The greater human and economic capital possessed by non-LM and non-Hispanic LM families certainly influences children's early learning. Moreover, these familial resource differentials are likely related to differences in peer and neighborhood contexts. These considerable social and academic differences again highlight the tremendous variability within the LM student population. Furthermore, even after controlling for the other covariates, considerable variability remains in initial status. This suggests further analyses of the early childhood experiences of LM and non-LM

children. Such analyses using ECLS-K would obviously be descriptive in nature, as the first wave of assessments did not occur until kindergarten.

Examinations of Achievement vs. Growth

The ultimate goal of school reform is to raise average achievement while simultaneously reducing overall variability in achievement—certainly not an easy task. In a growth curve analytic context, student learning would ideally be characterized by positive learning slopes with an overall decrease in variability—the "fan-close" pattern of cohort growth. Unfortunately, with the nationally representative ECLS-K, we do not detect this pattern. Although virtually all ECLS-K children gain skills during kindergarten and first grade, variance in both literacy and mathematics skills increase as children progressed through school. Put simply, children learn at different rates, a distinction overlooked by cross-sectional analyses.

This recognition that variability in achievement increases over time raises at least two questions related to educational equity and school accountability. *First*, to what extent should schools be held accountable for achievement gaps among children that existed prior to school entry? *Second*, to what extent should schools be held accountable for children's *learning* once they begin school? Regarding the first question, schools are clearly not responsible for disparities in student achievement that they did not create. However, to the extent that initial achievement gaps are related to social and structural inequalities, we—including schools—share a *collective* responsibility. Regarding the second question, learning is precisely how students, teachers, and schools *ought* to be evaluated. Assessment based on any other criteria clearly ignores the very real cognitive differences that exist among children as young as five-year-olds. The results presented here highlight this often ignored point.

As this paper hopefully demonstrates, education researchers now possess the technology to accurately capture and measure children's learning over time. More importantly, this learning can be modeled based on student and contextual factors (e.g., classrooms and schools). Although not the focus here, with equal effectiveness, these methodological advances can evaluate school performance. If our aim is to assist LM children in reaching their full academic potentials, we must craft accountability systems capable of measuring both achievement *and* learning. The work presented in this paper hopefully moves us toward such a system.

Methodology and Technical Notes

Analytic Sample

From the ECLS-K full sample, the analytic sample was collected in six stages. First, children were chosen who (1) had a non-missing weight; (2) remained in the same school in kindergarten and first grade; (3) advanced to the first grade following the 1998-1999 kindergarten year; (4) were not enrolled in a year-round school, and; (5) had complete language status, race/ethnicity and SES data. The final selection stage produced two distinct samples. Language-minority children who did not pass the OLDS did not participate in the literacy assessment. However, children who did not pass the OLDS but whose primary home language was English took a Spanish version of the mathematics assessment. As such, the analytic sample used to evaluate children's mathematics is somewhat larger than that for literacy. For each sample, children were selected who had test scores for three of the four assessment waves.

The final analytic sample for literacy learning includes 33,227 test scores nested within 10,059 children nested within 749 schools. The final analytic sample for mathematics learning includes 34,469 test scores nested within 10,425 children nested within 750 schools. A missing data analysis revealed that these final sub-samples were somewhat more socioeconomically advantaged than the full ECLS-K sample, with fewer language-minority children and fewer children from the lowest SES quintile. The loss of lower-SES and language-minority children mostly occurred when restricting the sample by available test scores.

An Alternate Growth Curve Approach

Quantitative researchers have traditionally used ANCOVA or gain score models to measure change over time within individuals. Over the past several decades, however, social scientists have concluded that estimating change based on only two data points is inherently inadequate (see Bryk & Raudenbush, 1987; Seltzer, Frank, & Bryk, 1994; Rogosa & Willett, 1985; Willett, 1988). Myriad statistical and substantive issues have driven this methodological shift, although one central concern is shared: traditional approaches assume that variance in the outcome remains steady over time. This assumption *itself* implies that growth trajectories among individuals are perfectly parallel, "an entirely unrealistic state of affairs [that] is obvious even at the most casual glance" (Willett, 1988, p. 377).

As an alternative approach, educational researchers are increasingly using three or more data points to model growth rates and learning trajectories. Such analyses entail both within-individual and between-individual components (Willett, 1988). The growth rates of individuals are estimated in the first analytic phase, while the second phase focuses on the detection and *explanation* of systematic variance in individual growth rates (Rogosa & Willett, 1985). An endless array of potential explanatory covariates exists, including the characteristics of individual children, their classrooms and teachers, schools, peers, neighborhoods or educational interventions (Willett, 1988).

The comparative examination of learning rates among LM and non-LM children presented here falls within this relatively new theoretical framework. Specifically, the multivariate analyses consist of three-level HLM growth curve models with test scores (Level-1) nested within children (Level-2) nested within schools ([Level-3]; see Raudenbush & Bryk, 2002). The initial unconditional HLM analyses included a traditional third-degree polynomial model. This model revealed a non-linear growth pattern between the start of kindergarten and the end of first grade in both reading and mathematics, with increasing learning in kindergarten, decreasing learning over the summer months, and increasing learning in first grade. For two reasons, however, this paper does not develop the polynomial model further. First, the complexity of such models makes them rather difficult to interpret. Second, traditional growth models assume that the temporal distance between repeated measures is constant across individuals—an assumption broken by the data structure of ECLS-K.

Conceptualizing time. The ECLS-K data provide a unique challenge in modeling children's cognitive growth over time. This challenge, however, can be used to the researcher's advantage. The dates on which the ECLS-K assessments were given varied substantially across children. This is understandable given the enormity of the data collection involved with ECLS-K and the amount of time each one-on-one assessment required. In addition to variability in testing dates, the starting and ending dates of academic years varied across schools. The combined result is that children's opportunities to learn between assessments differed both within and among schools. For example, the time children were in school between fall and spring kindergarten assessments ranged from almost four to over eight months. For some children, the fall assessments took place months into the school

year and the spring assessments occurred before the end of the school year. The situation was similar in first grade.

Methodologically, the implication of this variability is that the four assessments do not represent comparable events in time across children. Further complicating the analyses, approximately *half* of the "summer vacation" between the spring kindergarten and fall first grade assessments includes time when children were actually in school. These considerations are especially crucial considering the rapid learning rates among very young children (see Burkam, Ready, Lee, & LoGerfo, 2004, for further discussion).

Due to these methodological issues related to ECLS-K, the HLM growth curve models presented here are conceptually and statistically quite different from typical growth curve models. Many studies of growth consider indicators of time as constant across cases (i.e., "third grade" represents an identical value or construct across individuals). The considerable variability in testing dates and school calendars discussed above suggests that the ECLS-K assessments represent disparate events across time. To address this challenge, the Level-1 models presented here include three time-varying covariates that indicate children's exposure to school at the time of each assessment: (1) months of exposure to kindergarten, (2) months of exposure to summer between kindergarten and first grade, and (3) months of exposure to first grade. For example, at the time of the first assessment the average child had been "exposed" to over 2 months of kindergarten, but 0 months of summer and 0 months of first grade. With the second assessment, the average child had been exposed to over 8 months of kindergarten, but still no exposure to summer or first grade. At the third assessment, the average child had been exposed to 9.5 months of kindergarten (a full year), 2.7 months of summer (the traditional summer vacation), and over a month of first grade. At the point of the final assessment, the average child had been exposed to 9.5 months of kindergarten, 2.7 months of summer, and over 8 months of first grade.

These three measures—each linked to the four assessment points—permit the modeling of four distinct parameters: (1) *initial status*, or children's achievement as they began kindergarten (literally, predicted achievement with exposure to 0 days of kindergarten, 0 days of summer, and 0 days of first grade). This initial estimate addressed the first research question: To what extent do LM and non-LM children enter kindergarten with comparable literacy and mathematics skills?

Rather than initial *status*, the three remaining parameters are linear *learning* rates or slopes over: (2) *the kindergarten year*; (3) *the summer between kindergarten and first grade*; and (4) *the first-grade year*. The estimates obtained from these three parameters collectively addressed the second research question: How can we characterize the learning rates of LM and non-LM children during kindergarten, summer, and first grade? To isolate the unique effects of language-minority status, the LM growth estimates obtained from these Level-2 models were adjusted for the many socio-demographic characteristics associated with both LM status and student learning. Again, the variability in testing dates permits this "slopes as outcomes" approach, where the slopes modeled are exposure to school. An additional benefit of this approach is that at each analytic level, all coefficients are in an easily interpretable metric: points of learning *per month* in kindergarten, summer, and first grade. As the focus of this paper is the relationship between child characteristics, language status, and cognitive development, the Level-3 (school-level) models are "unconditional" and do not include school-level measures. Rather, they simply control for systematic variance between schools, providing "within-school" learning estimates.

Weights. Because ECLS-K followed a multistage stratified sampling design, the data include a series of design weights. As with other longitudinal NCES datasets, analyses using ECLS-K require the use of weights to compensate for (1) unequal probabilities of selection (e.g., the intentional over-sampling of Asian/Pacific Islander children), and (2) non-response effects. Although our growth curve models consider achievement at four waves of the ECLS-K data, the "1234" panel ECLS-K weights are only defined on children in the sample at time 3. Hence, the use of those weights automatically restricts the sample to that small subgroup. Instead, these analyses employ the "124" panel weights which retain the larger sample. The descriptive and analytic analyses employ a child-level weight [C124CW0] to compensate for differential sampling both within and between schools. The ECLS-K school-level weight [S2SAQW0] was used with the multi-level growth-curve analyses. Both weights were normalized to reflect the smaller sample size.

Measures

Dependent measures: cognitive assessments. The ECLS-K cognitive assessments were administered individually, with an adult assessor spending between 50-70 minutes with each child (NCES, 2001). The literacy assessment was

designed to measure both basic literacy skills (print familiarity, letter recognition, beginning and ending sounds, rhyming sounds, word recognition) as well as advanced reading comprehension skills (initial understanding, interpretation, personal reflection, and ability to demonstrate a critical stance). These advanced literacy skills, which were assessed through verbal dialogue between the child and the assessor, measured children's ability to identify main points and connect text to their own personal backgrounds, as well as their critical thinking skills and the ability to distinguish real versus imaginary content. Mathematics assessment items measured conceptual and procedural knowledge and problem solving, with items equally divided between number sense and measurement. The scores on both the reading and mathematics assessments were separately equated using Item Response Theory (IRT), in order to make them appropriate measures of change over time. As suggested by Seltzer et al. (1994), these analyses use the IRT scale scores.

Language status measures. The models employ several interaction terms representing Hispanic LM/P children (yes=1, no=0); Hispanic LM/NP children (yes=1, no=0) and Asian LM/P children (all languages; yes=1, no=0). LM children from the remaining racial/ethnic groups presented a final methodological challenge. Statistically, the subgroup sample sizes of White LM, Black LM, and other race/ethnicity LM children were too small to support unique interaction terms. Substantively, it seemed unwise to create a unique interaction term composed of such a socio-demographically diverse group of children. Although this group is examined with the descriptive analyses, the multivariate HLM models do not employ a non-Asian/non-Hispanic LM interaction term. Rather, the main-effect LM coefficient estimates the "LM effect" for these non-Hispanic/non-Asian LM/P children *controlling* for race/ethnicity (and the remaining covariates in subsequent models).

Home language use. The models also incorporate two measures that capture home literacy environments. A series of dummy variables indicates: whether at least one parent regularly speaks English to the child (yes=1, no=0), and; whether the child regularly speaks English to at least one parent (yes=1, no=0).

Social and academic background. Children's socioeconomic status is captured with a composite measure of parents' income, education, and occupational prestige (used as quintiles in multivariate analyses, with the middle quintile as the comparison group). The analyses also employ a dummy-coded gender measure (girls=1, boys=0) and account for children's race/ethnicity with a series of dummy

variables indicating whether a child is Asian, Hispanic, African-American, or Other race/ethnicity, with White as the un-coded comparison group. The models further account for children's age (in months) and whether the child lived in a single-parent home (1=yes, 0=no). Academic background was captured by whether the child was repeating kindergarten (repeater=1, non-repeaters=0); and had full-day kindergarten (full-day=1, half-day=0).

References

Burkam, D. T., Ready, D. D., Lee, V. E., & LoGerfo, L. (2004). Social-class differences in summer learning between kindergarten and first grade: Model specification and estimation. *Sociology of Education, 77*(1), 1-31.

Bryk, A. S., & Raudenbush, S. W. (1987). Applications of hierarchical linear models to assessing change. *Psychological Bulletin, 101*, 147-158.

Greene, J. (1997). A meta analysis of the Rossell and Baker review of bilingual education research. *Bilingual Research Journal, 21*(2-3), 103-122.

Lee, S. J. (1996). *Unraveling the "model minority" stereotype: Listening to Asian American youth*. New York: Teachers College Press.

Macias, R. F. (1993). Language and ethnic classification of language minorities: Chicano and Latino students in the 1990s. *Hispanic Journal of Behavioral Sciences*, *15*, 230-257.

McArthur, E. K (1993). *Language characteristics and schooling in the United States, a changing picture: 1979 and 1989*. Washington, DC: National Center for Education Statistics.

National Center for Education Statistics. (2001). *ECLS-K base year public-use data files and electronic codebook.* Washington, DC: Author.

National Center for Education Statistics. (2002). *Early Childhood Longitudinal Study—Kindergarten Class of 1998-1999 (ECLS-K), psychometric report for kindergarten through first grade*. Washington, DC: Author.

National Center for Education Statistics. (2003). *The condition of education 2003*. Washington, DC: Author.

Ogbu, J. U. (1978). *Minority education and caste: The American system in cross-cultural perspective*. New York: Academic Press.

Portes, A., & Rumbaut, R. G. (1990). *Immigrant America: A portrait*. Berkely: University of California Press.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage.

Rogosa, D. R., & Willett, J. (1985). Understanding correlates of change by modeling individual differences in growth. *Psychometrica, 50*, 203-228.

Rumbaut, R. (1995). The new Californians: Comparative research findings on the educational progress of immigrant children. In R. Rumbaut and W. Cornelius (Eds), *California's immigrant children: Theory, research, and implications for educational policy*. San Diego: University of California, Center for U.S.-Mexican Studies.

Rumberger, R. W., & Larson, K. A. (1998). Toward explaining differences in educational achievement among Mexican-American language-minority students. *Sociology of Education*, *71*, 69-93.

Seltzer, M. H., Frank, K. A. & Bryk, A. S. (1994). The metric matters: The sensitivity of conclusions about growth in student achievement to choice of metric. *Educational Evaluation & Policy Analysis*, *16*, 41-49.

Short, D. J., & Echevarria, J. (2005). Teacher skills to support English language learners. *Educational Leadership, 62*, 8-13.

Slavin, R. E., & Cheung, A. (2003). *Effective reading programs for English language learners: A best evidence synthesis*. Baltimore, MD: Johns Hopkins University.

Snow, R. E. (1977). Individual differences and institutional theory. *Educational Researcher*, *6*, 11-15.

Stanton-Salazar, R. D. (2001). *Manufacturing hope and despair: The school and kin support networks of U.S.-Mexican youth*. New York: Teachers College Press.

Willett, J. B. (1988). Questions and answers in the measurement of change. *Review of Research in Education, 15*, 345-422.

Willig, A. (1985). A meta-analysis of selected studies on the effectiveness of bilingual education. *Review of Educational Research, 55*, 269-316.

Ysseldyke, J., Thurlow, M., Graden, J., Wesson, C., Deno, S., & Algozinne, B. (1982). *Generalizations from five years of research on assessment and decision making* (Research Report 100). Minneapolis, MN: University of Minnesota, Institute for Research on Learning Disabilities.

Table 1

Literacy and Mathematics Ability by Language-Minority Status (n = 10, 425)

	Primary Home Language is English (n = 9,317)	Spanish Speaking, English Proficient (n = 453)	Spanish Speaking, Not English Proficient (n = 282)	Asian, Language Minority Proficient (n = 242)	Other Race/ Ethnicity, Language Minority Proficient (n = 131)
Literacy Ability					
Fall Kindergarten, mean	23.25	19.68*[a]	N/A[b]	25.16	24.14
SD	8.27	7.05		9.27	10.75
Spring Kindergarten, mean	33.48	30.18*	N/A	36.83*	34.51
SD	10.32	9.53		12.73	11.52
Fall First Grade, mean	39.11	34.89*	N/A	39.86	40.37
SD	12.23	10.34		15.58	15.04
Spring First Grade, mean	56.78	52.83*	N/A	60.61*	59.75
SD	12.79	11.66		12.22	12.99
Mathematics Ability					
Fall Kindergarten, mean	20.39	16.24*	13.04*	22.09	20.86
SD	7.00	5.30	3.87	7.38	5.98
Spring Kindergarten, mean	28.62	24.04*	19.55*	29.95	29.28
SD	8.41	6.84	6.25	9.09	7.98
Fall First Grade, mean	33.71	30.30*	23.73*	33.30	32.56
SD	9.16	7.97	6.53	9.90	8.89
Spring First Grade, mean	44.29	40.83*	36.87*	44.97	45.47
SD	8.54	7.87	8.60	7.64	7.73

* $p < .05$

[a] all statistical comparisons are to children whose primary home language was English.

[b] children identified as non-English proficient for whom Spanish was the primary home language were administered a Spanish-equivalent form of the mathematics assessment, but were not administered the English literacy assessment.

Table 2

Social and Academic Backgrounds of Children at Kindergarten Entry by Language Status (n = 10, 425)

	English is Primary Home Language (n = 9,335)	Hispanic, Language Minority/Proficient (n = 462)	Hispanic, Language Minority/ Non-Proficient (n = 283)	Asian, Language Minority/ Proficient (n = 244)	Other Race/ Ethnicity, Language Minority/ Proficient (n = 183)
Socio-Economic Status (SES)					
% Low SES	13.5	42.5*[a]	71.1*	15.8	10.2
% Med-Low SES	21.0	23.8	17.5	14.9	16.7
% Medium SES	21.4	14.4*	7.9*	15.8	13.8*
% Med-High SES	22.5	12.4*	1.6*	24.6	29.2
% High SES	21.6	6.9*	1.7*	28.9*	29.7*
Age (months), mean	68.8	68.3	67.3*	67.4*	68.4
SD	4.3	4.1	4.3	4.0	4.0
Number of Siblings, mean	1.4	1.5	1.9*	1.5	1.2
SD	1.1	1.1	1.3	1.6	0.9
% Female	49.3	52.6	47.5	50.9	45.7
% Single-Parent Family	21.0	18.0	17.1	11.4*	16.3
% Born in U.S.	99.0	90.0*	83.8*	85.7*	91.7*
% U.S. Citizen	99.6	91.0*	84.9*	88.9*	93.4*
% At least one parent speaks English to child	97.2	38.1*	12.5*	39.8*	48.8*
% Child speaks English to at least one parent	98.4	48.5*	13.6*	53.4*	69.9*

Table continued on next page.

Table 2, cont.

	English is Primary Home Language (n = 9,335)	Hispanic, Language Minority/Proficient (n = 462)	Hispanic, Language Minority/ Non-Proficient (n = 283)	Asian, Language Minority/ Proficient (n = 244)	Other Race/ Ethnicity, Language Minority/ Proficient (n = 183)
Academic Experiences					
% Repeated K	3.8	7.3*	3.5	2.3	1.6
% Full-Day Kindergarten	57.4	52.2*	50.3*	45.6*	58.7
% Kind. In-Class ESL	1.3	30.9	75.9	21.1	5.2
% Kind. Pull-Out ESL	0.6	12.8	8.9	12.8	19.3
% First Grade In-Class ESL	1.0	32.6	69.1	17.5	5.1
% First Grade Pull-Out ESL	0.5	14.7	18.4	18.4	5.8

* $p < .05$

[a] all statistical comparisons are to children whose primary home language was English.

Table 3

Language Status and Literacy Ability at Kindergarten Entry (n = 10,059)

	Model 1	Model 2	Model 3
Language Minority/Proficient	0.26	-0.01	0.07
Asian[a]	4.07*	4.15*	3.99*
Black	-1.33*	-0.48	0.01
Hispanic	-2.34*	-1.63*	-1.44*
Other Race/Ethnicity	-1.75*	-1.46*	-1.31*
Hispanic*LM/P	-2.49*	-1.66	-1.96
Asian*LM/P	-4.73*	-4.40*	-4.18*
Low SES[b]		-2.79*	-2.74*
Medium-Low SES		-1.01*	-0.97*
Medium-High SES		1.23*	1.20*
High SES		3.86*	3.88*
Female			1.11*
Kindergarten Repeater			0.23
Age (months)			0.21*
Single Parent Family			-0.99*
Intercept	20.28*	19.51*	0.44

* $p < .05$

[a] all racial/ethnic groups compared to White children

[b] compared to middle-SES children

Table 4

Language Status and Mathematics Ability at Kindergarten Entry (n = 10,425)

	Model 1	Model 2	Model 3
Language Minority/Proficient	-0.17	-0.30	-0.28
Asian[a]	0.53	0.60	0.60
Black	-2.49*	-1.86*	-1.35*
Hispanic	-2.40*	-1.87*	-1.70*
Other Race/Ethnicity	-1.84*	-1.60*	-1.43*
Hispanic*LM/P	-1.34	-0.59	-0.65
Hispanic*LM/NP	-3.46*	-2.40*	-2.30*
Low SES[b]		-2.26*	-2.30*
Medium-Low SES		-1.21*	-1.15*
Medium-High SES		1.18*	1.15*
High SES		3.04*	3.11*
Female			0.02
Kindergarten Repeater			-0.41
Age (months)			0.35*
Single Parent Family			-0.73*
Intercept	18.29*	17.75*	-5.57*

* $p < .05$

[a] all racial/ethnic groups compared to White children

[b] compared to middle-SES children

Table 5

Literacy Learning Rates During Kindergarten, Summer, and First Grade (points per month)

	Kindergarten Learning		Summer learning		First Grade Learning	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Language Minority/Proficient	-0.03[a]	-0.03	0.92	0.83	0.03	0.06
Asian[b]	-0.11	-0.12	0.34	0.36	-0.25*	-0.25*
Black	-0.23*	-0.26*	-0.03	0.17	-0.17*	-0.15*
Hispanic	-0.07	-0.06	0.36*	0.44*	-0.15*	-0.15*
Other Race/Ethnicity	0.04	0.04	-0.55*	-0.41*	-0.04	-0.02
Hispanic*Spanish-Speaking LM/P	0.22	0.23	-1.81*	-1.61*	0.12	0.11
Asian*LM/P (all languages)	0.42*	0.45*	-1.36	-1.21	0.17	0.33
Low SES[c]		-0.07*		-0.24*		-0.11*
Medium-Low SES		-0.01		-0.16		-0.01
Medium-High SES		0.06		0.05		-0.01
High SES		0.06		0.14		0.02
Female		0.11*		0.10		-0.01
Full-Day K		0.26*		-0.26*		-0.19*
Kindergarten Repeater		-0.20*		-0.66*		-0.20*
Age (months)		0.00		0.03*		-0.02*
Single-Parent Family		-0.04		-0.13		-0.01
Intercept	1.67*	1.54*	0.15*	-1.62*	2.60*	3.96*

* $p < .05$

[a] points per month of learning

[b] all racial/ethnic groups compared to White children

[c] compared to middle-SES children

Table 6

Mathematics Learning Rates During Kindergarten, Summer, and First Grade (points per month)

	Kindergarten Learning		Summer learning		First Grade Learning	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Language Minority/Proficient	-0.01[a]	-0.01	0.15	0.08	0.12	0.13
Asian[b]	0.02	0.03	0.49*	0.51*	-0.34*	-0.35*
Black	-0.25*	-0.28*	0.07	0.20	-0.06	-0.06
Hispanic	-0.07*	-0.06*	-0.07	-0.10	0.04	0.01
Other Race/Ethnicity	0.03	0.01	-0.50*	-0.41*	0.08	0.07
Hispanic*LM/P	-0.05	-0.05	-0.01	0.09	-0.07	-0.08
Hispanic*LM/NP	-0.24*	-0.21*	-0.16	-0.14	0.16	0.15
Low SES[c]		-0.02		-0.17		0.00
Medium-Low SES		0.07		-0.25*		-0.02
Medium-High SES		0.02		-0.17		0.03
High SES		0.09*		0.12		-0.13*
Female		0.00		-0.03		-0.04
Full-Day K		0.17*		-0.17		-0.08*
Kindergarten Repeater		-0.19*		-0.21		-0.03
Age (months)		0.00		0.01		-0.02*
Single Parent Family		0.01		-0.11		0.03
Intercept	1.35	1.06*	0.56*	0.15	1.54*	2.86*

* $p < .05$

[a] points per month of learning

[b] all racial/ethnic groups compared to White children

[c] compared to middle-SES children