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## Reading, Mathematics, and Science Achievement of Language-Minority Students in Grade 8

During a period when the school-age language-minority population<sup>1</sup> grew, from 8.8 million in 1999 to 10.8 million in 2007 (U.S. Department of Education 2010, indicator 5), the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K) tracked the educational experiences of a nationally representative sample of children who were in kindergarten in the 1998–99 school year. Approximately 12 percent of the ECLS-K cohort came from homes where the primary language was one other than English in the fall of kindergarten (table 1).

Previous analyses of the ECLS-K cohort have shown that language-minority students in public schools scored lower on a mathematics assessment in grade 1 than their peers whose primary home language was English (Hampden-Thompson et al. 2008). While all students made gains in mathematics knowledge and skills by grade 5, the differences in assessment scores persisted between language minorities and students whose primary home language was English.

This Issue Brief extends previous ECLS-K analyses, which were limited to an examination of mathematics achievement, by examining achievement in reading, mathematics, and science for language minorities in the ECLS-K cohort. The analyses present a picture of students' achievement at the end of the study by focusing on students' scores on the standardized assessments that were administered in the spring of 2007, when most students were in grade 8. The analysis is restricted to children who were first-time kindergartners in the 1998–99 school year and who attended public school in every wave of the study. Scores are reported by three background characteristics—students' race/ethnicity, poverty status,<sup>2</sup> and mother's education<sup>3</sup>—that have been found to be related to achievement (Rathbun and West 2004).

Students are categorized into four groups according to language background and English language proficiency. The first group consists of language-minority students who were proficient in English at kindergarten entry (referred to as English Proficient). Two other groups of language-minority students are identified as English language learners (ELLs): those not proficient in English at kindergarten entry, but

proficient by the spring of kindergarten (the second group); and those not proficient by the spring of kindergarten (the third group). The fourth group consists of students whose parents reported that English was their primary home language. Language-minority students' English proficiency is based on their scores on a direct measure of oral English language skills in kindergarten.<sup>4</sup> Language minorities are categorized by the timing of their acquisition of basic English language skills because research suggests that acquisition of such skills before, during, or after their first year of formal schooling is related to later academic outcomes (Halle et al. 2012, Kieffer 2011).

### Characteristics of Language-Minority Students

Of students who were first-time kindergartners in the 1998–99 school year and attended public school in all waves of the study, about 12 percent were language-minority students.<sup>5</sup> Within this group, 5 percent were English proficient at kindergarten entry, 2 percent were proficient by the spring of kindergarten, and 5 percent were not proficient by the spring of kindergarten (table 1). The remaining 88 percent were students from homes in which English was the primary language.

**Table 1. Percentage distribution of first-time public school kindergartners in 1998–99, by home language, English proficiency, timing of English proficiency, and selected characteristics: Fall 1998, spring 1999, and spring 2007**

Child's characteristics	All students	Primary home language is English	Timing of English language proficiency among those whose primary home language is not English <sup>1</sup>		
			English proficient at kindergarten entry	Not English proficient at kindergarten entry but English proficient by spring of kindergarten	Not English proficient by spring of kindergarten
<b>Total</b>	<b>100.0</b>	<b>87.8</b>	<b>5.1</b>	<b>2.4</b>	<b>4.7</b>
Race/ethnicity <sup>2</sup>					
Non-Hispanic	81.2	90.0	31.1	13.5	6.1 !
White	57.8	65.1	10.7	†	†
Black	17.3	19.6	1.2 !	†	†
Asian	2.4	1.3	15.3	12.4	5.3 !
Other	3.7	4.0	4.0 !	†	†
Hispanic	18.8	10.0	68.9	86.5	93.9
Poverty status, spring 2007 <sup>3</sup>					
Below poverty threshold	20.3	16.9	30.2	50.4	57.3
At or above poverty threshold	79.7	83.1	69.8	49.6	42.7
Mother's highest level of education, spring 2007					
Less than high school	10.9	6.6	28.1	34.8	59.2
High school diploma or equivalent	23.8	23.8	24.2	28.9	21.5
Some college/vocational/technical school	37.0	39.3	25.4	16.9	15.6
Bachelor's degree or higher	25.8	27.6	20.4	16.7	3.4 !
No mother in household	2.6	2.7	1.9 !	2.7 !	†

! Interpret data with caution. Standard error is more than 30 percent of estimate's value.

† Reporting standards not met (too few cases).

<sup>1</sup> Timing of English proficiency was determined by parent's report of primary language at home at kindergarten entry in the fall of 1998 and by Oral Language Development Scale (OLDS) results at kindergarten entry in the fall of 1998 and in kindergarten in the spring of 1999. Language-minority children were classified as English proficient or English language learners based on their score on the OLDS. The OLDS is an English language proficiency screener that measured children's listening comprehension, vocabulary, and ability to understand and produce language. The range of possible scores was 0 to 60, and children who received scores higher than 36 were considered English proficient. Language-minority children without OLDS scores but with subject area scores (for instance, in reading) from fall of kindergarten were classified as "English proficient at kindergarten entry." Language-minority children missing OLDS scores and missing subject area scores from fall of kindergarten but with subject area scores from spring of kindergarten were classified as "Not English proficient at kindergarten entry but English proficient by spring of kindergarten."

<sup>2</sup> All race categories exclude Hispanic origin. "Other" includes Native Hawaiian, Pacific Islander, American Indian (including Alaska Native), and those reporting more than one race.

<sup>3</sup> The federal poverty level status composite variable is derived from household income and the total number of household members. Federal poverty thresholds are used to define households below the poverty level. Students living in households where the income fell below the appropriate threshold (based on Census information from 2006) were classified as living "below" the poverty threshold.

NOTE: The sample is limited to children in kindergarten for the first time in 1998–99 who attended public school in every wave of the study and who have reading, math, and science assessment scores at spring of 8th grade. Primary home language was asked of the parent interview respondent. Detail may not sum to totals because of rounding. Estimates were weighted by weight C7PW0. Standard errors are available at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2012028>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten–8th Grade Public-Use Child File.

The majority of language-minority students were Hispanic, though the percentage of English Proficient students who were Hispanic (69 percent) was lower than the percentages of ELLs who were Hispanic (86 percent of ELLs who were proficient by the spring of kindergarten and 94 percent of ELLs who were not proficient by the spring of kindergarten). The majority of students whose primary home language was English were White, non-Hispanic (65 percent).

About one-third to one-half of language-minority students lived in households with incomes below the poverty threshold (30 to 57 percent), compared to just under one-fifth of students whose primary home language was English (17 percent). Among language minorities, higher percentages of ELLs (50 percent of students who were English proficient by the spring of kindergarten and 57 percent of students who were not) than English Proficient students (30 percent) lived in poor households.

About 59 percent of ELLs who were not proficient by the spring of kindergarten had a mother with less than a high school education, compared to 35 percent of ELLs who were proficient by the spring of kindergarten, 28 percent of English Proficient students, and 7 percent of students whose primary home language was English. In contrast, about 3 percent of ELLs who were not proficient by the spring of kindergarten had a mother with a bachelor's degree or higher, compared to 17 percent of ELLs who were proficient by the spring of kindergarten, 20 percent of English Proficient students, and 28 percent of students whose primary home language was English.

### Achievement in Grade 8

A consistent pattern of scale score differences was evident for all subjects: students whose primary home language was English and English Proficient students had higher overall mean eighth-grade (spring 2007) scores than did ELLs (table 2).<sup>6</sup> Specifically, on a scale of 0 to 212, the reading scores for students whose primary home language was English and those for English Proficient students (141 points each) were higher than the scores for both groups of ELL students (129 and 126 points, respectively, for those who were proficient by the spring of kindergarten and those who were not). On a scale of 0 to 174, the mathematics scores for students whose primary home language was English and those for English Proficient students (141 points each) were higher than the scores for both groups of ELL students (129 and 126 points, respectively, for those who were proficient by the spring of kindergarten and those who were not). On a scale of 0 to 111, the science scores for students whose primary

home language was English (84 points) and those for English Proficient students (83 points) were higher than the scores for both groups of ELLs (74 and 67 points, respectively, for those who were proficient by the spring of kindergarten and those who were not).

*Hispanicity.*<sup>7</sup> Among English Proficient students, non-Hispanics had higher eighth-grade reading (180 vs. 165 points), math (148 vs. 138 points), and science (87 vs. 80 points) scores than their Hispanic peers. Among English language learners, non-Hispanic ELLs who were proficient by the spring of kindergarten also had higher reading (173 vs. 149 points), mathematics (148 vs. 126 points), and science (83 vs. 73 points) scores than their Hispanic peers. Non-Hispanic ELLs who were not proficient by the spring of kindergarten had higher reading scores than their Hispanic peers (153 vs. 139 points). No measurable differences by Hispanicity were found in any subject for students whose primary home language was English.

*Poverty status.* For all four groups of students, those living in households with incomes at or above the poverty threshold had higher eighth-grade reading and science scores than their peers living in poverty. In math, this difference held for all groups

**Table 2. Mean reading, mathematics, and science scale scores at eighth grade for first-time public school kindergartners in 1998–99, by home language, English proficiency, timing of English proficiency, and selected characteristics: Fall 1998, spring 1999, and spring 2007**

Child's characteristics	Timing of English language proficiency among those whose primary home language is not English <sup>1</sup>			
	Primary home language is English	English proficient at kindergarten entry	Not English proficient at kindergarten entry but English proficient by spring of kindergarten	Not English proficient by spring of kindergarten
<b>Reading scale score total<sup>2</sup></b>	<b>168.8</b>	<b>169.5</b>	<b>151.9</b>	<b>140.3</b>
Race/ethnicity <sup>3</sup>				
Non-Hispanic	169.0	179.7	172.8	153.0
Hispanic	166.2	164.8	148.6	139.5
Poverty status, spring 2007 <sup>4</sup>				
Below poverty threshold	147.4	158.7	139.3	134.8
At or above poverty threshold	173.1	174.2	164.4	147.7
Mother's highest level of education, spring 2007 <sup>5</sup>				
Less than high school	147.3	161.1	139.3	136.6
High school diploma or equivalent	158.8	165.6	150.3	136.8
Some college/vocational/technical school	168.0	170.8	158.4	154.9
Bachelor's degree or higher	183.9	184.5	171.0	153.4
<b>Mathematics scale score total<sup>2</sup></b>	<b>140.9</b>	<b>140.9</b>	<b>129.3</b>	<b>125.8</b>
Race/ethnicity <sup>3</sup>				
Non-Hispanic	140.9	147.6	147.6	129.8
Hispanic	141.2	137.9	126.4	125.5
Poverty status, spring 2007 <sup>4</sup>				
Below poverty threshold	123.0	131.9	120.1	122.3
At or above poverty threshold	144.6	144.9	138.3	130.5
Mother's highest level of education, spring 2007 <sup>5</sup>				
Less than high school	122.7	133.4	117.5	122.4
High school diploma or equivalent	132.7	138.9	133.5	127.3
Some college/vocational/technical school	141.1	141.3	133.5	132.9
Bachelor's degree or higher	152.5	154.2	139.8	139.8
<b>Science scale score total<sup>2</sup></b>	<b>84.0</b>	<b>82.6</b>	<b>74.2</b>	<b>67.4</b>
Race/ethnicity <sup>3</sup>				
Non-Hispanic	84.1	87.3	83.2	73.5
Hispanic	82.4	80.4	72.9	67.0
Poverty status, spring 2007 <sup>4</sup>				
Below poverty threshold	70.1	77.0	65.0	64.6
At or above poverty threshold	86.8	85.0	83.4	71.2
Mother's highest level of education, spring 2007 <sup>5</sup>				
Less than high school	70.7	78.0	66.7	65.1
High school diploma or equivalent	78.2	80.9	72.3	66.7
Some college/vocational/technical school	83.4	83.0	79.0	73.8
Bachelor's degree or higher	93.1	90.3	87.6	79.5

<sup>1</sup> Timing of English proficiency was determined by parent's report of primary language at home at kindergarten entry in the fall of 1998 and by Oral Language Development Scale (OLDS) results at kindergarten entry in the fall of 1998 and in kindergarten in the spring of 1999. Language-minority children were classified as English proficient or English language learners based on their score on the OLDS. The OLDS is an English language proficiency screener that measured children's listening comprehension, vocabulary, and ability to understand and produce language. The range of possible scores was 0 to 60, and children who received scores higher than 36 were considered English proficient. Language-minority children without OLDS scores but with subject area scores (for instance, in reading) from fall of kindergarten were classified as "English proficient at kindergarten entry." Language-minority children missing OLDS scores and missing subject area scores from fall of kindergarten but with subject area scores from spring of kindergarten were classified as "Not English proficient at kindergarten entry but English proficient by spring of kindergarten."

<sup>2</sup> The assessment scale was 0 to 212 for the reading assessment, 0 to 174 for the mathematics assessment, and 0 to 111 for the science assessment.

<sup>3</sup> All race categories exclude Hispanic origin. "Other" includes Native Hawaiian, Pacific Islander, American Indian (including Alaska Native), and those reporting more than one race.

<sup>4</sup> The federal poverty level status composite variable is derived from household income and the total number of household members. Federal poverty thresholds are used to define households below the poverty level. Students living in households where the income fell below the appropriate threshold (based on Census information from 2006) were classified as living "below" the poverty threshold.

<sup>5</sup> Students living in households with no mother are excluded from analyses of mother's education.

NOTE: The sample is limited to children in kindergarten for the first time in 1998–99 who attended public school in every wave of the study and who have reading, math, and science assessment scores at spring of 8th grade. Primary home language was asked of the parent interview respondent. Detail may not sum to totals because of rounding. Estimates were weighted by weight C7PW0. Standard errors are available at <http://nces.ed.gov/pubsearch/pubinfo.asp?pubid=2012028>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-8th Grade Public-Use Child File.

except ELLs who were not proficient in English by the spring of kindergarten, for whom there were no measurable differences.

**Mother's education.** For students whose primary home language was English, reading, mathematics, and science scores were higher for those whose mother had a higher level of education compared to those whose mother had a lower level of education.

Among language minorities, when differences by mother's education were found, they reflected this pattern of students with more highly educated mothers having higher mean assessment scores. Specifically, mean reading, mathematics, and science scores were higher for English Proficient students whose mother had a bachelor's degree or higher compared to English Proficient students whose mother had a lower level of education.

English language learners who were proficient by the spring of kindergarten and whose mother had a bachelor's degree or higher had higher mean reading and mathematics scores than their ELL peers whose mother had less than a high school education. Additionally, these ELLs whose mother had a high school education had a higher mathematics score than their ELL peers whose mother had less than a high school education (133 vs. 118 points).<sup>8</sup> For science, ELLs who were proficient by the spring of kindergarten and whose mother had a bachelor's degree or higher had higher mean scores than their ELL peers whose mother had a high school education or lower. Additionally, the mean science score was higher for these ELLs whose mother had some college or vocational/technical school compared to their ELL peers whose mother had less than a high school education (79 vs. 67 points).

For ELLs who were not proficient by the spring of kindergarten, mean reading scores were higher for those whose mother had some college or vocational/technical school than they were for those whose mother had a high school education or lower. Mean mathematics and science scores were higher for these ELLs whose mother had a bachelor's degree or higher compared to these ELLs whose mother had a high school education or lower. Additionally, the mean science score was higher for these ELLs whose mother had some college or vocational/technical school compared to their ELL peers whose mother had less than a high school education (74 vs. 65 points).

## Summary

Of students who were first-time kindergartners in the 1998–99 school year and attended public school in all waves of the study, about 12 percent primarily spoke a language other than English at home when they started kindergarten, with about 5 percent of these language-minority students being proficient in English at that time. The majority of language-minority students were Hispanic, though Hispanics constituted a smaller percentage of the English Proficient group than of the two groups of English language learners. In addition, larger percentages of language-minority students were poor and had a mother with less than a high school education than were students whose primary home language was English.

Students who entered kindergarten as proficient in English, regardless of their home language, scored higher on the ECLS-K eighth-grade reading, math, and science assessments than language-minority students who became proficient in English after starting kindergarten. In contrast to previous findings related to math scores in grade 5 (Hampden-Thompson et al. 2008), measurable differences in eighth-grade scores were not found for any subject between English Proficient students and those whose primary home language was English. Non-Hispanic language-minority students who were English proficient either when they started or when they

completed kindergarten scored higher than their Hispanic peers in reading, math, and science in grade 8. This same pattern was seen for non-poor language-minority students who were English proficient either when they started or when they completed kindergarten compared to their peers who were poor. Among ELLs who were not proficient by the spring of kindergarten, non-Hispanic and non-poor students performed better on the reading assessment than their Hispanic and poor peers. Regardless of home language or English proficiency, those students with the most highly educated mothers generally had the highest scores in all three subjects, while those students with the least educated mothers generally had the lowest scores.

## References

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## Endnotes

- <sup>1</sup> The school-age language-minority population includes children ages 5–17 who spoke a language other than English at home.
- <sup>2</sup> The federal poverty-level status composite variable is derived from household income and the total number of household members. Federal poverty thresholds are used to define households below the poverty level. Households whose income fell below the appropriate threshold based on Census information from 2006 were classified as living in poverty.
- <sup>3</sup> Data on poverty status and mothers' education come from spring 2007 when most of the students were in eighth grade.
- <sup>4</sup> Students' English language proficiency is based on their score on the Oral Language Development Scale (OLDS), an English language proficiency screener that was used to measure children's listening comprehension, vocabulary, and ability to understand and produce language. The range of possible scores was 0 to 60, and children who received scores higher than 36 were considered to have passed the test. In the fall kindergarten data collection, the OLDS was administered to all children for whom school records indicated their home language was one other than English. Children who did not pass the OLDS in the fall were re-administered the OLDS in the spring of kindergarten. By the spring of first grade, the majority of children who had ever been administered the OLDS (82 percent) passed it. Readers should keep in mind that the categorization of children as ELLs for this report may differ from schools' categorization of children due to differences in the methods used for identification.
- <sup>5</sup> Estimates in this report may differ from those presented in other reports using ECLS-K data due to differences in the particular samples used to generate the estimates. For example, this report excludes children who attended private school in any round of data collection.
- <sup>6</sup> Assessment performance is described as achievement in grade 8 although not all students in the sample were in that grade at the final wave of the data collection due to either grade retention or acceleration. While the assessments were designed to contain mostly items that assessed knowledge and skills at an eighth-grade level, easier and more difficult items were included to measure the abilities of students performing below or above grade level.
- <sup>7</sup> Due to small sample sizes for non-Hispanic language minorities of different races, the non-Hispanic groups are categorized together for analyses of overall scores.
- <sup>8</sup> Although the mean score for ELLs who were proficient by the spring of kindergarten whose mother had some college or vocational/technical school is the same as the mean score for ELLs whose mother had a high school education, the score for the former group is not significantly different from the score for ELLs whose mother had less than a high school education because the standard error of their mean score is larger.

The Issue Brief series presents information on education topics of current interest. All estimates shown are based on samples and are subject to sampling variability. All differences discussed are statistically significant at the .05 level as measured by two-tailed *t* tests; this means a difference is discussed only if the probability that it is due to chance (i.e., sampling variability) is less than 1 in 20. No adjustments were made for multiple comparisons. In the design, conduct, and data processing of National Center for Education Statistics (NCES) surveys, efforts are made to minimize the effects of nonsampling errors, such as item nonresponse, measurement error, data processing error, or other systematic error. For more information on the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), visit <http://nces.ed.gov/ecls>.

This Issue Brief was prepared by Gail Mulligan (NCES), and Tamara Halle and Akemi Kinukawa (Child Trends). This report was prepared in part under Contract No. ED-05-CO-0044 with the American Institutes for Research. It was desktopped by Katie Mallory (MacroSys, LLC) and edited by Martin Hahn (American Institutes for Research) of ESSI. For further information, contact John Ralph, NCES, at 202-502-7441 or [john.ralph@ed.gov](mailto:john.ralph@ed.gov). To order additional copies of this Issue Brief or other NCES publications, call 1-877-4ED-PUBS or visit <http://www.edpubs.org>. NCES publications are also available on the Internet at <http://nces.ed.gov>.