INVESTIGATION ON MULTIPLE FACTORS AFFECTING ENGLISH-LANGUAGE LEARNERS' READING ACHIEVEMENT: HIERARCHICAL LINEAR MODELING APPROACH

BY

HUI-JEONG WOO

DISSERTATION

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Doctoral Committee:

Associate Professor Katherine Ryan, Chair
Professor Fred Davidson
Professor Hua-Hua Chang
Associate Professor Eurydice Bauer
Abstract

This study investigated the multiple factors affecting English language learners’ (ELLs) low reading achievement in standardized tests by exploring the complex, hierarchical relation in student, classroom, and school levels. The data used for this study was from National Center for Educational Statistics (NCES), the reading portion of the National Assessment of Educational Progress (NAEP). The three-level hierarchical linear modeling (HLM) analysis was employed to generate a model based on the student, teacher, and school level variables. Specifically, this study (a) identified the impact of student-, teacher-, and school characteristics on ELLs and non-ELLs’ standardized reading achievement and (b) examined how these characteristics impact on their reading achievements differently for ELLs and non-ELLs.

This study’s descriptive analyses supported findings from previous research, namely that ELLs tended to have more hardship measures than non-ELLs. The HLM analyses determined that some factors were related to ELLs’ and non-ELLs’ reading achievement differently after controlling for student, teacher, and school variables. Specifically, the frequency of a language other than English spoken at home yielded different results for ELLs and non-ELLs. The frequency of a language other than English spoken at home was a significant, positive predictor of reading achievement for ELLs. Meanwhile, it was a non-significant, negative predictor for non-ELLs. Positive influence of the frequent uses of a language other than English at home on ELLs’ reading performance implied a positive effect of first-language speaking on ELLs’ reading. Another implication that this study brought was the importance of providing equal opportunity to learn to all students.
To my parents, my husband, and my baby daughter, Nora
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Chapter 1

Introduction

Statement of the Problem

The recent major amendments to the Elementary and Secondary Education Act (ESEA), including Improving America’s Schools Act of 1994 and the No Child Left Behind Act (NCLB) of 2002 have brought important implications for the assessment of English language learners (LaCelle-Peterson & Rivera, 1994; August & Hakuta, 1997; Hakuta & Beatty, 2000). Historically, English language learners (ELLs)’ standardized test scores have not been included in the nation’s high-stake assessment reports and, therefore, they have not been a part of the United States (U.S.)’ educational accountability system (Abedi, 2004).

However, recent statistics shows that the numbers of children speaking a language other than English at home increased dramatically over the past few decades (National Center for Educational Statistics [NCES], 2006). In the last 20 years, the proportion of children who speak a language other than English at home and children who speak English with difficulty increased 10.3% and 2.5% of the total population of children ages 5-17 respectively (see Appendix A). The total number of language-minority students increased 161.8% between 1979 and 2004. By comparison, the total population of children ages 5-17 in the nation only increased 18.3% over the same 25 years (see also Appendix A). From 2000 to 2001, U.S. states reported that ELLs were enrolled primarily in pre-kindergarten through third-grade (44%) followed by the middle grades (35%) and high school (19%) (Kindler, 2002). The increasing enrollment of ELLs in the nation has made it necessary to include ELLs in our educational accountability system (Abedi, 2004).

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1 English-language learners are a subset of language-minority students (August & Shanahan, 2006).
The NCLB Act (2002) requires annual reading and mathematics testing for all children in grades 3-8 and once in high school. States are required to measure each public school’s and district’s achievement, establish annual achievement targets for their own schools, and report student progress. Unlike other initiatives, under the NCLB Act, a state’s adequate yearly progress (AYP) report is used as criteria for rewarding and/or sanctioning schools (NCLB, 2002). The consequences for schools that do not meet AYP goals are potentially severe. Schools that fail to improve are subject to increasingly tough corrective actions such as replacing school staff or significantly decreasing management authority at the school level (NCLB, 2002).

Yet while the number of the ELLs is increasing, their educational attainment remains low. The National Assessment of Educational Progress (NAEP) indicates that ELLs are being left behind and schools and districts serving significant portions of ELLs are less likely to meet their AYP goals (NCES, 2006; Goldenberg, Rueda, & August, 2006). Furthermore, these students receive low academic ratings from their teachers (August & Hakuta, 1997). As a response, in recent years, there have been some studies on the factors influencing ELLs’ low achievement on standardized tests, compared to non-ELLs. Many of the studies have focused on language as the primary mediator of ELLs’ outcome performance (Abedi, 2002; Abedi, Leon, & Mirocha, 2003; Butler & Stevens, 2001). The achievement performance gap between ELLs and non-ELLs has widened as the content areas such as reading and language arts demand higher English proficiency (Abedi, 2002; Abedi et al., 2003). This implies the impact of student’s language proficiency on content knowledge assessment.

Macias (1993) criticized that researchers often 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. Although ELLs share one educationally relevant variable —
the need to increase their proficiency in English — they differ in language, cultural background, and family history (LaCelle-Peterson & Rivera, 1994). According to Goldenberg et al. (2006), socio-cultural factors such as socio-economic status (SES), ethnicity, and other dimensions of family life create varied and complex contexts and influence learning outcomes directly by providing different opportunities or motivation to learn in the school context. However, most of the studies on ELLs’ low performance on standardized tests have centered on student’s lack of English proficiency, treating ELLs as a homogeneous group, regardless of their various demographics and environmental characteristics (Ready & Tindal, 2006).

There have been some studies that have related issues other than English proficiency such as SES, to ELLs’ standardized test achievement (Abedi et al., 2003). Yet, explanations for ELLs’ low performance are limited. Appendix B indicates that more than 60% of Hispanic students speak a language other than English at home (NCES, 2006). On the contrary, only 5.3% of white students speak a language other than English at home. Appendix B also indicates that 9.9% of students living in poverty have difficulty speaking English, compared to 2.9% of students not living in poverty have difficulty speaking English. These results imply that ELLs often fall into one or more of the NCLB Act’s “other protected classes”, such as major racial/ethnic groups and low-income families (Capps et al., 2005).

A student’s demographic and environmental characteristics such as race/ethnicity, parent’s engagement in schooling, SES, and home language environment can sometimes cause residential and school segregation, which eventually results in many schools being linguistically segregated (Capps et al., 2005). Research shows that over half of ELLs attend elementary and secondary schools in which at least 30% of their classmates are also ELLs, whereas, 57% of non-ELLs attend schools where fewer than 1% of all students are ELLs (Ruiz-de-Velasco & Fix,
August (2006) indicated standards-based goals may prove more difficult for the schools with high concentrations of ELLs.

**Purpose of the Study**

ELLs have been primarily conceptualized as a single, distinct population in research (Lesaux & Geva, 2006). Yet, ELLs are as diverse as non-ELLs, differing widely in terms of race/ethnicity, socioeconomic background, and the educational and familial contexts in which they develop cognitively (Ready & Tindal, 2006). Literacy outcomes are inclined to be influenced by home and school language, and literacy learning opportunities that students have. However, research indicates there is surprisingly little evidence for the impact of socio-cultural variables on literacy achievement or development (August & Shanahan, 2006). An additional shortcoming is that most of the studies on ELLs’ low standardized tests performance have centered on student’s lack of English proficiency (Ready & Tindal, 2006). Lesaux and Geva (2006) asserted research should recognize the heterogeneity of ELLs with respect to language use in home, school, and community.

The interpretation of ELLs’ standardized test performance is attributable to the characteristics of ELLs and the environments they belong to, rather than solely to their English proficiency. In addition, it should be considered that student’s individual characteristics are closely associated with social structures, such as teachers and schools. Students exist within a hierarchical social structure, which includes classroom, school, school district, etc. Therefore, it is necessary to disentangle the role of students’ individual differences in academic achievement from other possible contributors, including SES, educational opportunities, and school effects in order to understand the achievement gap between ELLs and non-ELLs more systematically.
This study will investigate the multiple factors affecting ELLs’ and non-ELLs’ reading achievement in standardized tests using the 2005 NAEP national reading assessment of fourth graders. The goal of this study is to identify various contextual factors that may influence students’ reading performance on standardized tests. The analyses will be done in three levels: student, teacher, and school level. This study aims to provide robust portraits of how multiple factors affect differently ELLs and non-ELLs in educational settings using a hierarchical linear modeling (HLM) method. This study also will investigate whether reading performance influences students’ reading engagement and whether it is different between ELLs and non-ELLs.

Definition of Terms

The following terms appear in this paper. Definitions are included to provide an understanding of the basic concepts and language presented in this study.

**Adequate Yearly Progress (AYP).** Each year states need to report student progress and this report is referred to as the adequate yearly progress (AYP). States calculate a school’s or district’s AYP to determine if students are improving their performance based on the established annual targets (Illinois State Board of Education [ISBE], 2006).

**Elementary and Secondary Education Act (ESEA).** The ESEA is a United States federal statute enacted April 11, 1965. As mandated in the Act, the funds are authorized for professional development, instructional materials, resource to support educational programs, and parental involvement promotion. The federal legislation signed into law in January 2002. This term is also referred to as the No Child Left Behind Act of 2001 (NLCB) (U.S. Department of Education, 2002).
English Language Learners (ELLs). A student who is acquiring English as a second language and it encompasses both students who are just beginning to learn English (often referred to as "limited English proficient" or "LEP") and those who have already developed considerable proficiency (August & Shanahan, 2006; LaCelle-Peterson & Rivera, 1994). In this study, ELLs are students who are categorized as English language learners by their schools and non-ELLs are students who are not categorized as ELLs by their schools.

Hierarchical Linear Modeling (HLM). A complex associational research method that accounts for the nested and multilevel nature of educational data.

First language (L1). Student’s primary language.

Second language (L2). Student’s target language.

Language minority. Individuals from homes where a language other than a societal language is actively used, who therefore have had an opportunity to develop some level of proficiency in a language other than a societal language. The language minority may be of limited second-language proficiency, bilingual, or essentially monolingual in the second language (August & Shanahan, 2006).

Limited English Proficient students (LEP). Students that have a limited ability to speak and/or understand the English language, which impairs their testing capability. In this study, English Language Learners (ELLs) is used instead of Students with Limited English Proficiency (LEP). The term, Limited English Proficiency (LEP), may be used when quoted from another source.

No Child Left Behind Act of 2001 (NCLB). NCLB reauthorizes the Elementary and Secondary Education Act of 1965 (ESEA) and incorporates nearly all of the major reforms
proposed in *No Child Left Behind* framework for education reform, particularly in the areas of assessment, accountability, and school improvement (NCLB, 2002).

**National Assessment of Educational Progress (NAEP).** An organization, known as the ‘Nation’s Report Card’, that is the only nationally representative and continuing assessment of what America’s students know and can do in various subjects. Funded by the National Center for Educational Statistics (NCES), NAEP assessments examine, in general, subject-matter achievement, instructional experiences, and school environments among the nation’s students in the 4th, 8th, and 12th grades (Rogers & Stoeckel, 2007).
Chapter 2

Literature Review

Overview

This section explores research in the following three areas: (a) standardized tests and their use for ELLs, (b) reading acquisition, and (c) multiple factors affecting students’ reading achievement. The first area presents the concerns on validity issue, when using standardized tests written in English for ELLs. The second area is devoted to reading and literacy acquisition research, including both first and second language. The third area reviews literature covering factors impacting students’ reading performance in student, teacher, and school levels. Finally this section ends with a summary and a discussion of how this research interests could potentially fill a void with related research questions and hypotheses.

Standardized Tests

Standardized tests in educational reform. Standardization ensures that all students are subjected to similar situations and contexts in large-scale assessments. With standardization, it is assumed that the tests are administered, scored, and interpreted in an objective, standardized manner. Therefore, interpretation of test results is more attributable to the individual rather than environmental assessment conditions (Popham, 1999). Due to its effectiveness in the assessment process, standardized tests have been used as a measure of student achievement for numerous purposes, including placing and comparing students. NAEP is one such standardized test that provides easy-to-use indicators of the educational achievement of large groups of students in the U.S.
In recent years, there has been an increase in the use of standardized tests, along with standard-based reforms as a means to hold school districts, schools, teachers accountable for student performance. Education reform has given increased weight to the results of standardized tests and made state assessment programs play an even more significant role. However, increased use of standardized tests has been criticized for over-standardization and over-simplification (Madaus, 1994). Further, problems in interpreting differential test performance between particular groups and concerns about the validity of inferences derived from assessments have increased (Messick, 1989). Butler and Stevens (2001) assert that while there is a definite need to show the public what students are learning in schools and to hold schools accountable for the education of students, the use of the same standardized content assessments with all groups of students is problematic and may not be the best approach to accountability (p. 409). Standards for Educational and Psychological Testing define validity as “the degree to which evidence and theory support the interpretations of test scores entailed by proposed uses of tests” (AERA, APA, & NCME, 1999, p. 9). Thus, validation of test use for high-stakes decisions about students includes attention to evidence about the intended and unintended consequences of those uses (Baker & Linn, 2002).

These concerns can be more intensified when students with special needs are involved. Specifically, the test score gap existing between ELLs and non-ELLs may indicate there is an issue with the validity of these tests. Messick (1989) introduced the concept of construct-irrelevant variance. In the present context, that refers to the degree to which the language of the test questions contaminates the validity of the test. ELLs’ unfamiliarity with the language and format of items on content assessments can threaten the validity of these tests (Abedi et al., 2003).
Testing English language learners. The differential performance between ELLs and non-ELLs was the rationale provided for the exclusion of ELLs from large-scale, content-based standardized assessments, administered in English (Abedi, 2004). Meanwhile, some researchers have argued that the lower test performance of ELLs can be attributed to limitations of testing practices, such as unfamiliarity with the language used on the tests and cultural effects, rather than students’ educational abilities (Abedi, 2002; Abedi et al., 2003; Lutkus, 2004; Hofstetter, 1998). In order to reduce the impact of language factors, the use of accommodations have been suggested by various educational researchers and practitioners (Mazzeo, Carlson, Voelkl, & Lutkus, 2000; O’Sullivan, Reese, & Mazzeo, 1997; Rivera & Stansfield, 1998).

One of the confounders to test validity for ELLs is student’s language proficiency. The majority of ELLs in the U.S. are immigrants or children of immigrants whose native language is not English. There have been a number of studies exploring factors affecting ELLs’ low performance on standardized tests in comparison to non-ELLs. Many of them have found language to be the primary mediator of ELLs’ achievement outcome (Abedi, 2002; Abedi et al., 2003; Butler & Stevens, 2001). However, there has also been criticism on over-simplification of ELLs as homogenous group (Madaus, 1994; Ready & Tindal, 2006).

ELLs are as diverse as non-ELLs. Some ELLs enter school with well-developed literacy skills, while others enter with few initial academic competencies (Paret, 2006; August, 2002). Given the dominance of immigration from Latin America and Asia since the mid-twentieth century, it is likely that the majority of ELLs fall into major racial and ethnic groups. Moreover, many immigrants from Latin America tend to come from low-income family groups (Paret, 2006). Thus, studies on ELLs’ low achievement on standardized tests should also be extended to other mediators of ELLs’ performance, rather than language alone. Sparse research describes
ELLs’ lower achievement on standardized tests, compared to their counterparts, with reference to systematic socioeconomic and socio-cultural perspectives in terms of students’ individual and school levels. Lately, researchers have argued that language proficiency is often singled out as the primary reason for the poor performance of ELLs on standardized content assessments without considering other student demographic characteristics (Ready & Tindal, 2006; Rutherford, 2006; Paret, 2006).

**Literacy Development**

**First-language literacy.** Learning to read is critical to a child’s success in school. Reading is of particular concern because it is highly related to most other kinds of academic learning and could be used as an index of general academic achievement (Chall, Jacobs, & Baldwin, 1990). Children who are poor readers are likely to suffer from limitations in general knowledge, vocabulary, spelling, and writing (Campbell, 2005). Reading is generally credited as the primary pathway to academic success and post-educational opportunities such as acquiring meaningful employment and participating in civic affairs (Harris, 1992). Achievement in reading is, therefore, not only a foundation for learning the mother tongue-or other subjects—but also a prerequisite for successful participation in most areas of youth or adult life (Organization for Economic Co-Operation and Development [OECD], 2004).

Leasux and Geva (2006) defined literacy development as a process that begins early in childhood and involves many different skills and experiences. The process of becoming literate includes the development of oral language skills, experience with print, an understanding of the concepts of print, and the acquisition of knowledge before receiving formal reading instruction (Leasux & Geva, 2006). Kern and Schultz (2005) defined literacy as the use of socially,
historically, and culturally situated practices of creating and interpreting meaning through texts. More recently, literacy development has been interpreted as a process that is influenced by individual, contextual, and instructional factors (Lesaux & Geva, 2006, Kern & Schultz, 2005). Snow, Burns, and Griffin (1998) looked at reading as a complex developmental challenge with many other developmental accomplishments such as attention, language, and motivation. Further, the acquisition of reading is construed with specific contexts or socio-cultural frameworks as well as cognitive skills (Verhoeven & Vermeer, 2006). Thus, reading is a multidimensional entity rather than a single monolithic one.

Researchers also have explored external influences on reading, such as instruction. Lesaux and Geva (2006) asserted that although literacy development is conceptualized as the acquisition of increasingly complex skills and strategies, the effectiveness with which any individual child, whether a member of a language minority or not, develops into a proficient reader may depend heavily on his or her schooling experience, including exposure to appropriate instruction, both formal and informal (p. 58).

**Second-language literacy.** Research shows ELLs and monolingual English speakers in the same classrooms demonstrate equivalent word and pseudo-word reading abilities (Chiappe, Siegel, & Gottardo, 2002; Lesaux & Geva, 2006). The longitudinal findings indicate that by the first grade there were no differences between ELLs and monolingual English speakers on measures of word and pseudo-word reading (Chiappe et al., 2002). Contrary to the common inclination that language-minority status results in lower achievement, studies with poor readers indicate that phonological skills were a more significant correlate of reading skills (Chiappe & Siegel, 1999). Second language word reading ability correlates with first language word reading

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ability as well as second language phonological processing skills and second-language vocabulary knowledge (Gottardo, 2002, p. 92).

Vocabulary is one of the significant factors on reading proficiency. Stanovich (1986) asserted that vocabulary development provides a potent reciprocal relationship to individual differences in reading ability. He pointed out that unlike the case of phonological awareness, the relationship of vocabulary knowledge to reading continues throughout reading development and remains in force for even the most fluent adult readers (p. 379). Carlo et al. (2004) also suggested that gaps in reading performance between Anglo and Latino children are associated with gaps in vocabulary knowledge. They asserted vocabulary knowledge is a root cause for the intellectual challenge posed by the reading comprehension gap and the effect is reciprocal – the greater vocabulary knowledge is, the easier reading becomes, while the more reading means, the larger vocabularies are (p. 191). They found that direct vocabulary instruction was effective with ELLs.

Lesaux and Geva (2006) asserted that the process of learning to read in a second language by language-minority students is influenced by the same skills that influence reading for native speakers (p. 94). Studies of ELLs as well as monolinguals have revealed the role of early literacy, such as phonological awareness and word-level skills, for reading comprehension (Reese, Garnier, Gallimore, & Goldenberg, 2000; Verhoeven, 2000).

Contrary to second-language word reading skills, second language reading comprehension skills in ELLs ranked lower than their language majority peers (Verhoeven, 2000). Existing large-scale data sets on the school achievement of language-minority students both in the U.S. and abroad suggest that comprehension is a significant area of difficulty for these learners (Lesaux & Geva, 2006).
Among immigrant students, some ELLs have strong academic preparation while others do not. According to statistics, among Hispanic students who are newcomers to the U.S. more than one-third are enrolled below grade-level (Jamieson, Curry, & Martinez, 2001). These students may not be literate even in their native language. Literacy development of these second language learners can be considered at risk. In short, different educational experiences can be seen as relevant predictors of second language learners’ literacy achievement (Verhoeven & Vermeer, 2006). Researchers have synthesized different components in second language acquisition, such as social, cognitive, and linguistic practices that vary with cultural contexts (McRight 2002; Kern & Schultz, 2005).

Education is known to become more complicated and de-contextualized around the fourth grade with the introduction of different content areas. Some refer to this time as the “fourth grade slump” (Chall et al., 1990). Researchers found that gaps in reading comprehension between children from a low SES background and those from more privileged backgrounds tend to increase around this time (Verhoeven & Vermeer, 2006). Race, SES, and educational experience account for about forty percent of the variance in the children’s reading literacy scores (Verhoeven & Vermeer, 2006). This indicates that special attention should be given to strengthening the connections between home and school in order to stimulate the literacy development of minority children.

Previous studies have shown that the development of children’s vocabulary and world knowledge is highly dependent on input from the home environment (Snow et al., 1995). Reciprocal relationships between reading and other factors such as vocabulary seem to cause the increasing differences between good and poor readers (Stanovich, 1986). Some researchers went further, discussing the low motivation and educational aspirations of minority students. They
claim that “secondary cultural discontinuities,” such as low motivation and low educational aspirations are the result of discrimination and limited social and economic opportunities for minority groups. Other researchers assert that high motivation and educational aspirations can and do coexist with low achievement and that other factors must therefore explain the differential achievement of culturally diverse group (Verhoeven & Vermeer, 2006). Stanovich (1986) applied the term, Matthew effect, to the education setting to describe a phenomenon that has been observed in research on how new readers acquire the skills to read: early success in acquiring reading skills usually leads to later successes in reading as the learner grows, while failing to learn to read before the third or fourth year of schooling may be indicative of life-long problems in learning new skills.

Major differences in the success of native versus non-native children in the upper grades of primary school may largely depend on differences in their underlying linguistic skills. Bialystock (2001) explored meta-linguistic skills for children who are exposed to more than one language, which can predict student’s second language performance if well-developed. While some ELLs have strong academic preparation, other immigrant students arrive at U.S. schools with limited schooling. These students are not literate in their native language and have significant gaps in their educational backgrounds. Beyond the educational limitations, these students often need additional time to become accustomed to school routines and expectations (August, 2002).

It is well-known that academically mediated language skills transfer across languages (Cummins, 1979) and readers use knowledge of their native language as they read in a second language (Garcia, 1998). The ability to read transfers across languages, as do some of the components of reading, which prepare children for that ability. Therefore, children who have
learned skills in one language can potentially benefit from that mastery by applying that same skill set to other languages (Bialystok, 2001).

Multiple Factors Affecting Reading Performance

The factors identified in this research are the most common factors mentioned in the previous literature that studied ELLs’ reading performance (August & Hakuta, 1997; Snow et al., 1998). These factors can contribute to both ELLs’ and non-ELLs’ reading achievement.

Student characteristics and environments. Literature covering students’ characteristics on their low academic achievement, specifically reading comprehension performance, is reviewed in this section. This section discusses three such sets of factors: language proficiency, social background, and student’s engagement in learning.

Language.

English proficiency. NCLB results show that ELLs generally perform lower than non-ELLs on major content areas such as reading, math, and science. The gap between the two groups gets even bigger as the content areas demand higher language proficiency. This indicates the impact of English language proficiency on content knowledge assessment. Research has shown that language background affects students’ performance, particularly in content-based assessments (Abedi & Lord, 2001; Abedi, 2002; Abedi et al., 2003; Solano-Flores & Trumbull, 2003).

Standardized high-stakes achievement tests are used for assessment and classification of ELLs as well as for accountability purposes (Linn, 1998). However, most standardized content-based tests are administered in English and developed for targeting native or highly proficient non-native English-speaking test takers. Therefore, many standardized tests unintentionally
function as English language proficiency tests. In particular, ELLs at the lower end of the English proficiency spectrum are found to suffer from lower internal consistency, which indicates the language background of students may add another dimension to the assessment of content-based areas (Abedi, 2002). This was particularly true for students in higher grades where language has more impact on performance. Because of their limited English proficiency, ELLs may be confronted with test questions that have an unfamiliar linguistic structure or they may not recognize vocabulary terms which they could understand if they were written in their native language. Linguistic factors may act as construct-irrelevant sources in ELLs’ assessment (Messick, 1994):

> With respect to distortion of task performance, some aspects of the task may require skills or other attributes having nothing to do with the focal constructs in question, so that deficiencies in the construct-irrelevant skills might prevent some students from demonstrating the focal competencies (p. 14).

Thus, it is apparent that if language proficiency is not treated as a measurement error in a content area test, it is likely to reduce the validity and reliability of the inferences drawn from students’ content-based knowledge (Abedi, 2002). This is also indicated in the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999):

> For all test takers, any test that employs language is, in part, a measure of their language skills. This is of particular concern for test takers whose first language is not the language of the test. Test use with individuals who have not sufficiently acquired the language of the test may introduce construct-irrelevant components to the testing process. In such instances, test results may not reflect accurately the qualities and competencies intended to be measured (p. 91).

Therefore, without proper treatment of these construct-irrelevant test components, states and schools with large ELL populations may suffer negative consequences, in response to AYP accountability. Messick (1995) asserted that construct validity should incorporate any evidence that impacts the meaning and interpretation of assessment scores. Messick termed the
unanticipated assessment result “the social consequences of score use” (p. 741). The confounding of test language comprehension with student demonstration of content knowledge makes ELLs show improvement in content knowledge only when their level of academic English proficiency increases (Abedi & Lord, 2001). The confounding effect of English proficiency to the content knowledge tests may even work as systematic variance for ELLs.

In 2004, two new policies related to the implementation of NCLB were announced. Previously, ELLs were required to take both reading/language arts content assessment and the English-language proficiency tests. ELLs who are new arrivals to US public schools during their first year of enrollment in U.S. schools are now allowed to have the option of taking the reading/language arts content assessment in addition to the English-language proficiency assessment. They are required to take the math assessment, with accommodations as needed. In addition, states are now can exclude for one year results from the math and the reading/language arts content assessments in AYP calculations. The other new policy change allows states to include in the LEP subgroup students who have attained English proficiency are no longer considered LEP according to the district/state’s definition (Garcia, McKoon, & August, 2006).

However, research shows that ELLs need more than three years to improve their academic English proficiency (Cummins, 1981). The ELL population is rapidly growing, and they are being assessed in content areas without being afforded enough time to develop sufficient English proficiency to accurately assess their academic progress. As a result, schools with large numbers of ELLs are more likely to be classified as needing improvement according their state standards.

First-language proficiency. In addition to English proficiency, student’s first-language proficiency can affect student’s test performance. English proficiency in the academic setting, in
particular, is related to a student’s native-language proficiency. Cummins (1981) proposed the linguistic interdependence hypothesis, which supposes an underlying cognitive or academic proficiency. Cummins wrote “[T]he literacy-related aspects of a bilingual’s proficiency in first language (L1) and second language (L2) are seen as common or interdependent across languages” (pp. 23-24). The language interdependence hypothesis assumes that acquiring literacy ability in the L1 not only constructs literacy skills in that language but also formulates deep underlying conceptual or academic proficiency, which in turn is transferable to another language.

While students may develop social skills in English, a surface feature of L2, fairly quickly, development of cognitive/academic language proficiency, which is the common underlying proficiency, may take five to seven years (Cummins, 1981). The cognitive or academic proficiency of English may be influenced by ELLs’ prior school experiences, home language environment, parents’ education, SES, and other environmental factors. Considering that students’ linguistic behaviors reflect the linguistic and social practices of their environments (e.g., home, classroom, school), it is necessary to find out how ELLs’ characteristics, such as prior learning experiences, engagement in learning, and environmental factors e.g., home literacy environments can affect ELLs’ English reading performance. The purpose of non-cognitive information, such as engagement in learning and environmental factors, is to inform educational policy makers by describing the contexts for learning, sometimes called opportunities to learn (Mullis, 2002).

**Social background.** In this study, social background refers to students’ familial contexts in which they develop language proficiency both cognitively and non-cognitively.
Race/ethnicity, SES, and home literacy environment are reviewed as components of student’s social background.

Studies show that factors influencing second language reading comprehension tend to fall into either individual or contextual factors (Lesaux & Geva, 2006). Individual factors include early literacy, word-level skills, background knowledge, and motivation. Contextual factors are variables like SES (Lesaux & Geva, 2006). Although ELLs’ English proficiency was found to be the most profound influence on their assessment outcomes in some studies, limited proficiency in English does not appear to be entirely responsible for the low reading achievement of ELLs (Abedi et al., 2003; Snow et al., 1998). Studies found that many Spanish-speaking students in the U.S. still demonstrate low levels of reading performance even when taught and tested in Spanish, (Snow et al.). This suggests that factors other than the lack of English proficiency significantly contribute to ELLs’ low reading performance. The risk of being a low achiever is strongly determined by several socio-cultural factors as well as by students’ personal characteristics, attitudes and activities both in and outside school (Linnakylä, Malin, & Taube, 2004).

Race/ethnicity. The majority of ELLs in the U.S. are immigrants or children of immigrants whose native language is not English. A statistical report shows that over four hundred languages were spoken by ELLs enrolled in the 2004-2005 school year (National Clearinghouse for English Language Acquisition [NCELA], 2005). Spanish is the most dominant language spoken by ELLs followed by Vietnamese, Hmong, Chinese, and Korean. Eighty percent of ELLs are native Spanish speakers and the nationwide Hispanic students percentage in the both 4th and 8th grades doubled between 1992 and 2005 (NCES, 2006).
Hispanic students are, by far, the most at risk ELLs for reading difficulties (Snow et al., 1998, p. 28). There have been consistent achievement gaps in all content areas including reading between Hispanic and White students (NCES, 2006). The achievement gaps in reading have been reduced through the 1970s and 1980s; however, recent data indicates the achievement gap between Hispanics and White is increasing (Lee, 2002). Research shows that achievement gaps in reading between Hispanics and White, regardless of whether they are U.S. or foreign born, tend to appear early and persist throughout their school careers (Snow et al., 1998). Snow et al. (1998) indicated there are many more chances for poor children, among non-white children and non-native English to fail to learn to read sufficiently to succeed in school. They further connected the association of poor reading outcomes with limited English, minority, and poverty status to the accumulated effects of several of these risk factors. They include lack of access to literacy-stimulating pre-school experiences and to excellent, coherent reading instruction (p. 4). Therefore, it is difficult to distinguish the risk associated with minority status and not speaking English from the risk associated with lower SES.

Socioeconomic status (SES). Solano-Flores and Trumbull (2003) found language factors interact with test items. They conducted item micro-analysis to see how different linguistic properties and SES are related to socio-cultural perspective when students are taking tests. According to their analysis existing approaches to testing ELLs may not ensure equitable and valid outcomes due to the fact that current research and assessment practices overlook the complex nature of language, including its interrelationship with culture. Their research shows if a student has low educated parents, is from a low income family, or is of certain ethnicity, then the student tends to interpret the words on the test differently compared to his/her peers. This wording issue becomes even more serious when a linguistically diverse group is tested because
in many cases ELLs often come from low income families with low educated family. Studies have shown that there is a high correlation among limited English proficiency, poverty, and other hardship measures (Capps et al., 2005; Hakuta & Beatty, 2000). Thus, defining academic English proficiency is complicated by students’ SES.

Besides coming from families with low income, children of immigrants and ELLs are more likely to have parents with relatively little formal education, which can affect their educational experiences. Studies have shown that parental educational attainments influence the ultimate children’s education attainment and income into adulthood (Hernandez, 2004). Parents with low income, low education and limited English proficiency may have a harder time to conduct functional roles for literacy than affluent parents. Families have long been known to vary substantially in their capacities to provide educational environments that foster early literacy and help a child to be ready to enter a social and educationally based environment, school. Families provide different support for children’s literacy, thus measurement of the home literacy environment can indicate whether a child is at-risk for reading development (Snow et al., 1998). In a study designed to examine the literacy attainment of Finnish and Swedish speaking students, Linnakylä et al. (2004) found that the economic, cultural, and social capital of a family influences a child’s learning in various ways, either promoting or hindering it. Research also found that children from lower SES families are even less likely to have highly qualified teachers (Goldhaber & Brewer, 2000).

Considering that many ELLs are from low income families, they are more likely to be provided with fewer opportunities to interact with books and other printed materials for school-like experiences. This puts them at a higher risk for reading difficulties, more so than a child whose home provides more literacy materials. Home literacy environment can be one of the
factors affecting a student’s opportunity to learn in reading along with classroom practices regarding content coverage or quality of instruction delivery. Family income and maternal education levels have been strong predictors of child academic outcomes and have been used as a proxy for SES. Maternal education is associated with the quality of the home environment, parental teaching styles, and investments in a variety of resources that promote learning (Connor, Son, Hindman, & Morrison, 2005).

*Home language environment (HLE).* Family involvement in children’s education is widely believed to promote academic achievement, and their literacy (Dearing, McCartney, Weiss, Kreider, & Simpkins, 2004). Furthermore, a student’s home literacy environment is considered to be one of the most important factors in their reading development while learning a first and second language. Each family provides a different supportive environment for their children’s literacy development because all families are not alike. Literacy levels of adults in the family vary and thus their literacy experiences may be vastly different.

Hess and Holloway (1984) identified five broad areas of family functioning that may influence reading development. They are value placed on literacy, press for achievement, availability and instrumental use of reading materials, reading with children, and opportunities for verbal interaction. Both available reading materials at home and parents’ encouragement on reading can help children’s literacy. Parents who read and encourage their children to read are showing that they value literacy and are likely to set high expectations for their achievement. In homes where reading and writing materials are available children are more apt to have experiences with literacy. Thus, measurement of the home literacy environment can provide proxy indication of a child’s reading ability (Snow et al., 1998).
Children from middle income homes have greater opportunities for informal literacy learning than children of low income homes, such as more access to reading materials and opportunities. There is overwhelming evidence that children living in low income families display lower levels of academic self-efficacy and literacy achievement relative to other children (Dearing et al, 2004). The accumulated and ongoing influences of home learning environment and SES can be the most powerful predictors of children’s achievement in the first grade (Connor et al., 2005, p. 371).

Reading engagement. A number of factors have been consistently identified as significant in explaining reading performance. These include characteristics related to student’s gender, self-esteem, motivation, reading interest and activities as well as parent’s education, economic and cultural resources in the home, and ethnic and language background (OECD, 2004). Motivation has been a significant non-cognitive aspect researched in relation to learning (Abedi & O’Neil, 2005). Research on the effects of gender, math achievement, and ethnicity on students’ attitudes toward mathematics found that failing students scored lowest on self-confidence, motivation, value, and enjoyment (Abedi & O’Neil, 2005).

Study also found that poor readers have poorer intrinsic motivation than good readers (Shell, Colvin, & Bruning, 1995). Students who are good readers like to read, which usually results in them becoming even better readers. Study shows that when interest in reading is high, student’s performance improves more quickly than when it is low (Ecalle et al., 2006). More broadly, studies on students with learning difficulties have demonstrated that a long history of failure causes them to have poor self-esteem and have little intrinsic motivation to learn (Wigfield, 1997). Reading interest can be related to students’ SES. Parents with more money tend to look for outside school to support children for better achievement and aide in increasing
confidence and device to learn. Reading engagement may play an important role in determining academic achievement for ELLs. Studies of poor first and second language readers have shown that a lack of motivation to read or to spend time practicing reading keeps them from improving, which compounds the problem of poor readers (Alderson & Bachman, 2000; Snow et al., 1998). Since learning is the acquisition of knowledge and skills which are not already present, it requires interest, effort, and concentration (Neuman & Roskos, 1992).

Apart from the family- and school-related factors, students’ personal characteristics, attitudes, and interests proved to be strong predictors of at-risk achievement (Linnakylä et al., 2004). However, reading engagement is described as a multidimensional domain with different constructs such as self-efficacy beliefs, coping tendencies, learning goals, attitudes about reading and interest in reading. Student’s engagement in reading is associated with both social class and culture and is a key mechanism for explaining differences in educational success between language-minority students with different levels of English language proficiency (Rumberger & Larson, 1998). Research suggests although language-minority status is not connected to the affective component of academic engagement, language-minority students are less likely to engage in academic behaviors outside of school that facilitate higher academic reading achievement (Paret, 2006).

The lack of a literacy environment can affect student’s motivation to read as well as their reading achievement scores. However, engagement in reading can compensate for low family income and poor educational background (Linnakylä et al., 2004).

**Teacher qualifications.** Teachers’ capacity to teach effectively is among the most important factors contribute to students’ academic success. Research indicates teacher qualifications as well as student and family characteristics affect students’ success in school
(McClelland, Kessenich, & Morrison, 2003). Allington (2006) asserted the importance of expert teacher. Although there are multiple sources of influence on students’ achievement that occur outside the classroom, the intended curriculum is translated into practice by teachers. It is the expert teacher who can modify and adapt curriculum materials such that children are successful. Thus, teacher qualification influences the quality of instruction and students’ performance when considered with other factors.

Becoming literate in a second language may depend on the quality of teaching with factors outside the classroom, which is a function of the content coverage and methods used to support the special language needs of second language learners and to build on their strengths (August, 2006).

There is a greater need for teachers who are able to teach ELLs because of the changing demographics in the U.S. (McRight, 2002; Hawkins, 2004). Every bilingual and ESL classroom, just like other classrooms, must have a highly qualified teacher who has credentials or significant expertise in the subject areas he or she teaches (Capps et al., 2005). Hawkins (2004) claims that there is currently only one qualified teacher available for every 100 ELLs. As a result of the dominant use of the English language in schools, students with limited English proficiency may not only experience communication difficulties but also confront teachers who are unprepared to teach them (Paret, 2006; Hawkins, 2004). Although states reported significant numbers of teachers receiving training related to teaching ELLs, research shows that not all ELL teachers are certified in their field (Kindler, 2002).

Orellana (1995) found teachers tend to blame ELLs’ difficulty with reading skills on their cultural and language backgrounds, rather than on teaching methods, materials, and teacher assumptions. Teacher training may influence teacher beliefs and help teachers become more
aware of how their attitudes and beliefs influence their instruction. Research indicates that schools teach in ways that fail to make the content comprehensible to ELLs who are just beginning to learn English. Among the factors responsible were the lack of trained teachers and assessment practices that failed to identify students’ academic needs (LaCelle-Peterson & Rivera, 1994). Teachers are distinguished by several characteristics including years of teaching experience, certificates, degrees, and professional development in their content areas. Recent evidence indicates that students’ achievement is predicted by specific teacher qualifications—certifications, highest education achieved, including general academic ability and subject matter knowledge, teacher experience (Darling-Hammond, 2000). Ferguson (1991) found that better student test performances were correlated with teachers who have more years of teaching when other variables, such as student’s family and community background factors, were controlled (Clauser, 2002). Another research indicates teachers’ years of teaching experience and educational degree positively predicted student outcomes (Greenswald, Hedges, & Laine 1996; Goldhaber & Brewer, 2000). Connor et al. (2005) found that teachers’ years of education directly affected student outcomes. Moreover, teachers with more years of education were more likely to interact with their students in sensitive and responsive ways than were teachers with fewer years of education. Rueda and García (1996) found the fully credentialed and emergency-credentialed teachers held slightly more positive views of bilingualism and bi-literacy.

Recent studies indicate that teachers found professional development to be most helpful when it provided opportunities for hands-on practice with teaching techniques readily applicable to their classroom, in-class demonstrations with their own or a colleague’s students, or more personalized coaching (August & Shanahan, 2006). A research report on professional development asserts that professional development leads to better instruction and improved
student learning when it focuses on how students learn particular subject matters, instructional practices that are specifically related to those subject matter and how students understand them, and strengthening teachers’ knowledge of specific subject matters (August & Calderón, 2006).

In addition to teacher qualifications, class size and instructional resources may affect the effect of instruction. Research showed that small classes work better (Finn, Pannozzo, & Achilles, 2003). They found often times class size is associated with student’s engagement in learning. Students can have more active participation and more time on task in small classes. Small classes can also motivate less anti-social behavior. Ecalle (2006) found a significant effect of class size to the performance, that is to say that the performance observed in the small classes were better than those found in the normal-sized classes. However, she also found interesting relation between class size and other variables. It was found that students coming from the middle SES benefited most from attending small classes but not the students from the low SES level. Connor et al. (2005) mentioned that when class size was included, teachers with more years of experience were more likely to have more students in their classroom. However, class size was not related to the other teacher qualification variables nor did it significantly predict either the classroom practice variables or the student outcome variables.

There is also the issue that schools are not necessarily equipped to help new teachers in the field be prepared for their new populations. Availability of instructional resources is another variable that can affect teacher’s effective teaching. School districts with weaker tax-bases tend to have under-resourced schools including less qualified teachers. Thus, teacher qualifications and allocation of instructional resources may contribute to student’s academic achievement simultaneously along with student and school characteristics (Connor et al., 2005).
School environments. Students’ performance has been linked with certain school characteristics, most notably cooperation with parents, emphasis on reading instruction, the quality of school life, school location, school size, and cooperation with community (OECD, 2004). Yet the research during the past decades tells us that the relation between schooling and student achievement is neither direct nor easily understood (Everson & Millsap, 2004). Sirin (2005) asserted that there is a much stronger relationship between SES and academic achievement when we consider the schools students attend or the neighborhood in which they live, rather than the status of the students or families themselves.

There have been numbers of studies on the relationship between school resources and practices and students’ achievement scores. Tavani (2004) looked at how school location and school type can affect the math performance of students with disabilities. Winokur (2004) studied how teacher quality and school SES can affect the students’ reading achievement. Everson and Millsap (2004) examined the differential effects of family background and school level variables on ethnic minority students’ math academic achievement. They found school size, the proportion of children in poverty, and the ethnic and racial composition of the schools were all important and meaningful predictors of student achievement beyond the individual differences that children bring with them to the schools (p. 171).

The schools with high percentages of ELLs face multiple challenges trying meet NCLB standards as they are predominantly urban, enroll large numbers of low-income minority students, and have less experienced principals and teachers than schools that enroll few or no ELLs (Capps et al., 2005).
Summary

Problems in interpreting differential test performance between particular groups and concerns about the validity of inferences derived from assessments have more increased past years due to the recent major amendments to the Elementary and Secondary Education Act (ESEA), particularly NCLB. Many of studies have found language as the primary mediator of ELLs’ achievement outcome, but there has also been criticism on over-simplification of ELLs as homogenous group. Language proficiency has been often singled out as the primary reason for the poor performance of ELLs on standardized content assessments with mere consideration of other student demographic characteristics.

Reading is important as a prerequisite for successful participation in most areas of youth or adult life. Literacy is multidimensional. It is influenced by one’s individual, instructional, and contextual factors. Reading comprehension tends to be more difficult for ELLs and reading becomes more complex and the factors tend to increase gaps between high SES students and low SES students from around 4th grade. Some researchers suggest the existence of underlying linguistic skills and its transfer language to language. Further, some discuss the issue of the low motivation and educational aspiration of minority of students, which can influence students’ achievement performance.

There are accumulated effects of risk factors such as limited English, minority, poverty status, teacher, and school environment to poor reading outcomes. The cognitive proficiency of English may be influenced by ELLs’ prior school experiences, home language environment, parents’ education, SES, and other environmental factors. Studies have shown that there is a high correlation among limited English proficiency, poverty, and other hardship measures. Thus, defining academic English proficiency is complicated by students’ SES. In homes where reading
and writing materials are available children are more apt to have experiences with literacy. Thus, measurement of the home literacy environment can provide proxy indication of a child’s reading ability. The lack of a literacy environment can affect student’s motivation to read and research found that poor readers tend to have poorer intrinsic motivation than good readers. Some researchers suggest engagement in reading can compensate for low family income and poor educational background.

The intended curriculum is translated into practice by teachers, so teacher qualification influences the quality of instruction and students' performance when considered with other factors outside the classroom. Student’s individual characteristics and teacher qualifications are affected by school characteristics such as school SES, race, and resources and class size.

**Significance of This Study**

One contribution this study makes to the extant literature is a better understanding of multiple factors contributing to ELLs’ standardized reading test performance, using large data sets. Extant research on ELLs’ standardized test achievement often overlooked the impact of ELLs’ various demographics and environmental characteristics. Rather it has generally focused on language as the primary mediator of student achievement. Research says the effects of school and teacher differences on student achievement are made more complex when we recognize the variety of individual differences in background and ability that accompany students in schools (Everson and Millsap, 2004). This study looks at ELLs and non-ELLs’ standardized reading test performance more closely with detailed attention on student, teacher, and school demographic variables, using HLM, and compares how those demographic variables are related to ELLs and non-ELLs’ performance differently.
Another contribution that this study can make is a nuanced understanding of the relationship between students’ reading performance and their reading engagement when controlling for student, teacher, and school characteristics. Research informs that academic engagement is associated with student’s social class and culture but it can compensate for low family income and poor educational background at the same time. This study looks at ELLs’ reading engagement related to their reading performance and other demographic variables.

Lastly, this study hopes to highlight the persuasive power of NAEP in studying ELLs’ achievement. NAEP data can be used to understand the relationship between student and school variables and achievement. NAEP data and its research result can be used to document educational inequities and take appropriate policy decisions.

**Research Questions and Hypotheses**

1. How is NAEP 4th grade reading achievement related to the six student level variables identified in the literature review: home literacy environment (HLE), SES, race, reading engagement, language other than English used at home, and student’s English proficiency (ELL vs. non-ELL)? Do these relationships differ for ELLs and non-ELLs?

   - **HO$_{1A}$**: Non-ELLs will have higher reading engagement, SES and better home literacy environment than ELLs.
   - **HO$_{1B}$**: Students who speak English at home will have higher NAEP reading achievement than the students who speak a language other than English at home.

2. How is NAEP 4th grade reading achievement related to the six teacher qualification variables identified in the literature review: academic degree, major in reading or related field, years of teaching, class size, instructional resources, and professional development? Do these relationships differ for ELLs and non-ELLs?

   - **HO$_2$**: Non-ELLs will have teachers with higher academic degrees, more content knowledge and more professional development than ELLs.

3. How is NAEP 4th grade reading achievement related to four school level variables identified in the literature review: mean SES, race, locale, and LEP percentage? Do these relationships differ for ELLs and non-ELLs?
- **HO3**: ELLs will attend schools with low SES and higher LEP percentage than non-ELLs.

4. How does NAEP 4th grade reading achievement vary among ELLs, when controlling for students-, teacher-, and school-level demographic variables? To what extent do these demographic factors correlate with ELLs’ achievement?

- **HO4A**: ELLs who have higher reading engagement will have higher NAEP reading achievement than ELLs with low reading engagement.

- **HO4B**: Non-Hispanic ELLs will have higher NAEP reading achievement than Hispanic ELLs.

- **HO4C**: ELLs who speak a language other than English more often at home will have lower NAEP reading achievement than those who speak English more often at home.

- **HO4D**: ELLs will have higher NAEP reading achievement when the teacher has higher academic degree, more content knowledge and professional development.

- **HO4E**: ELLs will have higher NAEP reading achievement when the mean school SES is high and/or school has a lower LEP percentage.

5. How does NAEP 4th grade reading achievement vary between ELLs and non-ELLs in schools located in urban areas? Does it persist when controlling for students-, teacher-, and school-level demographic variables?

- **HO5**: ELLs will perform lower than Non-ELLs when the school is located in urban areas.

6. How does reading engagement vary among ELLs, when controlling for student-, teacher-, and school-level demographic variables?

- **HO6A**: ELLs who have attended schools with high mean SES and/or low LEP percentage will have higher reading engagement.

- **HO6B**: ELLs who have teachers with higher academic degree, more content knowledge, and professional development will have higher reading engagement.

- **HO6C**: ELLs who have better home literacy environment will have higher reading engagement.
Figure 1. Conceptual model on multiple factors affecting ELLs’ reading achievement, adapted and modified from Paret (2006)
Overview of Conceptual Model

Figure 1, which follows, presents the conceptual model describing the multiple factors affecting ELLs’ reading achievement in standardized tests. These factors have been reviewed in detail in the literature review. The factors in this conceptual model are the most common factors mentioned in the previous literature that studied ELLs’ reading performance (August & Hakuta, 1997; Snow et al., 1998). Then, each of the hypotheses that will be tested in this study is outlined afterwards.

In the model, student’s English proficiency, social background, and reading engagement are student level characteristics affecting ELLs’ reading achievement. Teacher and school level factors are in the shaded boxes. Solid lines represent the relationships found in the extant literature and dashed lines represent the relationships that would like to be established in this study.

Research indicates that student’s English proficiency, social background such as SES, ethnicity, and home literacy environment affect students’ reading achievement (Abedi, 2002; Abedi et al., 2003; Lutkus, 2004; Hofstetter, 1998; Snow et al., 1995). Students who speak a language other than English at home more often tend to be ELLs and they are expected to have lower NAEP reading achievement than non-ELLs (HO$_{1B}$, HO$_{4C}$).

Statistics shows that ELLs tend to have low SES and lower home literacy environment than non-ELLs and ELLs often come from specific race/ethnicity such as Hispanic (NCES, 2006). Non-ELLs will have better social background than ELLs and social background is expected to affect students’ NAEP reading achievement (HO$_{1A}$, HO$_{4B}$).

Teacher demographic variables and school characteristics are known as factors on student’s reading achievement (McClelland et al., 2003; Snow et al., 1998). Students who have
more qualified teachers and/or who go to schools with high mean SES are expected to have higher NAEP reading achievement (HO\textsubscript{4D}, HO\textsubscript{4E}).

Researchers have claimed that there are currently limited numbers of qualified teachers available for ELLs (Hawkins, 2004). Thus, Non-ELLs are likely to have more qualified teachers than ELLs (HO\textsubscript{2}).

Studies found that ELLs tend to go school with large percentage of LEP and low mean SES (NCES, 2006). Therefore, in this study, more ELLs are expected to attend schools with low SES and higher LEP percentage than Non-ELLs (HO\textsubscript{3}).

Students who are good readers tend to enjoy reading and a lack of motivation to read keeps students from improving reading (Shell et al., 1995; Alderson & Bachman, 2000; Snow et al., 1998). Thus, ELLs who have higher reading engagement will have higher NAEP reading achievement than students with low reading engagement (HO\textsubscript{4A}).

Statistics shows students who attend schools located in urban area have lower NAEP reading achievement than nation’s average NAEP reading achievement (NCES, 2006). The characteristics of urban schools may correlate with student’s reading achievement to some extent. However, ELLs are still expected to perform lower than Non-ELLs when the school is located in an urban area (HO\textsubscript{5}).

Lack of motivation to read keeps students from improving reading. Students who have better home literacy environment, more qualified teachers, and attend schools with high mean SES and/or low LEP percentage are expected to have higher standardized achievement and higher reading engagement (HO\textsubscript{6A}, HO\textsubscript{6B}, HO\textsubscript{6C}).
Chapter 3

Methodology

This section provides the information on the 2005 NAEP reading data along with its methodological challenges posed for the data analysis of this study. Analysis tools used for this study and the analysis procedures are followed next. The first section specifies the population and samples of this assessment and reviews the instrument used for collecting the data. This section is concluded with a description of the procedures used to collect the data, including the methodological challenges, working with this database. The second section describes analysis tools used for this study, AM and HLM. The last section specifies the analysis procedures and the design of the study used in the study.

Information on the 2005 Main NAEP Reading Data

NAEP, which is administered by NCES, is a survey designed to produce national, state, and large district level results of 4th, 8th, and 12th graders’ performance in a range of subject areas, including reading, writing, mathematics, science, U.S. history, and world geography. NAEP’s purpose is to report to the public on the status of academic achievement in the U.S. and the assessment does not report results for individual students, but only for groups with large, representative samples. NAEP’s role is an assessment of overall achievement rather than a diagnostic test for individual students (NCES, 2007).

NAEP reading framework. The main NAEP reading assessment is a large-scale assessment and was developed to focus on the nature of reading comprehension. The NAEP reading assessment reports how well students perform in reading various texts and responding to those texts in multiple-choice and constructed-response formats (NCES, 2007). This assessment
reflects current definitions of literacy by differentiating among three contexts and four aspects of reading. The contexts for reading are, namely, reading for literacy experience, reading to gain information, and reading to perform a task. The four aspects of reading are forming a general understanding, developing interpretation, making reader/text connections, and examining content and structure (Rogers & Stoecket, 2007). The contexts and aspects of reading specified in the NAEP are described in detail in the literature review section.

The proportion of items related to each context for reading in each grade is shown in Table 1. As shown in Table 1, the proportion of items changes from grade to grade to reflect the changing demands of students as they grow. In fourth grade, items to perform a task are not tested.

Table 1

Proportion of Items in Each Context for Reading

<table>
<thead>
<tr>
<th>Grade</th>
<th>For Literacy Experience (%)</th>
<th>For Information (%)</th>
<th>To Perform a Task (%)</th>
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<tbody>
<tr>
<td>4</td>
<td>55</td>
<td>45</td>
<td>No scale</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>35</td>
<td>45</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 2 shows the percentage of time students in a given grade would spend on NAEP items that measure each aspect if they responded to all items in the NAEP reading assessment. In fourth grade, students will spend 60% of time for forming a general understanding and developing interpretation, 15% for making reader/test connections, and 25% for examining content and structure. The time allotment in each aspect does not change too much from grade to grade.
Table 2

*Percentage of Time Spent on Each Aspect of Reading*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Aspects of Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forming a general understanding &amp; developing interpretation (%)</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>55</td>
</tr>
<tr>
<td>12</td>
<td>50</td>
</tr>
</tbody>
</table>

NAEP reading assessment results are reported in terms of average scores for groups of students on the NAEP 0–500 scale and as percentages of students who attain each of the three achievement levels: Basic, Proficient, and Advanced (see Table 3). The achievement levels offer a means of identifying percentages of students who have demonstrated certain reading proficiencies (NCES, 2007).

Table 3

*NAEP Reading Assessment Result Report*

<table>
<thead>
<tr>
<th>Achievement level</th>
<th>Policy definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>Superior performance.</td>
</tr>
<tr>
<td>Proficient</td>
<td>Solid academic performance. Students reaching this level have demonstrated competency over challenging subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.</td>
</tr>
<tr>
<td>Basic</td>
<td>Partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at each grade.</td>
</tr>
</tbody>
</table>

Table 3 is the generic policy definitions to develop descriptions of what students should know and be able to do at the Basic, Proficient, and Advanced performance on the NAEP reading assessment for 4th, 8th, and 12th graders. These descriptions are presented in Appendix D.
to illustrate Basic, Proficient, and Advanced performance on the NAEP reading assessment for 4th graders.

Each student who participated in the main NAEP reading assessment received a booklet containing - two sets of cognitive questions, a set of general background questions, and a set of subject-specific background questions. Three types of questions were used in the cognitive questions: multiple-choice, short constructed-response, and extended constructed-response (Rogers & Stoecket, 2007). In addition to the student test booklet, three other instruments provided data relating to the assessment - a teacher questionnaire, a school questionnaire, and a student with disabilities/Limited English Proficiency (SD/LEP) questionnaire. The teacher questionnaire consisted of items relating to their educational background and classroom instruction strategies and techniques. The school questionnaire included items based on the students’ enrollment, teacher and staff curriculums, available resources, and school policies. The SD/LEP questionnaire was completed by school administrators and teachers who were knowledgeable with the students who were selected to take the assessment and also identified as having an Individualized Education Plan (IEP) or being limited English proficient. Items were related to the performances and the special programs in which the student was enrolled (Rogers & Stoecket, 2007).

**NAEP methodology.** NAEP data analyses are complicated by the methodological challenges posed by the NAEP data which must be overcome in order to provide accurate results from the statistical analyses. These challenges are the multi-stage cluster sampling design and measurement error associated with the matrix sampling scheme.

**Multi-stage cluster sampling.** The main NAEP 2005 reading assessment of the 4th graders is based on a national sample. Since the relatively small samples of selected students
must represent the entire population, a complex sampling scheme was applied to collect the data instead of simple random sampling. Schools are stratified based on urbanization, area income, and minority population strata. Schools within each stratum are then selected at random. Lastly, students are selected randomly within schools. Thus, students do not have an equal probability of being selected and observations are not independent of one another as they are in simple random sampling. Consequently, statistical procedures should not be directly applied to this data without modifications because doing so may affect the validity of conventional techniques of statistical inference (Rogers & Stoeckel, 2007).

Certain strata, such as schools with high enrollment of African American or Hispanic students, were deliberately over-sampled in order to improve the precision in the estimation of the characteristics of various subgroups (Rogers & Stoeckel, 2007). This over-sampling resulted in an over-representation of the members of these subgroups relative to the population.

Each student and school has been assigned a sampling weight due to the unequal probability of selection for students and schools. Sampling weights reflect the appropriate proportional representation of the various types of individuals and schools in the population. The larger the probability of selection for students in a particular demographic area, the smaller the weights applied to those students will be. These weights include adjustments for non-responses and adjustments designed to make sample estimates reflect those obtained in external, accurate databases (Rogers & Stoeckel, 2007). The overall student weights consisted of a base weight, an adjustment for school non-participation, and an adjustment for student non-participation.

**Matrix sampling scheme.** In order to maximize coverage of reading assessment with the limitations of testing time for students, matrix sampling was employed to assess student
achievement. The matrix sampling scheme of NAEP assesses student performance on only a small portion of the entire items and aggregates the results across the entire assessment to allow for broad reporting of reading abilities for the targeted population (Rogers & Stoecker, 2007). The assessment is called as “balanced incomplete block (BIB) spiraling” (Rogers & Stoecker, 2007). Cognitive items are arranged in blocks, and the blocks are arranged in booklets. Each block is given to an equal number of students and each block appears with every other block in a booklet an equal number of times (Rogers & Stoecker, 2007, p. 4).

**Plausible variables.** Because of the matrix sampling scheme used by NAEP, students do not receive enough questions about a specific topic to provide reliable information about individual performance. Consequently, NAEP constructs sets of plausible values designed to represent the distribution of performance in the population. Scaling models are used to summarize student performance and account for substantial amounts of missing data. Multiple imputation procedures are used to create five plausible values based on random number selections from the posterior distribution of each student’s proficiency on the items observed and recorded by that student. The essential idea of plausible values is that even though we do not observe the ? value of respondent, we do observe other kinds of variables that are related to it such as the respondent’s answers to the cognitive items he or she was administered in the area of interest, and the respondent’s answers to demographic and background variables (Rogers & Stoecket, 2007).

A plausible value for an individual is not a scale score for that individual, but can be regarded as a representative value from the distribution of potential scale scores for all students in the population with similar characteristics and identical patterns of item response (Rogers &
Stoecket, 2007). Thus, NAEP does not report results for individual students, but only for groups with large, representative samples.

Although there have been procedures used by NAEP to handle imprecision of individual measurement associated with the matrix sampling scheme such as plausible values, some researchers suggested that the matching method that NAEP uses may increase measurement errors. Chang (2003) asserted that difficulty levels often vary among different booklets and ignoring the different difficult levels among booklets may cause measurement errors and misplacement.

**Analysis Tools**

Descriptive statistics will be analyzed using AM software. AM makes it possible address the special features of NAEP data, the appropriate student- and school-level weight. Although descriptive statistics will be analyzed using AM software, the majority of the analyses will be conducted using Hierarchical Linear Modeling (HLM).

**AM software.** AM is a software package that was designed specifically for analyzing NAEP by the American Institutes for Research (http://am.air.org). AM was created specifically to address the two major methodological challenges of NAEP – the cluster sampling and the BIB design. In this study, descriptive statistics will be generated using AM.

**HLM.** Students are nested within schools, thus school characteristics influence students’ school achievement. School effects used to be investigated using statistical regression analyses or analysis of variance. However, “some obvious conceptual and methodological difficulties are inherent in using these methods, not the least of which was the troublesome confounding of variability at the individual student level with the variation within and between aggregated levels
(e.g., school) of the data” (Everson & Millsap, p. 158). Student background and school context contribute to between- and within-school variation in the outcome variable. It is important to analyze the contextual data accurately, so as to make recommendations for implementation of effective policies for students and schools. It should be noted that some assumptions of multiple regressions are violated in HLM analysis. The assumption of independent observations in multiple regression may no longer be valid in HLM because the observations within a group possess similar characteristics and the observations between the groups possess dissimilar attributes (Radenbush & Bryk, 2002). For example, the SES of students in a public school may exhibit more similar characteristics compared to the SES of students in a private school. Thus, the independence assumption may not always be valid when we observe student SES data within a specific private school.

In HLM, each level of the structure data is represented by its own sub-model, which describes the relationships among variables within each given level and specifies how variables at one level influence variables occurring at another (Radenbush & Bryk, 2002). When analyzing NAEP achievement data, it is necessary to obtain the results of separate analyses for each of the five plausible values and then to synthesize using appropriate statistical technique. HLM can accommodate plausible values. It prompts the program to run models for each of the five plausible values internally, and producing their average value and correct standard errors (Lubienski & Lubienski, 2006). Lastly, NAEP data are cross-sectional, not longitudinal, so they do not allow for analyses of value-added effects. However, HLM techniques allow accounting for the primary possible confounding variables that could explain patterns in these data (Lubienski & Lubienski, 2006).
**Three-level HLM.** To overcome the limitations of the multiple regression approach in modeling research, this study will use the HLM approach to examine the interrelationships between the explanatory and the dependent variables in school, teacher, and student levels. HLM software version 6.06 will be used for the analyses. Three-level HLM models will be used to estimate parameters for data consisting of students (level 1) nested within teachers (level 2) and schools (level 3). Although teachers are not randomly sampled as students and schools in the NAEP data, the two-level model may not be sufficient for meaningful analysis when encountering hierarchically nested data structures such as NAEP. The use of HLM on NAEP data facilitates resolving the problem of sampling error resulting from multi-stage sampling (Subedi, 2005). Further, the multi-level structure of educational systems, the evidence of classroom effects on the NAEP data sets, and prior research suggest that a three-level analysis is appropriate for NAEP because there is evidence that a three-level analysis produces the most efficient estimates (Subedi, 2005).

In three-level HLM, level-1 coefficients will be the outcomes in the level 2 model, and the level-2 parameters will be modeled as outcomes in the level-3 model. Consequently, student outcomes are predicted by not only level-1 and level-2 predictors, but by level-3 predictors as well. The fully unconditional model allows estimation of variability associated with the three levels – students, teachers, and schools. However, in this study, part of the variability at each level can be accounted for by measured variables at each level (Raudenbush & Bryk, 2002). Student background characteristics, teacher characteristics, and school characteristics could be used as predictors. Furthermore, some of the relationships at the teacher and school levels may vary randomly among these units (Raudenbush & Bryk, 2002).
The general level-1 model for three-level HLM can be given as follows (adapted from Raudenbush & Bryk, 2002, p. 231).

\[ Y_{ijk} = \beta_{0jk} + \beta_{1jk} a_{1ijk} + \beta_{2jk} a_{2ijk} + \cdots + \beta_{pjk} a_{pijk} + e_{ijk}, \]

where

- \( Y_{ijk} \) represents the reading achievement of student \( i \) associated with teacher \( j \) and school \( k \);
- \( a_{pijk} \) are student characteristics that predict students’ reading achievement;
- \( \beta_{0jk} \) is the intercept for teacher \( j \) in school \( k \), adjusted for the covariates \( a_{1}, \ldots, a_{p} \); \( \beta_{pjk} \) are the corresponding level-1 coefficients for teacher \( jk \), associated with the covariates \( a_{1}, \ldots, a_{p} \); and
- \( e_{ijk} \) is a level-1 random effect that represents the deviation of student \( ijk \)’s score from the predicted score based on the student-level model, which is assumed to be normally distributed with a mean of zero and variance \( s^{2} \).

In the level-2 model, the level-1 intercept and slopes are used as outcomes. For teacher \( j \), the level-2 models can be formulated as follows:

\[ \beta_{pjk} = \beta_{p0k} + \beta_{p1k} X_{1jk} + \cdots + \beta_{pqk} X_{qjk} + r_{pjk}, \]

where

- \( X_{qjk} \) represent teacher characteristics used as predictors of the teacher effect \( \beta_{pjk} \);
- \( \beta_{p0k} \) is a level-2 intercept for school \( k \) in the modeling the teacher effect \( \beta_{pjk} \);
- \( \beta_{pqk} \) is level-2 slope for teacher characteristics. These are the corresponding coefficients that represent the direction and strength of association between teacher characteristics \( X_{qjk} \) and teacher effects \( \beta_{pjk} \); and
- \( r_{pjk} \) is the random error in the level-2 equation, assumed to be independently and normally distributed across teachers with mean zero and variance \( s^{2} \).

In the level-3 model, the level-2 intercept and slopes are used as outcomes. For school \( k \), the level-3 model can be formulated as follows:

\[ \beta_{pqk} = \gamma_{pq0} + \gamma_{pq1} W_{1k} + \cdots + \gamma_{pq5} W_{sk} + u_{pqk}, \]

where

- \( W_{sk} \) represent school characteristics used to predict the school effect, \( \beta_{pqk} \);
\( \gamma_{pq0} \) is the intercept term in the school-level model for \( \beta_{pqk} \);

\( \gamma_{pqk} \) is the corresponding level-3 coefficient, representing the direction and strength of association between school characteristics \( W_{sk} \) and school effects \( \beta_{pqk} \); and

\( u_{pqk} \) is a level-3 random effect that represents the deviation of school \( k \)'s coefficient, \( \beta_{pqk} \), from its predicted value based on the school-level model.

**HLM application.** HLM applications for this study examined the relationships among student-, teacher-, and school-level independent variables with student-level outcome variable. Random Effects ANOVA model was performed as the first step of the analysis to provide an estimate of the grand mean average performance score across all schools and to partition the total variation in performance into between and within schools. Then, either Regression with mean-as-outcome or Random-Coefficient model were used to gain information about the variability of intercepts and slopes across teachers and schools. Lastly, Intercepts- and Slopes-as-Outcomes model was performed to build an exploratory model to account for the variability of the intercepts and slopes.

**Analysis Procedure**

**Population and sample.** Nationally representative probability samples of students in the 4th grades were used to analyze the data from the NAEP 2005 main reading assessments. The samples include 155,623 un-weighted, fourth graders from 8,538 un-weighted, representative public schools. The full NAEP samples were used for descriptive comparisons using AM, but the samples used in the HLM analyses were reduced due to missing variables in the database.

Overall, the HLM samples contained 146,623 un-weighed students across 8,334 un-weighted schools. Table 4 shows the un-weighted numbers of students, teachers, and schools of
ELLS and English-proficient students respectively as well as all students samples used for the HLM analyses in this study.

Table 4

*Un-weighted Samples Sizes*

<table>
<thead>
<tr>
<th>Student Type</th>
<th>Students</th>
<th>Teachers</th>
<th>Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>All students</td>
<td>146,623</td>
<td>26,240</td>
<td>8,334</td>
</tr>
<tr>
<td>ELLs</td>
<td>10,813</td>
<td>5,129</td>
<td>2,653</td>
</tr>
<tr>
<td>English-proficient students</td>
<td>135,664</td>
<td>25,517</td>
<td>8,270</td>
</tr>
</tbody>
</table>

**Variables.** Seventeen variables, including students’ demographic information, reading engagement, teacher-, and school-level information, were used for this study. See Tables 5-7 for a list of variables and their response categories, along with brief description of the procedures on some composite variables created for this study.

**Student-level.** The selected seven student-level variables are listed below with a name of the variable, a code used in the database, and the response categories used for this study.

Table 5

*Student-Level Variables to be Considered in This Study*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code</th>
<th>Response Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Composite home language environment (HLE)</td>
<td>HLE</td>
<td>1=Very Poor, 2=Poor, 3=Average, 4=Good, 5=Very Good</td>
</tr>
<tr>
<td>2. Composite Reading engagement</td>
<td>Engagement</td>
<td>1=Very low, 2=Low, 3=High, 4=Very high</td>
</tr>
<tr>
<td>3. Student’s race is Black</td>
<td>Black</td>
<td>1=Black, 0=Other</td>
</tr>
<tr>
<td>4. Student’s race is Hispanic</td>
<td>Hispanic</td>
<td>1=Hispanic, 0=Other</td>
</tr>
<tr>
<td>5. Language other than English spoken at home</td>
<td>Language</td>
<td>0=Omitted, 1=Never, 2=Once in a while, 3=Half the time, 4=All or most of time</td>
</tr>
</tbody>
</table>
Table 5 (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code</th>
<th>Response Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Eligibility of free/reduced lunch (SES)</td>
<td>SES</td>
<td>1=Eligible, 0=Not eligible</td>
</tr>
<tr>
<td>7. Student is ELL</td>
<td>ELL</td>
<td>1=ELL, 0=Not ELL</td>
</tr>
</tbody>
</table>

1. Composite Home language environment [HLE]: A composite was created by summing the number of the following items that students reported having in their home, then dividing to five categories – very poor, poor, average, good, and very good.

- Books [B013801] (0-10 books coded as 0, 11-25 books coded as .33, 26-100 books coded as .67, and more than 100 coded as 1)
- Magazines [B000995] (Yes coded as 1, No and I don’t know coded as 0)
- Newspaper [B017001] (Yes coded as 1, No and I don’t know coded as 0)
- Computer [B017101] (Yes coded as 1, No coded as 0)
- Encyclopedia [B017201] (Yes coded as 1, No and I don’t know coded as 0)

2. Reading engagement [Engagement]: A composite was created by summing the number of the following items that students reported about their interest in reading, then dividing to four categories – very low, low, high, and very high. Factor analysis was performed and confirmed that these seven variables have one common factor, reading engagement.

- Learn a lot when reading books [R830601] (Not like me coded as 0, A little like me coded as .50, and A lot like me coded as 1)
- Reading is a favorite activity [R830701] (Not like me coded as 0, A little like me coded as .50, and A lot like me coded as 1)
- Read for fun on own [R831001] (Never or hardly ever coded as 0, Once or twice a month coded as .33, 1-2 times a week coded as .67, and Almost everyday coded as 1)
- Talk with friends about what you read [R831101] (Never or hardly ever coded as 0, Once or twice/month coded as .33, 1-2 times a week coded as .67, and Almost everyday coded as 1)
- Read stories or poems for fun [R831501] (Never or hardly ever coded as 0, Few times a year coded as .33, Once or twice/month coded as .67, and At least once a week coded as 1)

- Read to learn about real things [R831601] (Never or hardly ever coded as 0, Few times a year coded as .33, Once or twice/month coded as .67, and At least once a week coded as 1)

- Read stories on internet for fun [R831701] (Never or hardly ever coded as 0, Few times a year coded as .33, Once or twice/month coded as .67, and At least once a week coded as 1)

3. Student’s race is Black [Black]: A dummy variable was created from student’s self-reported race variable.

4. Student’s race is Hispanic [Hispanic]: A dummy variable was created from student’s self-reported race variable.

5. Language other than English spoken in home [Language]: Students reported how often a language other English spoken in home.

6. Eligibility of free/reduced lunch (SES) [SES]: Student’s eligibility for the national free-or reduced-lunch program was used as a proxy for student’s SES.

7. Student is ELL [ELL]: If student is categorized as LEP (limited English proficient), the student is ELL. Otherwise the student is non-ELL.

**Teacher-level.** The selected six teacher-level variables are listed below with a name of the variable, a code used in the database, and the response categories used for this study.

Table 6

*Teacher-Level Variables to be Considered in This Study*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code</th>
<th>Response Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Majored in language education or related field</td>
<td>Major_Minor</td>
<td>0=Not majored nor minored, 1=Major/Minored</td>
</tr>
<tr>
<td>2. Years of Teaching</td>
<td>YrsfTeahing</td>
<td>1=Less than 1 year, 2=1 to 5 years, 3=6 to 10 years, 4=11 to 19 years, 5=20 to 29 years, 6=More than 30 years</td>
</tr>
</tbody>
</table>

(continued)
Table 6 (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code</th>
<th>Response Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Composite professional development on reading &amp;</td>
<td>Prof_devmt</td>
<td>1=Not at all, 2=Small extent, 3=Moderate extent, 4=Large extent</td>
</tr>
<tr>
<td>language arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Highest academic degree</td>
<td>Degree</td>
<td>0=Omitted, 1=High-school diploma, 2=Associate degree/vocational certificate, 3=Bachelor’s degree, 4=Master’s degree, 5=Education specialist, 6=Doctorate, 7=Professional degree</td>
</tr>
<tr>
<td>5. Instructional resources</td>
<td>Resources</td>
<td>0=Omitted, 1=Get all resources, 2=Get most resources, 3=Get some resources, 4=Don't get resources</td>
</tr>
<tr>
<td>6. Class size</td>
<td>ClassSize</td>
<td>0=Omitted, 1=15 or fewer, 2=16–18, 3=19-20, 4=21-25, 5=26 or more</td>
</tr>
</tbody>
</table>

1. Majored in language education or related field [Major_Minor]: This variable, ‘majored in language education or related field’, is derived from the eight variables in the data. For this study, teachers who either majored or minored in reading, language arts, English or elementary education in their undergrad or grad were selected.

- Undergrad major/minor reading, language arts [T077305]
- Undergrad major/minor English [T077306]
- Undergrad major/minor other language arts [T077307]
- Undergrad major/minor education w/elementary [T077312]
- Grad major/minor reading, language arts [T077305]
- Grad major/minor English [T077306]
- Grad major/minor other language arts [T077307]
- Grad major/minor education w/elementary [T077312]

2. Years of Teaching [YrsfTeahing]: This variable was recoded to a category variable with 6 categories from a continuous variable.

3. Composite Professional development for teachers [Prof_devmt]: A composite was created by summing the number of the following items, then dividing to four categories –
not at all, small extent, moderate extent, large extent. Factor analysis was performed and confirmed that these four variables have one common factor.

- Prof dev using language arts across curriculum [C049201]
- Prof dev interpreting and analyzing literature [C049202]
- Prof development on reading and writing process [C049203]
- Prof dev on strategies for teaching language arts [C049204]

4. Highest Academic Degree [Degree]: Highest academic degree that teacher achieved.

5. Instructional resources [Resources]: Teachers responded how much instructional resources they get.

6. Class size [ClassSize]: Teachers responded how many students are in their classes.

**School-level.** The selected five school-level variables are listed below with a name of the variable, a code used in the database, and the response categories used for this study.

Table 7

**School-Level Variables to be Considered in This Study**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code</th>
<th>Response Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Percent Black</td>
<td>PctBlack</td>
<td>1=0-25%, 2=26-50%, 3=51-75%, 4=76-100%</td>
</tr>
<tr>
<td>2. Percent Hispanic</td>
<td>PctHispanic</td>
<td>1=0-25%, 2=26-50%, 3=51-75%, 4=76-100%</td>
</tr>
<tr>
<td>3. Percent eligible for school lunch program (SES)</td>
<td>PctFreelunch</td>
<td>0=Omitted, 1=0%, 2=1-5%, 3=6-10%, 4=11-25%, 5=26-34%, 6=35-50%, 7=51-75%, 8=76-99%, 9=100%</td>
</tr>
<tr>
<td>4. Percent enrollment identified as LEP (LEP)</td>
<td>PctLEP</td>
<td>0=Omitted, 1=0%, 2=1-5%, 3=6-10%, 4=11-25%, 5=26-50%, 6=51-75%, 7=76-90%, 8=Over 90%</td>
</tr>
<tr>
<td>5. School locale</td>
<td>Location</td>
<td>1=Large city, 2=Mid-size city, 3=Fringe/large city, 4=Fringe/mid-size city, 5=Large town, 6=Rural town. 7=Rural (MSA/non-MSA)</td>
</tr>
</tbody>
</table>

1. Percent Black [PctBlack]: Percentage of Black students in each school. This variable was modified to four different categories – 0-25%, 26-50%, 51-75%, and 76-100%.
2. Percent Hispanic [PctHispanic]: Percentage of Hispanic students in each school. This variable was modified to four different categories – 0-25%, 26-50%, 51-75%, and 76-100%.

3. Percent eligible for school lunch program (SES) [PctFreelLunch]: The percent eligible for National School Lunch Program was used as a proxy for school mean SES.

4. LEP percentage [PctLEP]: Percent enrollment identified as LEP.

5. School locale [Location]: School location with seven response categories.

**Dependent variable.** NAEP 2005 Reading assessment score is used as the dependent variable in this study. The measurement outcome was derived from the five plausible values that were obtained for each student. NAEP constructs sets of plausible values designed to represent the distribution of performance in the population because of BIB-spiraling design. A plausible value for an individual is not a scale score for that individual, but may be regarded as a representative value from the distribution of potential scale scores for all students in the population with similar characteristics and identical patterns of item response (Rogers & Stoeckel, 2007). HLM software allowed for the manipulation of these five plausible values into one outcome of interest, and this outcome was used as students’ overall reading performance.

**Design of the study.** A non-experimental design was employed in this study. Non-experimental designs are typically described in terms of methods, such as survey research and analyses such as correlational research (Pedhazur & Schmelkin, 1991). According to Pedhazur and Schmelkin, the aim of non-experimental designs is either predictive (i.e., criterion-related validation) or explanatory (i.e., hypothesis testing). This study set out to examine a sample of students’ (students with and without English proficiency) content-area test performances based on information from other variables such as student, teacher, and school characteristics.

Throughout this study, the appropriate weights and statistical techniques were used to address the special features of NAEP data. Although most data management tasks were
conducted within SPSS, most statistical analyses were conducted with the use of two software programs, AM and HLM. Because of the nested nature of the data (students within classroom, classrooms within schools), HLM 6.06 was used to create 3-level hierarchical linear models to examine achievement while controlling for potential student-, teacher, and school-level confounding variables. A school-level weight was used at level 2; no level-1 weight was used because students were randomly selected within schools (Lubienski & Lubienski, 2006). The plausible value feature of HLM was used; HLM prompts the program to run models for each of the five plausible values internally and produces their average value and correct standard errors. A detailed explanation of the data analysis methods used by the HLM software is available in Raudenbush and Bryk (2002).

For all research questions, first Random Effects Analysis of Variance (ANOVA) model will be performed to examine the existence of differences in the mean reading performance among schools and the amount of variation that is within and between schools. For research questions 1 – 3, first, descriptive statistics will be performed using AM to compare ELLs’ and English-proficient students’ reading performance on each student-level variables. Then, HLM procedures (Fixed and random slopes model) will be used to examine the variability of the intercepts and slopes across teachers and schools. For research question 4, a full conditional HLM procedure with only ELLs will be performed. HLM procedures (fixed and random slopes model) will be used to examine the variability of the intercepts and slopes across teachers and schools, using students in schools located in urban areas for the research question 5. Lastly for the research question 6, three-level HLM models will be created which will allow examining the relationship between different schools and reading engagement both before and after adding various potential confounding variables.
Chapter 4

Findings

NAEP reading scores are reported for grades 4 and 8 on a 0-500 scale. The 2005 NAEP mean reading score is 219 at grade 4. The first part of this section presents the descriptive statistical results of this study. HLM application results are then presented with models built for the study. Lastly, each research question is answered along with the results of the proposed hypotheses.

Descriptive Statistics

Table 8 presents the weighted mean reading performances of ELLs and non-ELLs that were calculated using AM. As expected, non-ELLs got significantly higher reading scores than ELLs (220.41 > 186.76). More detailed comparisons between the two groups are presented next.

Table 8

Comparison of ELLs and non-ELLs

<table>
<thead>
<tr>
<th>Student is English language learner</th>
<th>Weighted N</th>
<th>Mean (se)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (ELL)</td>
<td>270,232</td>
<td>186.76 (.60)</td>
<td>34.32</td>
</tr>
<tr>
<td>No (Non-ELLs)</td>
<td>2,866,163</td>
<td>220.41 (.25)</td>
<td>34.91</td>
</tr>
</tbody>
</table>

Note: se = standard error; Dependent variable = NAEP 2005 reading performance score.

Tables 9-11 present the descriptive statistics for the student-, teacher-, and school-level variables, respectively. These descriptive results were calculated using AM and they are comprised of weighted mean scores, standard deviations, as well as weighted numbers of students in a variable for ELLs and non-ELLs groups. In general, non-ELLs got higher scores than ELLs in all three level variables.
### Descriptive Statistics for Level-1 Variables

<table>
<thead>
<tr>
<th>Level 1 variables</th>
<th>ELLs</th>
<th>Non-ELLs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (se)</td>
<td>N (%)</td>
</tr>
<tr>
<td><strong>HLE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very poor</td>
<td>179.88 (1.0)</td>
<td>57,826 (21.9)</td>
</tr>
<tr>
<td>Poor</td>
<td>185.97 (1.6)</td>
<td>68,204 (25.8)</td>
</tr>
<tr>
<td>Average</td>
<td>189.26 (0.7)</td>
<td>73,404 (27.8)</td>
</tr>
<tr>
<td>Good</td>
<td>192.54 (1.0)</td>
<td>49,405 (18.7)</td>
</tr>
<tr>
<td>Very good</td>
<td>192.78 (2.0)</td>
<td>15,163 (5.7)</td>
</tr>
<tr>
<td><strong>Reading Engagement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low</td>
<td>186.96 (1.7)</td>
<td>20,683 (8.0)</td>
</tr>
<tr>
<td>Low</td>
<td>184.65 (0.9)</td>
<td>78,793 (30.3)</td>
</tr>
<tr>
<td>High</td>
<td>185.99 (0.9)</td>
<td>102,303 (39.3)</td>
</tr>
<tr>
<td>Very high</td>
<td>193.61 (1.1)</td>
<td>58,249 (22.4)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>178.00 (3.0)</td>
<td>10,021 (3.7)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>185.23 (0.7)</td>
<td>201,996 (74.8)</td>
</tr>
<tr>
<td>American Indian</td>
<td>180.81 (3.4)</td>
<td>7,765 (2.9)</td>
</tr>
<tr>
<td>Asian</td>
<td>202.49 (1.7)</td>
<td>20,739 (7.7)</td>
</tr>
<tr>
<td>White</td>
<td>188.76 (1.6)</td>
<td>26,186 (9.7)</td>
</tr>
<tr>
<td>More than one</td>
<td>205.10 (4.6)</td>
<td>3,417 (1.3)</td>
</tr>
<tr>
<td><strong>Language other than English at home</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>174.40 (1.9)</td>
<td>4,581 (9.2)</td>
</tr>
<tr>
<td>Once in a while</td>
<td>181.19 (1.2)</td>
<td>43,886 (16.5)</td>
</tr>
<tr>
<td>Half the time</td>
<td>188.06 (1.5)</td>
<td>33,147 (12.4)</td>
</tr>
<tr>
<td>All or most of time</td>
<td>190.24 (0.7)</td>
<td>165,049 (61.9)</td>
</tr>
<tr>
<td><strong>Eligibility of free/reduced lunch (SES)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible</td>
<td>183.99 (0.6)</td>
<td>225,859 (82.7)</td>
</tr>
<tr>
<td>Not eligible</td>
<td>199.79 (1.7)</td>
<td>47,372 (15.2)</td>
</tr>
</tbody>
</table>

*Note: se = standard error.*

**Student level.** Both ELLs and non-ELLs have higher reading scores when they have better home language environments (HLE). More non-ELLs reported to have better HLE than ELLs. Almost 50% of non-ELLs reported they have either good or very good HLE, compared to
24.4% of ELLs. Only 6.7% of non-ELLs reported to have very poor HLE, compared to 21.9% of ELLs.

The distributions of scores are very similar between ELLs and non-ELLs with regard to reading engagement. Students who reported to have higher reading engagement got higher scores. But descriptive statistics results show that aside than ELLs who have very high reading engagement, ELLs’ scores did not vary much across the reading engagement levels.

Table 9 indicates that nearly all non-ELLs got higher scores than ELLs regardless of race. The distributions of reading scores versus race are somewhat similar between ELLs and non-ELLs. Minority students relatively got lower reading scores in both groups. Table 9 also indicates that almost 75% of ELLs are Hispanics.

The variable, ‘language other than English spoken in home’, provides interesting results. It is shown that almost 62% of ELLs speak a language other than English at home all or most of time. In contrast, more than 56% of non-ELLs reported they never speak a language other than English at home. The distributions of reading scores between ELLs and non-ELLs were very different. Table 9 indicates that ELLs who speak languages other than English at home more often have the higher reading scores (190.24 > 174.40). The opposite was true for non-ELLs. Non-ELLs who speak a language other than English at home tend to have lower reading scores (213.08 < 220.93).

Students’ eligibility for the national school lunch program was used as a proxy for SES for students in this study. It is shown that students who are eligible for the national school lunch program tended to have lower scores. The majorities of ELLs (82.7%) were eligible for free or reduced lunches but only 41.2% of non-ELLs were eligible for free or reduced lunches.
### Table 10

**Descriptive Statistics for Level-2 Variables**

<table>
<thead>
<tr>
<th>Level 2 variables</th>
<th>ELLs</th>
<th>Non-ELLs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (se)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Teacher major/minored in reading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>183.91 (1.3)</td>
<td>50,932 (18.8)</td>
</tr>
<tr>
<td>YES</td>
<td>187.42 (0.7)</td>
<td>219,300 (81.2)</td>
</tr>
<tr>
<td>Years of Teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 1 year</td>
<td>184.01 (6.1)</td>
<td>2,801 (1.1)</td>
</tr>
<tr>
<td>1 to 5 years</td>
<td>183.81 (0.9)</td>
<td>88,704 (33.3)</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>185.69 (1.1)</td>
<td>80,581 (30.3)</td>
</tr>
<tr>
<td>11 to 19 years</td>
<td>189.63 (1.1)</td>
<td>55,986 (21.0)</td>
</tr>
<tr>
<td>20 to 29 years</td>
<td>190.65 (1.5)</td>
<td>25,990 (9.8)</td>
</tr>
<tr>
<td>More than 30 years</td>
<td>196.82 (2.1)</td>
<td>12,301 (4.6)</td>
</tr>
<tr>
<td>Composite Professional Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>177.88 (4.0)</td>
<td>3,143 (1.2)</td>
</tr>
<tr>
<td>Small extent</td>
<td>194.08 (3.4)</td>
<td>11,063 (4.2)</td>
</tr>
<tr>
<td>Moderate extent</td>
<td>187.24 (1.0)</td>
<td>94,247 (36.2)</td>
</tr>
<tr>
<td>Large extent</td>
<td>186.49 (0.8)</td>
<td>152,238 (58.4)</td>
</tr>
<tr>
<td>Teacher’s academic degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school diploma</td>
<td>187.55 (11.3)</td>
<td>61 (0.0)</td>
</tr>
<tr>
<td>Assoc deg/voc cert</td>
<td>192.57 (13.6)</td>
<td>170 (0.0)</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>186.39 (0.7)</td>
<td>167,828 (62.8)</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>187.79 (1.0)</td>
<td>89,081 (33.3)</td>
</tr>
<tr>
<td>Education specialist</td>
<td>188.14 (2.9)</td>
<td>8,121 (3.0)</td>
</tr>
<tr>
<td>Doctorate</td>
<td>164.09 (8.3)</td>
<td>1,036 (0.4)</td>
</tr>
<tr>
<td>Professional degree</td>
<td>188.55 (7.0)</td>
<td>909 (0.3)</td>
</tr>
<tr>
<td>Instructional resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Get all resources</td>
<td>189.74 (1.7)</td>
<td>34,677 (15.1)</td>
</tr>
<tr>
<td>Get most resources</td>
<td>187.02 (1.0)</td>
<td>92,181 (40.3)</td>
</tr>
<tr>
<td>Get some resources</td>
<td>185.55 (0.8)</td>
<td>91,805 (40.1)</td>
</tr>
<tr>
<td>Don’t get resources</td>
<td>179.19 (1.3)</td>
<td>10,321 (4.5)</td>
</tr>
<tr>
<td>Class size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 or fewer</td>
<td>181.01 (2.2)</td>
<td>13,689 (5.2)</td>
</tr>
<tr>
<td>16-18</td>
<td>190.57 (2.1)</td>
<td>18,897 (7.1)</td>
</tr>
<tr>
<td>19-20</td>
<td>191.07 (2.1)</td>
<td>21,686 (8.2)</td>
</tr>
<tr>
<td>21-25</td>
<td>190.03 (1.1)</td>
<td>63,243 (23.9)</td>
</tr>
<tr>
<td>26 or more</td>
<td>184.90 (.8)</td>
<td>147,410 (55.6)</td>
</tr>
</tbody>
</table>

*Note: se = standard error.*
**Teacher level.** Students got higher scores when teachers had majored or minored in reading or language arts (Table 10). For both groups of students, only a small percentage of students had teachers who did not major or minor in reading or a related field—18.8% for ELLs and 12.1% for non-ELLs.

Both groups of students had higher reading scores when their teachers had more years of teaching experience. The distributions of years of teaching for ELLs and non-ELLs were similar, but non-ELLs tended to have more experienced teachers than ELL students.

The variable, ‘composite professional development’, seemed not to relate to non-ELLs’ reading scores. However, ELLs’ reading scores were lowest when teachers did not have any professional development and highest when teachers had a small extent of professional development. The distributions of teachers’ professional development for ELLs and non-ELLs are similar—most teachers reported that they had moderate to large extent of professional development related to reading or language arts.

The variable, ‘Teacher’s highest academic degree’ provided interesting results. Non-ELLs had relatively higher scores when their teachers had higher degrees. However, ELLs’ reading scores did not vary in accordance with teacher’s academic degree. Apparently, ELLs’ scores were lowest when teachers had a doctorate degree, but the distributions of teachers’ degrees were similar between ELLs and non-ELLs. Most of the teachers had either bachelors or masters degrees although non-ELLs had more teachers with a masters degree than ELLs.

Table 10 indicates that the more instructional resources teachers received, the higher students’ reading scores were in both groups. More teachers of non-ELLs reported that they got most or all instructional resources compared to ELLs’ teachers. ELLs got lower reading scores when the class sizes were either very small or very large. However, non-ELLs tended to have
lower scores when the classes were small. More than 55% of ELLs were in a class with 26 or more students, compared to 28.4% for Non-ELLs.

**School level.** Table 11 shows that both ELLs and non-ELLs tended to have lower reading scores when they attended schools with higher percentage of minority students. In particular, ELLs appeared to have lower reading scores when they attended schools with large percentage of Hispanic students. ELLs’ reading score gap was a lot more salient when it was considered with school Hispanic percentage, implying Hispanic ELLs tend to get lower reading scores than other ELLs. Table 11 indicates that almost 80% of non-ELLs went to schools where 0-25% of the students was Hispanic. On the contrary, 35.7% of ELLs attended schools where 76-100% of the students were Hispanic. The percentage of students who are eligible for the national school lunch program was used as a proxy for school mean-SES in this study. Table 11 shows that both ELLs and non-ELLs got higher reading scores when they went to a school where fewer students were eligible for the national school lunch program. ELLs tended to go schools where large percentages of students were eligible for the national school lunch program–more than 56% of ELLs went to a school where 76 or more percent of students were eligible for free or reduced lunches. It is also shown that both ELLs and non-ELLs had higher reading scores when they went to a school with fewer LEP students (see Table 11).

However, it is noticeable that non-ELLs’ score gap between the lowest LEP percentage schools and the highest LEP percentage schools is not as salient as ELLs’. ELLs who attended a school where LEP enrollment was over 90% got almost 40 points lower than students who attended a school with zero LEP enrollment. It also appears that over 40% of ELLs go to a school where 50 or more percent of students are LEP.
Table 11

Descriptive Statistics for Level-3 Variables

<table>
<thead>
<tr>
<th>Level 3 variables</th>
<th>ELLs</th>
<th>Non-ELLs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (se)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Percent Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-25%</td>
<td>186.68 (0.7)</td>
<td>241,783 (89.5)</td>
</tr>
<tr>
<td>26-50%</td>
<td>188.57 (2.4)</td>
<td>18,214 (6.7)</td>
</tr>
<tr>
<td>51-75%</td>
<td>186.93 (3.0)</td>
<td>7,169 (2.7)</td>
</tr>
<tr>
<td>76-100%</td>
<td>181.73 (2.8)</td>
<td>3,067 (1.1)</td>
</tr>
<tr>
<td>Percent Hispanic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-25%</td>
<td>197.35 (1.1)</td>
<td>62,189 (23.0)</td>
</tr>
<tr>
<td>26-50%</td>
<td>188.32 (1.3)</td>
<td>54,725 (20.3)</td>
</tr>
<tr>
<td>51-75%</td>
<td>184.72 (1.5)</td>
<td>56,842 (21.0)</td>
</tr>
<tr>
<td>76-100%</td>
<td>180.24 (1.0)</td>
<td>96,476 (35.7)</td>
</tr>
<tr>
<td>Percent eligible Nat School Lunch Program (Mean SES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td>197.44 (17.1)</td>
<td>70 (.0)</td>
</tr>
<tr>
<td>1-5%</td>
<td>216.10 (4.6)</td>
<td>2,914 (1.1)</td>
</tr>
<tr>
<td>6-10%</td>
<td>211.40 (4.4)</td>
<td>2,889 (1.1)</td>
</tr>
<tr>
<td>11-25%</td>
<td>207.58 (2.3)</td>
<td>13,436 (5.3)</td>
</tr>
<tr>
<td>26-34%</td>
<td>196.69 (1.8)</td>
<td>13,028 (5.1)</td>
</tr>
<tr>
<td>35-50%</td>
<td>193.22 (2.1)</td>
<td>20,975 (8.2)</td>
</tr>
<tr>
<td>51-75%</td>
<td>188.30 (1.5)</td>
<td>57,332 (22.5)</td>
</tr>
<tr>
<td>76-99%</td>
<td>181.79 (0.9)</td>
<td>116,444 (45.8)</td>
</tr>
<tr>
<td>100%</td>
<td>180.76 (1.6)</td>
<td>27,375 (10.8)</td>
</tr>
<tr>
<td>Percent enrollment identified as LEP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td>214.78 (5.4)</td>
<td>1,389 (.5)</td>
</tr>
<tr>
<td>1-5%</td>
<td>200.15 (1.5)</td>
<td>17,486 (6.8)</td>
</tr>
<tr>
<td>6-10%</td>
<td>199.51 (2.4)</td>
<td>16,014 (6.3)</td>
</tr>
<tr>
<td>11-25%</td>
<td>192.96 (1.5)</td>
<td>44,345 (17.3)</td>
</tr>
<tr>
<td>26-50%</td>
<td>184.74 (1.3)</td>
<td>72,066 (28.2)</td>
</tr>
<tr>
<td>51-75%</td>
<td>183.25 (1.3)</td>
<td>58,308 (22.8)</td>
</tr>
<tr>
<td>76-90%</td>
<td>180.84 (1.5)</td>
<td>38,122 (14.9)</td>
</tr>
<tr>
<td>Over 90%</td>
<td>175.29 (3.7)</td>
<td>8,071 (3.2)</td>
</tr>
<tr>
<td>School location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large city</td>
<td>184.06 (1.0)</td>
<td>85,136 (31.5)</td>
</tr>
<tr>
<td>Mid-size city</td>
<td>186.86 (1.6)</td>
<td>52,407 (19.4)</td>
</tr>
<tr>
<td>Fringe/large city</td>
<td>188.71 (1.3)</td>
<td>79,766 (29.5)</td>
</tr>
<tr>
<td>Fringe/mid-size city</td>
<td>186.19 (1.9)</td>
<td>24,828 (9.2)</td>
</tr>
<tr>
<td>Large town</td>
<td>186.99 (4.8)</td>
<td>1,898 (0.7)</td>
</tr>
<tr>
<td>Small town</td>
<td>188.70 (2.6)</td>
<td>9,158 (3.4)</td>
</tr>
<tr>
<td>Rural</td>
<td>190.51 (2.2)</td>
<td>17,039 (6.3)</td>
</tr>
</tbody>
</table>

*Note: se = standard error.*
On the contrary, over 60% of non-ELLs go to a school where 0-5% of the students are LEP. Although students in a large city tended to get the lowest reading scores in both groups, Table 11 indicates that for both groups, students’ scores did not vary with school location. More ELLs appeared to go schools located in large cities than non-ELLs (31.5% > 13.7%).

Table 12

Un-weighted Descriptive Statistics for Variables Used in the HLM Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>ELLs</th>
<th>Non-ELLs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN</td>
<td>MAX</td>
</tr>
<tr>
<td><strong>Student Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plausible value 1</td>
<td>51.03</td>
<td>313.46</td>
</tr>
<tr>
<td>Plausible value 2</td>
<td>38.79</td>
<td>326.83</td>
</tr>
<tr>
<td>Plausible value 3</td>
<td>30.99</td>
<td>329.47</td>
</tr>
<tr>
<td>Plausible value 4</td>
<td>36.67</td>
<td>304.00</td>
</tr>
<tr>
<td>Plausible value 5</td>
<td>36.91</td>
<td>317.61</td>
</tr>
<tr>
<td>HLE</td>
<td>1.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Engagement</td>
<td>1.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Black</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Asian</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Language at Home</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>SES</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Teacher Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Years of Teaching</td>
<td>1.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Profession development</td>
<td>1.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Degree</td>
<td>0.00</td>
<td>7.00</td>
</tr>
<tr>
<td>Resources</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Class Size</td>
<td>0.00</td>
<td>5.00</td>
</tr>
<tr>
<td><strong>School Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pct Free Lunch</td>
<td>0.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Pct LEP</td>
<td>0.00</td>
<td>8.00</td>
</tr>
<tr>
<td>Location</td>
<td>1.00</td>
<td>7.00</td>
</tr>
<tr>
<td>Pct Black</td>
<td>1.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Pct Hispanic</td>
<td>1.00</td>
<td>4.00</td>
</tr>
</tbody>
</table>
Table 12 is the raw and un-weighted descriptive statistical result for the variables including the plausible values used in the HLM analyses of this study. It provides minimum, maximum, mean, and standard deviation of each variable for ELLs and non-ELLs. Student’s race was recoded as two binary variables—whether a student’s race is Black or Hispanic—in order to learn more about the racial effect on students’ reading achievement. The un-weighted descriptive statistics of Table 12 shows very similar trends that were seen in the weighted descriptive statistics of Tables 9-11. Thus, the statistics in Table 12 are not discussed here.

Some of the descriptive statistical results brought interesting results such as the relationship between languages other than English spoken at home and ELLs’ reading achievement. The descriptive results presents thus far raises more questions than just whether the difference between non-ELLs’ relatively high-achievement and ELLs’ relatively low-achievement is due simply to differences in English proficiency.

**HLM Analyses**

**Model building.**

*Ran...
The null hypothesis here is $H_0: t_{000} = 0$, which assumes there is no difference in mean reading scores among schools. The fixed effect for the grand-mean reading performance was $\gamma_{000} = 217.06$ with a standard error of 0.30. As shown on Table 13, the average school-mean is significantly different from zero. Thus, the null hypothesis is highly implausible because $p < .001$ which indicates variation exists in students’ NAEP reading achievement scores among schools.

Table 13

*Fixed Effects From the ANOVA Model*

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>Se</th>
<th>t Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average school mean, $\gamma_{000}$</td>
<td>217.06</td>
<td>0.30</td>
<td>723.91***</td>
</tr>
</tbody>
</table>

*Note.*** = $p < .000$; ** = $p < .01$; * = $p < .05$*

As shown on Table 14, the estimates of the within-group variability are 925.29 (the variance of student performance around the school mean) and 125.70 (the variance of student performance around the teacher mean). The estimate of the between-group variability is 254.04 (the variance of school means around the grand-mean). The intra-class correlation, which represents the variance decomposition in $Y$ between schools is .195, indicating that about 19.5% of the variation in students’ reading achievement is between schools. The largest variance percentage lies between students (70.9%) and a small, but not negligible percentage lies between teachers (9.6%). The variations between both teachers and schools are statistically significant, $\gamma^2 = 29,205.82$ with 8,333 $df$ ($p < .001$) and $\gamma^2 = 31,413.86$ with 17,906 $df$ ($p < .001$), respectively.

In summary, the random effects ANOVA provided an estimate of the grand-mean and a partitioning of the total variation in reading achievement into variation between and within schools, indicating variation in students’ NAEP reading achievement exists among schools.
Table 14

Random Effects From the ANOVA Model

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Variance Component</th>
<th>df</th>
<th>( \sigma^2 )</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-1, ( e_{ijk} )</td>
<td>925.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-2, ( r_{0kj} )</td>
<td>125.70</td>
<td>17,906</td>
<td>31,413.86</td>
<td>.000</td>
</tr>
<tr>
<td>L-3, ( u_{0kj} )</td>
<td>254.04</td>
<td>8,333</td>
<td>29,205.82</td>
<td>.000</td>
</tr>
</tbody>
</table>

Level 1 70.9%
Level 2 9.6%
Level 3 19.5%

Note. *** = \( p < .000 \); ** = \( p < .01 \); * = \( p < .05 \)

**Regression with mean-as-outcome model.** Although the outcome variable, reading achievement score, is measured at the student level, the key predictors are measured at the teacher and school levels as well as the student level. Thus, multilevel modeling is required to represent random variation and structural effects that may exist at different levels. Many alternative formulations are possible between the fully unconditional model and the full three-level conditional model. In the regression with mean-as-outcome model, the level-1 mean is predicted by level-3 variables. The models used at level-1 and level-2 remain as the one-way ANOVA and the level-3 model expands to include predictor, \( W_j \). As a result, the model is posed as the following:

Level 1: \[ Y_{ijk} = p_{0jk} + e_{ijk} \]

Level 2: \[ p_{0jk} = \beta_{00k} + r_{0jk} \]

Level 3: \[ \beta_{00k} = \gamma_{000} + \gamma_{001} \text{(Mean SES)} + \gamma_{002} \text{(Pct LEP)} + \gamma_{003} \text{(Location)} + \gamma_{004} \text{(Pct Black)} + \gamma_{005} \text{(Pct Hispanic)} + u_{00k}. \]

The null hypothesis here is that the selected level-3 predictors are not related to reading achievement within schools and is represented as \( H_0: \gamma_{00p} = 0 \). Table 15 provides the estimates for the average regression equation. The expected reading performance for students across the
population of schools, with all predictors equal to zero, was $\gamma_{000} = 217.31$ with a standard error of 0.21. The average school mean is still significantly different from zero. Thus, the null hypothesis is highly implausible ($p < .001$) which indicates variation still exists in students’ NAEP reading achievement scores among schools after controlling school level characteristics.

Table 15

*Fixed Effects From the Level 3- Coefficient Model*

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>Se</th>
<th>t Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average school mean, $\gamma_{000}$</td>
<td>217.31</td>
<td>.21</td>
<td>1040.40***</td>
</tr>
<tr>
<td>Pct free lunch (Mean SES), $\gamma_{001}$</td>
<td>-3.39</td>
<td>.15</td>
<td>-23.35***</td>
</tr>
<tr>
<td>Pct LEP, $\gamma_{002}$</td>
<td>-1.10</td>
<td>.20</td>
<td>-5.54***</td>
</tr>
<tr>
<td>Location, $\gamma_{003}$</td>
<td>-.61</td>
<td>.11</td>
<td>-5.51**</td>
</tr>
<tr>
<td>Pct Black, $\gamma_{004}$</td>
<td>-7.62</td>
<td>.32</td>
<td>-23.90***</td>
</tr>
<tr>
<td>Pct Hispanic, $\gamma_{005}$</td>
<td>-5.27</td>
<td>.44</td>
<td>-12.08***</td>
</tr>
</tbody>
</table>

*Note.* *** = $p < .001$; ** = $p < .01$; * = $p < .05$

All of the school-level variables are significantly related to students’ reading achievement, but the results show that the percentages of minority students in schools are most significantly related to students’ reading achievement. They are negatively related to reading achievement ($\gamma_{004} = -7.62; \gamma_{005} = -5.27$). Schools with a higher percentage of minority students had an average reading performance that was 5-7 points lower than schools with fewer minority students. The percentage of LEP students and free lunch are also negatively related to reading achievement ($\gamma_{001} = -3.39; \gamma_{002} = -1.10$). The coefficient for the school location ($\gamma_{003} = -0.61$) indicates that students who live in rural area tend to get lower reading achievement scores than those living in cities.

As shown on Table 16, the estimate of the school-level variance is 76.34. By comparison, the estimated variance in the random effects ANOVA model, which did not include level-3 predictors, was 254.04. Thus, the proportion of these two school-level variances is
(254.04-76.34)/254.04 = .69, meaning that 69% of the true between-school variance in reading achievement is accounted for by the school-level variables in the model. After removing the effect of mean-SES, LEP percentage, location, and minority percentage, the correlation between pairs of scores in the same school, which had been .195, is now reduced to .068 = 76.34 / (926.59 + 121.97 + 76.34), indicating about 6.8% of the variation in students’ reading achievement is between schools.

Table 16

*Random Effects From the Level 3- Coefficient Model*

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Variance Component</th>
<th>Df</th>
<th>(?^2)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-1, (e_{ijk})</td>
<td>926.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-2, (r_{0kj})</td>
<td>121.97</td>
<td>17,906</td>
<td>31,356.31</td>
<td>.000</td>
</tr>
<tr>
<td>L-3, (u_{0kj})</td>
<td>76.34</td>
<td>8,328</td>
<td>14,368.48</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note. *** = \(p < .001\); ** = \(p < .01\); * = \(p < .05\)

A random-intercept model with level-1 covariates. In the previous model, the relationship between school characteristics and mean outcomes was estimated. Now, the relationship between student characteristics and mean outcome will be estimated. First, a model examined the effects of student characteristics except students’ English proficiency (whether a student is an ELL or not). Next, students’ English proficiency was added in the student characteristics. The level-1 predictors in are centered on the grand-mean. The effects of the level-1 predictors are constrained to be the same fixed value for each level-2 and level-3 units. As a result, the model is posed as the following:

Level 1:  
\[ Y_{ijk} = p_{0jk} + p_{ijk} (HLE) + p_{2jk} (Engagement) + p_{3jk} (Language at home) + p_{4jk} (SES) + p_{5jk} (Black) + p_{6jk} (Hispanic) + p_{7jk} (ELL) + e_{ijk} \]

Level 2:  
\[ p_{0jk} = \beta_{00k} + r_{0jk} \]
\[ p_{ijk} = \beta_{10k} \]
\[ p_{7k} = \beta_{70k} \]

**Level 3:**
\[ \beta_{00k} = \gamma_{000} + u_{00k} \]
\[ \beta_{10k} = \gamma_{100} \]
\[ \ldots \]
\[ \beta_{70k} = \gamma_{700} \]

The null hypothesis here is that the level-1 predictors are not related to reading achievement within schools, that is, \( H_0: \beta_{p00} = 0 \). Table 17 provides the estimates for the average regression equation within schools. The average school-mean is significantly different from zero. Thus, the null hypothesis is highly implausible \((p < .001)\), indicating significant variation among school-mean achievement remains to be explained.

The top portion of Table 17 shows the estimates for the model with student characteristics without student’s English proficiency. The bottom portion shows the results after the English proficiency variable was added. In both portions, the expected reading performance for students across the population of schools with all predictors equal to zero is \( \gamma_{000} = 217.56 \). HLE and reading engagement are thus positively related to students’ NAEP reading achievement performance in both portions. Students with a higher level of HLE and reading engagement have an average performance of about 2 and 6 points higher than students with lower HLE and reading engagement, respectively. Table 17 also indicates that free lunch eligibility (SES) and race had significant relationships on reading achievement. Students who were eligible for free or reduced lunches received reading scores that were 13 to 14 points lower than the average. Minority students also received reading scores that were 9 to 15 points lower than the average.

The model yielded slightly different results after adding students’ English proficiency. The estimated effect of English proficiency \( (\gamma_{700} = -19.46) \) was by far the largest. It is also noticeable that the effects of the frequency of a language other than English spoken at home
found have largely disappeared (|.88| versus |.08|). This suggests that the negative effects of speaking a language other than English at home more frequently on students’ reading performance may reflect the greater prevalence of English proficiency status. Earlier descriptive statistics showed that ELLs who speak a language other than English at home more frequently tended to get higher reading scores but it was opposite for non-ELLs.

Table 17

**Fixed Effects From the Level 1- Coefficient Models**

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>se</th>
<th>t Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level-1 w/o English proficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average school mean, $\gamma_{000}$</td>
<td>217.56</td>
<td>.22</td>
<td>985.47***</td>
</tr>
<tr>
<td>HLE, $\gamma_{100}$</td>
<td>2.51</td>
<td>.12</td>
<td>20.78***</td>
</tr>
<tr>
<td>Engagement, $\gamma_{200}$</td>
<td>6.26</td>
<td>.17</td>
<td>37.65***</td>
</tr>
<tr>
<td>Language at home, $\gamma_{300}$</td>
<td>-.88</td>
<td>.12</td>
<td>-7.48***</td>
</tr>
<tr>
<td>Free lunch (SES), $\gamma_{400}$</td>
<td>-14.11</td>
<td>.34</td>
<td>-41.47***</td>
</tr>
<tr>
<td>Black, $\gamma_{500}$</td>
<td>-14.47</td>
<td>.41</td>
<td>-34.91***</td>
</tr>
<tr>
<td>Hispanic, $\gamma_{600}$</td>
<td>-10.39</td>
<td>.39</td>
<td>-26.94***</td>
</tr>
<tr>
<td>Level-1 with English proficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average school mean, $\gamma_{000}$</td>
<td>217.56</td>
<td>.21</td>
<td>1020.62***</td>
</tr>
<tr>
<td>HLE, $\gamma_{100}$</td>
<td>2.14</td>
<td>.12</td>
<td>18.10***</td>
</tr>
<tr>
<td>Engagement, $\gamma_{200}$</td>
<td>6.31</td>
<td>.17</td>
<td>38.09***</td>
</tr>
<tr>
<td>Language at home, $\gamma_{300}$</td>
<td>.08</td>
<td>.12</td>
<td>.51</td>
</tr>
<tr>
<td>Free lunch (SES), $\gamma_{400}$</td>
<td>-13.34</td>
<td>.34</td>
<td>-39.19***</td>
</tr>
<tr>
<td>Black, $\gamma_{500}$</td>
<td>-15.19</td>
<td>.41</td>
<td>-37.03***</td>
</tr>
<tr>
<td>Hispanic, $\gamma_{600}$</td>
<td>-9.35</td>
<td>.39</td>
<td>-24.18***</td>
</tr>
<tr>
<td>English proficiency, $\gamma_{700}$</td>
<td>19.46</td>
<td>.62</td>
<td>31.38***</td>
</tr>
</tbody>
</table>

Note. *** = p < 000; ** = p < .01; * = p < .05

Table 18 shows that after removing the effect of the student variables other than English proficiency, the variance percentage which lies among students is 82% (842.99/(842.99+93.93+94.47) = .82). The incremental variance explained by adding English proficiency to the model was 1% (\{831.23/(831.23+87.67+83.27)\} - \{842.99/(842.99+93.93+94.47)\} = .01). By comparison, the estimated variance from the random
effects ANOVA model, which did not include level-1 predictors, was 925.29. Thus, the proportion variance explained at level-1 is \((925.29-831.23)/925.29= .10\). The student predictors accounted for about 10.0\% of the student-level variance in the outcome, which indicates that significant student-level variation among school mean achievement remains to be explained.

Table 18

*Random Effects From the Level 1- Coefficient Models*

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Variance Component</th>
<th>Df</th>
<th>(\hat{=}^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level-1 w/o English proficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-1, (e_{ijk})</td>
<td>842.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-2, (r_{0kj})</td>
<td>93.93</td>
<td>17,906</td>
<td>29,343.23</td>
</tr>
<tr>
<td>L-3, (u_{0kj})</td>
<td>94.47</td>
<td>8,333</td>
<td>17,270.93</td>
</tr>
<tr>
<td>Level-1 with English proficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-1, (e_{ijk})</td>
<td>831.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-2, (r_{0kj})</td>
<td>87.67</td>
<td>17,906</td>
<td>28,813.95</td>
</tr>
<tr>
<td>L-3, (u_{0kj})</td>
<td>83.27</td>
<td>8,333</td>
<td>16,470.55</td>
</tr>
</tbody>
</table>

*Note.*** = \(p < .000\); ** = \(p < .01\); * = \(p < .05\)*

*Full conditional model (fixed and random slopes model).* In earlier models, only the intercept parameter varied across schools. In this full conditional model, fixed and random slopes were used to build an explanatory model to account for the variability of the regression equations across schools. To see how students’ English proficiency is related to their NAEP reading achievement after controlling student-, teacher-, and school-level characteristics, students’ English proficiency status effect was treated as a random slope coefficient.

At the level-1 of the model, the predictors are HLE, engagement, language at home, SES, Black, Hispanic, and English proficiency. This implies that the level-1 model will have eight coefficients for each student: the intercept \((p_{0jk})\) and seven slopes \((p_{1jk}, p_{2jk}, p_{3jk}, p_{4jk}, p_{5jk}, p_{6jk}, p_{7jk})\), as shown below.
Level 1: \[ Y_{ijk} = p_{0jk} + p_{1jk} (HLE) + p_{2jk} (engagement) + p_{3jk} (language) + p_{4jk} (SES) + p_{5jk} (Black) + p_{6jk} (Hispanic) + p_{7jk} (ELL) + e_{ijk} \]

At level-2 of the hierarchy, it was hypothesized that teacher’s major, years of teaching, professional development, teacher’s degree, instructional resources, and class size are related to student’s reading achievement. The level-2 model specifies that all the level-1 effects, except student’s English proficiency, are the same for all students within each school \( j \).

Level 2: \[ p_{0jk} = \beta_{00k} + \beta_{01k} (major) + \beta_{02k} (Years of teaching) + \beta_{03k} (professional development) + \beta_{04k} (degree) + \beta_{05k} (Instructional resources) + \beta_{06k} (class size) + r_{0jk} \]

\[ p_{1jk} = \beta_{10k} \]
\[ p_{2jk} = \beta_{20k} \]
\[ p_{3jk} = \beta_{30k} \]
\[ p_{4jk} = \beta_{40k} \]
\[ p_{5jk} = \beta_{50k} \]
\[ p_{6jk} = \beta_{60k} \]
\[ p_{7jk} = \beta_{70k} + \beta_{71k} (major) + \beta_{72k} (Years of teaching) + \beta_{73k} (professional development) + \beta_{74k} (degree) + \beta_{75k} (Instructional resources) + \beta_{76k} (class size) + r_{7jk} \]

The level-3 model represents the variability among schools in the twenty \( \beta \) coefficients.

Information about a school’s percentage of free lunches, LEP students, Black students, Hispanic students, and the school location are incorporated into the model. The slopes are assumed to be constant at this level of the model due to the effect of the level-2 variables.

Level 3: \[ \beta_{00k} = \gamma_{000} + \gamma_{001} (Pct Free Lunch) + \gamma_{002} (Pct LEP) + \gamma_{003} (location) + \gamma_{004} (Pct Black) + \gamma_{005} (Pct Hispanic) + u_{00k} \]

\[ \beta_{01k} = \gamma_{010} \]
\[ \beta_{02k} = \gamma_{020} \]
\[ \beta_{03k} = \gamma_{030} \]
\[ \beta_{04k} = \gamma_{040} \]
\[ \beta_{05k} = \gamma_{050} \]
\[ \beta_{06k} = \gamma_{060} \]
\[ \beta_{10k} = \gamma_{100} \]
\[ \beta_{20k} = \gamma_{200} \]
\[ \beta_{30k} = \gamma_{300} \]
\[ \beta_{40k} = \gamma_{400} \]
\[ \beta_{50k} = \gamma_{500} \]
\[ \beta_{60k} = \gamma_{600} \]
\[ \beta_{70k} = \gamma_{700} + \gamma_{701} (mean\ SES) + \gamma_{702} (LEP\ percentage) + \gamma_{703} (location) + \gamma_{704} (Pct\ Black) + \gamma_{705} (Pct\ Hispanic) + \eta_{70k} \]
\[ \beta_{71k} = \gamma_{710} \]
\[ \beta_{72k} = \gamma_{720} \]
\[ \beta_{73k} = \gamma_{730} \]
\[ \beta_{74k} = \gamma_{740} \]
\[ \beta_{75k} = \gamma_{750} \]
\[ \beta_{76k} = \gamma_{760} \]

Table 19 presents the results of the model above. The expected average reading performance for students across the population of schools was \( \gamma_{600} = 217.08 \) with a standard error of 0.22 and \( t = 1000.63 \). The intercept of 217.08 is the estimated mean achievement of a student who has 0 on all of the binary predictors and at the mean of all of the continuous predictors.

Thus, 217.08 is the estimated mean achievement for non-minority, English-proficient, free-lunch ineligible students with average home resources, reading engagement, and teacher quality, in a mid-large town and attend a school having average minority, LEP and SES populations. The average school-mean is significantly different from zero, which indicates variation in students’ NAEP reading achievement among schools still exists after controlling student-, teacher-, and school-level variables.

All of the student other than the frequency of a language other than English spoken at home, were found to have a statistically significant relationship to reading performance, independent of teacher and school variables. Students who are eligible for free or reduced lunches got on average 10.05 points lower than those who are not eligible for free or reduced lunches but who have similar race, HLE, English proficiency, reading engagement, school environment, and teacher characteristics. Black students got on average 11.59 points lower than their peers of similar SES, English proficiency and HLE status, and other environments. This gap was 7.87 points for Hispanic students.
### Table 19

**Random English Proficiency Slope Model**

<table>
<thead>
<tr>
<th>Fixed effect</th>
<th>Coefficient</th>
<th>se</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLE, $\gamma_{100}$</td>
<td>1.58</td>
<td>.12</td>
<td>13.07</td>
<td>.000***</td>
</tr>
<tr>
<td>Reading engagement, $\gamma_{200}$</td>
<td>6.11</td>
<td>.16</td>
<td>38.24</td>
<td>.000***</td>
</tr>
<tr>
<td>Language at home, $\gamma_{300}$</td>
<td>-12</td>
<td>.12</td>
<td>-.95</td>
<td>.344</td>
</tr>
<tr>
<td>Free lunch eligibility, $\gamma_{400}$</td>
<td>-10.05</td>
<td>.36</td>
<td>-28.31</td>
<td>.000***</td>
</tr>
<tr>
<td>Black, $\gamma_{500}$</td>
<td>-11.59</td>
<td>.49</td>
<td>-23.65</td>
<td>.000***</td>
</tr>
<tr>
<td>Hispanic, $\gamma_{600}$</td>
<td>-7.87</td>
<td>.42</td>
<td>-18.82</td>
<td>.000***</td>
</tr>
<tr>
<td><strong>School mean achievement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base, $\gamma_{000}$</td>
<td>217.08</td>
<td>.22</td>
<td>1000.63</td>
<td>.000***</td>
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<td>.15</td>
<td>-22.11</td>
<td>.000***</td>
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<td>Pct LEP, $\gamma_{002}$</td>
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<td>.20</td>
<td>-6.66</td>
<td>.000***</td>
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<td>.11</td>
<td>-3.13</td>
<td>.002**</td>
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<td>-.51</td>
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<td>.36</td>
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<td>.020*</td>
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<td>-.30</td>
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<td>Pct Black, $\gamma_{704}$</td>
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<td>2.04</td>
<td>.041*</td>
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<td>.73</td>
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<td>.184</td>
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<td>-.55</td>
<td>.59</td>
<td>-.93</td>
<td>.356</td>
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</tbody>
</table>

**Note.** *** = $p < .000$; ** = $p < .01$; * = $p < .05$; the chi-square statistics reported above are based on only 2477 of 8334 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.
Students who have higher reading engagement got reading scores that were 6.11 points higher on average, controlling for other students, teacher, and school variables. Students who speak a language other than English at home more frequently tended to get lower reading scores \((\gamma_{300} = -.12)\) compared to other students with similar demographics, but it was not significant.

The effects of some teacher variables – teacher’s major, highest academic degree, and instructional resources – were found not to be statistically significant. Therefore we may conclude that students’ reading scores are not related to a teacher’s major, degree and instructional resources when other demographics and environments are similar. Meanwhile, teacher’s professional development and years of teaching are positively related to student’s reading achievement \((\gamma_{030} = 0.96; \gamma_{020} = 0.85)\) when student’s demographics and school environments are similar. Class size is also positively related to reading \((\gamma_{060} = 2.01)\), meaning that students tend to get higher scores when the class size gets larger.

Table 19 indicates that all of the school variables were found to be negatively statistically significant. Students who go to a school where more students are minority, LEP, or eligible for free lunch tended to have lower reading scores. The results also indicate that students who go to a school located in rural areas had lower scores.

The estimated average within-school effect of English proficiency on reading performance, with all predictors equal to zero or average, was -14.27, with a standard error of 1.21. This means ELLs got an average performance of 14.27 points lower than non-ELLs after controlling for other students, teacher, and school variables. The within-school effects on reading performance of LEP percentage and school location for ELLs vs. non-ELLs, controlling for student and teacher variables, were found not to be statistically significant. Therefore it can be concluded that differences between the two groups’ reading performance, controlling for
student and teacher variables, are not related to LEP percentage and school location. The percentage of students with free-lunch eligibility was found to be statistically significant ($p = .020$). This supports the expectation that the reading scores, controlling for students, teacher, and school variables, are related to school mean SES. Earlier it was noted students who go to a school where more students are eligible for free lunches tended to have lower reading scores ($\gamma_{00} = -3.23$). However, this time the estimated coefficient of percent free lunch within-school effect of English proficiency is 0.84, meaning the reading score difference between ELL students and non-ELLs actually gets smaller when students attend a low-SES school. This indicates the influence of school-mean SES over English proficiency.

The percentage of Black students was found to be marginally significant with $p = .041$ and the percentage of Hispanic students was found not to be significant with $p = .060$. Previously, it was thought that students who go to a school with a higher Black-student percentage have lower reading scores ($\gamma_{00} = -7.30$), but the estimated coefficient of percent Black within-school effect of English proficiency was actually 2.20. This means the reading score difference between ELLs and non-ELLs gets smaller when students go to a school with a higher Black-student percentage. This indicates the influence of race over English-proficiency.

The within-school effects on reading performance of all the teacher variables for ELLs vs. non-ELLs when controlling for student and school variables, were found not to be statistically significant. This indicates that differences between ELLs and non-ELLs’ performance scores, controlling for student and school variables, are not related to any of the selected teacher variables. Impacts that school location, LEP percentage, and teacher variables demonstrated on the relationships between the student-level variables and the performance scores among the students in different English proficiency status produced non-significant
findings. This result highlights that differences between the scores of ELLs and non-ELLs were not related to their school’s location, LEP percentage in school, and any of the selected teacher variables. On the other hand, the significant relation among race, school mean SES, and reading performance shows that reading score differences between ELLs and non-ELLs is significantly influenced by school mean SES and race.

The estimated variance of the expected reading performance for students across the population of schools, with all predictors equal to zero, after the effects of students, teacher, and school variables have been removed was 83.04 with a $p$-value <.001. The estimated variance of the expected reading performance across the population of teachers was 137.57 with a $p$-value <.001, also. Therefore, it was concluded that a significant variation in the reading performance variance remained unexplained after controlling for students, teacher, and school variables. The variance of ELLs’ vs. non-ELLs’ performance slope has a $p$-value smaller than 0.05 across teachers (0.000) and greater than 0.05 across schools (0.095). Consequently, it was concluded that significant variation in the within-teacher effects on ELLs vs. non-ELLs remains unexplained even after controlling student, teacher, and school variables but it appeared that most of the variation in the within-school effects of ELLs vs. non-ELLs were well-explained after controlling the selected student, teacher, and school variables.

A series of three-level HLM models were created to examine the relationship between English proficiency and reading achievement while controlling for demographic and other relevant variables. I began by running a traditional null model, followed by a model with an English proficiency variable only. Then, student-, teacher-, and school-level variables were added to examine how much the demographics and other environmental variables explained the school achievement disparities in the prior model.
Table 20

*English Proficiency and Demographic Variables Predicting 4th Grade Reading Scores*

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 1 (Null Model)</th>
<th>Model 2 (ELL status only)</th>
<th>Model 3 (ELL + Level 1)</th>
<th>Model 4 (ELL + Level 1 + Level 2)</th>
<th>Model 5 (ELL + All Levels)</th>
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<tbody>
<tr>
<td></td>
<td>Coefficient (se)</td>
<td>Coefficient (se)</td>
<td>Coefficient (se)</td>
<td>Coefficient (se)</td>
<td>Coefficient (se)</td>
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<tr>
<td>Intercept - School Mean achievement</td>
<td>217.06*** (0.30)</td>
<td>217.15*** (0.28)</td>
<td>217.54*** (0.21)</td>
<td>217.22*** (0.22)</td>
<td>217.09*** (0.21)</td>
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<tr>
<td>Student Level</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>English-proficiency</td>
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<td>-19.44*** (0.62)</td>
<td>-19.51*** (0.62)</td>
<td>-19.51*** (0.62)</td>
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<td>2.08***</td>
<td>1.95***</td>
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<tr>
<td>Engagement</td>
<td>6.31***</td>
<td>6.31***</td>
<td>6.35***</td>
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<tr>
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<td>-15.55***</td>
<td>-12.79***</td>
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<td>-9.78***</td>
<td>-8.94***</td>
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<td>Pct Black</td>
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<td></td>
<td></td>
<td>-0.12***</td>
</tr>
<tr>
<td>Pct Hispanic</td>
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<td></td>
<td></td>
<td>-0.10**</td>
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</table>

Note: * p<.05; ** p<.01; *** p<.001

Table 20 presents the results of the four three-level HLM models. Standards errors are included for the intercept and English proficiency coefficient, given that this is of primary
interest. Model 1, the traditional HLM null model, indicates that the school reading mean for all of the schools averaged 217.06 points. Model 2 indicates that without controlling for any demographic or other differences, non-ELL students’ reading achievement was 24.43 points higher than ELLs. Model 3 adds student demographic controls, revealing that after adjusting for such differences among students, the reading achievement gap between ELLs and non-ELLs got smaller to 19.44.

Model 3 also highlights some important inequities that persisted across all schools. Specifically, within schools and teachers, Black and Hispanic students scored an average of 15.73 and 9.82 points lower than their peers of similar SES, ELL status and other environments. Model 4 and Model 5 indicate that the reading achievement gap between ELLs and non-ELLs did not change much at all after teacher- and school-level variables were controlled, meaning school and teacher variables did not affect ELLs’ lower reading achievement scores.

Student effects on NAEP reading. This section addresses the first research question: How is NAEP 4th grade reading achievement related to the six student level variables identified in the literature review: English proficiency, home literacy environment (HLE), SES, race, reading engagement, and home language? Do these relationships differ for ELL students and non-ELLs?

**HO_{1A}: Non-ELLs will have higher reading engagement, SES and better home literacy environment than ELL students.**

This hypothesis was supported partially. Table 12 indicates that non-ELLs had a higher level of HLE than ELLs. ELLs’ mean HLE was 2.51 which is located between “poor” and “average” in the response category. Non-ELLs’ mean HLE was more than “average” at 3.29. Descriptive statistics support that non-ELLs have better home literacy environments. Descriptive statistical results also support that non-ELLs have higher SES than ELLs. Table 12
indicates that more ELLs are eligible for free or reduced lunches than non-ELLs (0.82 > 0.42).
But non-ELLs appear to have lower reading engagement than ELLs (2.65 < 2.68).

**$H_{OB}$**: *Students who speak English at home will have higher NAEP reading achievement than students who speak a language other than English at home.*

The data did not support this hypothesis. Table 19 indicates that language other than English spoken at home was not a significant predictor of reading performance after key student-, teacher-, and school-level variables were statistically controlled ($\gamma_{\text{other}}=-0.12$, t-ratio=-0.12, $p=.344$). Earlier in this study, the results of a random-intercept model with level-1 covariates indicated that the effect of the frequency of languages other than English spoken at home was significant if the student variable, ELL, was not included. The effect has largely disappeared when English proficiency was added in the model ([-.88] versus [.08]). This suggests that the negative effects of speaking languages other than English at home more frequently on students’ reading performance may reflect the greater prevalence of English proficiency status.

Descriptive statistics showed that ELLs who speak languages other than English at home more frequently tend to get higher reading performance, but the opposite was true for non-ELLs (See Table 9).

In addition to these hypothesized student-level variables (Hypotheses 1A and 1B), several other student-level variables were significant predictors of NAEP reading performance. Table 19 indicates that students’ English proficiency had by far the most significant effect on student’s reading achievement ($\gamma_{\text{proficiency}}=-14.27$, t-ratio=-11.76, $p=.000$). Students who are categorized as ELL got an average of 14.27 points lower on their reading scores than those who are not ELLs.

Student’s race and SES also had significant effects on reading. Black and Hispanic students got significantly lower scores than other students (11.59 and 7.87 respectively). Students who are eligible for free or reduced lunches got an average of 10.05 points lower on their reading scores.
than those who are not. HLM results show that reading engagement had positive effects on student’s reading ($\gamma_{200}=6.11$, t-ratio=38.24, p=.000). Students who have higher reading engagement got an average of 6.11 points higher on their reading scores. Lastly, home literacy environment (HLE) had a positive effect on reading performance ($\gamma_{300}=1.58$, t-ratio=13.07, p=.000).

**Teacher effects on NAEP reading.** Previous research on teacher and school effects suggest that teacher and school related variables may affect NAEP reading test performance in addition to student background variables. This section presents the following research question and the hypothesis: How is NAEP 4th grade reading achievement related to the six teacher level variables identified in the literature review: academic degree, majored in reading or related field, years of teaching, class size, instructional resources, and professional development? Do these relationships differ for ELLs and non-ELLs?

**HO2:** *Non-ELLs will have teachers with higher academic degrees, more content knowledge and teaching experience, professional development and more instructional resources than teachers of ELLs.*

Descriptive statistics supports most of this hypothesis. Tables 12 shows that non-ELLs have more teachers who majored in reading or a related field than ELLs (0.89 > 0.86). It also indicates that teachers of non-ELLs tend to have more years of teaching than teachers of ELLs (3.61 > 3.37). Non-ELLs also tend to have teachers with higher degrees (3.48 > 3.4.3) than teachers of ELLs. However, ELLs appear to have teachers who have more professional development than teachers of non-ELLs (3.37 < 3.48). More ELLs’ teachers reported they got less instructional resources than teachers of non-ELLs’ and ELLs’ class sizes tended to be larger than class for non-ELLs.
Table 19 addresses how NAEP reading performance is related to the teacher variables after controlling student and school variables. Whether a teacher majored in reading or a related field was not significantly related to students’ reading performance ($\gamma_{010}=0.96$, t-ratio=1.68, p=.097). Teacher’s highest academic degree was not a significant predictor either. Accessibility to instructional resources had a positive effect on reading performance, but it was not significant. Years of teaching was a significant predictor ($\gamma_{020}=0.85$, t-ratio=6.12, p=.000). Students who have teachers with more years of teaching experience got an average 0.85 points higher reading scores. Professional development was also significantly related to student’s reading performance. Lastly, class size was a significant predictor for reading. Results show that as class size increases, student’s reading performance improve ($\gamma_{600}=2.01$, t-ratio=11.79, p=.000).

Table 19 also indicates whether ELLs’ and non-ELLs’ reading performance differences are related to teacher effects, after controlling student and school effects. It appears that none of the teacher variables are significantly related to the differences in reading performance between ELLs and non-ELLs. However, some of the estimates of teacher effect coefficients yielded interesting results. A teacher’s degree had a positive relation to reading scores ($\gamma_{400}=0.31$), meaning students get higher reading scores when their teachers have more advanced degrees. But the model for ELL-reading slopes shows that a teacher’s degree has a negative effect on the reading performance difference between ELLs and non-ELLs ($\gamma_{740}=-1.58$). This means ELLs tend to get higher reading scores when their teachers’ degrees are lower, but the relation was insignificant (p=.079). The coefficient for class size also changed positive to negative (2.01 ? -0.55), meaning ELLs got higher reading scores as the class sizes got smaller. But again, this variable was not a significant predictor to explain the different scores between the two groups.
School effects on NAEP reading. This section addresses the third research question: How is NAEP 4th grade reading achievement related to the four school level variables identified in the literature review: mean SES, location, race, and LEP percentage? Do these relationships differ for ELLs and non-ELLs?

\( H_03: \) ELLs will attend schools with lower SES and higher LEP percentage than non-ELLs.

Descriptive statistics supports this hypothesis. Schools where the majority of students are ELLs tended to have a higher percentage of students eligible for free lunches than schools where the majority of students are non-ELLs (6.34 > 5.76, See Table 12). Schools where the majority of students are ELLs had average 35-50% of students with free lunch eligibility. Schools where the majority of students are non-ELLs had average 26-34% of students with free lunch eligibility. Table 12 also indicates that schools where the majority of students are ELLs tended to have a higher percentage of LEP students than schools where the majority of students are non-ELLs (3.84 > 2.35). Table 11 points out that ELLs tended to go to schools with a higher percentage of LEP students. It also shows that more non-ELLs go to schools located in rural or small towns than ELLs.

Table 19 addresses how NAEP reading performance is related to the selected school variables after controlling for student and teacher variables. As shown in Table 19, all of the school variables were significant predictors for reading performance. Among school variables race was the most significant predictor (\( \gamma_004 = -7.30, \) t-ratio=-22.67, p=.000; \( \gamma_005 = -4.96, \) t-ratio=-11.09, p=.000). Black and Hispanic students tended to get, on average, 7.30 and 11.09 points lower reading scores than others, respectively. A school’s mean SES and LEP percentage were significantly related to students’ reading performance. Lastly, a school’s location was a significant predictor for reading performance (\( \gamma_003 = -0.35, \) t-ratio=-3.13, p=.002). The results
show that if a school is located in a rural or small town, students’ reading performance tended to be lower.

Table 19 also indicates whether the differences in reading performance between ELLs and non-ELLs are related to school effects, after controlling student and teacher effects. A school’s mean SES is a significant factor in understanding the reading performance difference between ELLs and non-ELLs ($\gamma_{01i}=0.84$). ELLs’ reading performance improves (reducing the reading performance difference between the two groups) when the school mean SES is lower, after controlling student, teacher, and other school variables. Race was another school variable that was significantly related to the reading performance difference between the two groups. The percentage of Black students in a school was a positive predictor. ELLs’ reading performance improves (reducing the reading performance difference between the two groups) as the percentage of Black students in a school increased, after controlling students, teacher, and other school variables. The percentage of Hispanic students was marginally insignificant predictor ($\gamma_{05i}=-1.36$, t-ratio=-1.88, p=.060). ELLs’ reading performance degrades (increasing the reading performance difference between the two groups gets) as the percentage of Hispanic students in a school increases.

**Student-, teacher-, and school- effects on NAEP reading for ELLs.** This section addresses the fourth research question: How does 4th grade NAEP reading achievement vary among ELLs, when controlling students-, teacher-, and school-level demographic variables? To what extent do these demographic factors correlate with ELLs’ achievement? For this question, a full conditional HLM was constructed for ELLs. The models are described below and Table 18 presents the results, comparing the results from non-ELLs:

**Level 1:**

$$Y_{ijk} = p_{0jk} + p_{1jk} (HLE) + p_{2jk} (engagement) + p_{3jk} (language) + p_{4jk} (SES) + p_{5jk} (Black) + p_{6jk} (Hispanic) + e_{ijk}$$
Level 2: \[ p_{ojk} = \beta_{00k} + \beta_{01k}(\text{major}) + \beta_{02k}(\text{Years of teaching}) + \beta_{03k}(\text{professional development}) + \beta_{04k}(\text{degree}) + \beta_{05k}(\text{Instructional resources}) + \beta_{06k}(\text{class size}) + r_{ojk} \]

Level 3: \[ \beta_{00k} = \gamma_{000} + \gamma_{001}(\text{Pct Free Lunch}) + \gamma_{002}(\text{Pct LEP}) + \gamma_{003}(\text{location}) + \gamma_{004}(\text{Pct Black}) + \gamma_{005}(\text{Pct Hispanic}) + u_{00k} \]

\[HO_{4A}]: \text{ELLs who have higher reading engagement will have higher NAEP reading achievement than ELLs with lower reading engagement.}\]

This hypothesis was supported. HLM results indicate that reading engagement was a significant predictor for ELL students’ reading. Reading engagement has a positive effect on ELL students’ NAEP reading performance (\(\gamma_{200}=2.75\), t-ratio=5.53, p=.000). Students with a higher reading engagement received reading scores that were 2.75 points higher on average than those who have lower reading engagement.

\[HO_{4B}]: \text{Non-Hispanic ELLs will have higher NAEP reading achievement than Hispanic ELLs.}\]

This hypothesis was also supported. Table 21 indicates that the Hispanic had a negative effect on ELLs’ reading achievement (\(\gamma_{500}=-4.61\), t-ratio=-3.94, p=.000). Hispanic ELLs tended to receive reading scores that were 4.61 points lower on average than non-Hispanic ELLs.

\[HO_{4C}]: \text{ELLs who speak a language other than English more often at home will have lower NAEP reading achievement than those who speak English more often at home.}\]

Whether a student speaks a language other than English at home frequently or not was a significant predictor for students’ reading achievement, after controlling for teacher and school variables, but as shown in Table 21, ELLs who speak a language other than English at home more frequently received reading scores that were 4.17 points higher on average than those who don’t. Thus, this hypothesis was not supported.
Table 21

Comparison Between ELLs and non-ELLs

<table>
<thead>
<tr>
<th>Fixed effect</th>
<th>ELLs</th>
<th>Non-ELLs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient (se)</td>
<td>t-ratio</td>
</tr>
<tr>
<td>Student variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLE, $\gamma_{100}$</td>
<td>1.93 (.46)</td>
<td>4.20***</td>
</tr>
<tr>
<td>Reading engagement, $\gamma_{200}$</td>
<td>2.75 (.50)</td>
<td>5.53***</td>
</tr>
<tr>
<td>Language at home, $\gamma_{300}$</td>
<td>4.17 (.39)</td>
<td>10.69***</td>
</tr>
<tr>
<td>Free lunch eligibility, $\gamma_{400}$</td>
<td>-8.75 (1.57)</td>
<td>-5.57***</td>
</tr>
<tr>
<td>Black, $\gamma_{500}$</td>
<td>-11.96 (3.32)</td>
<td>-3.60**</td>
</tr>
<tr>
<td>Hispanic, $\gamma_{600}$</td>
<td>-4.61 (1.17)</td>
<td>-3.94***</td>
</tr>
<tr>
<td>Teacher variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher’s major, $\gamma_{010}$</td>
<td>.82 (1.48)</td>
<td>.582</td>
</tr>
<tr>
<td>Years of teaching, $\gamma_{020}$</td>
<td>1.51 (.50)</td>
<td>.006**</td>
</tr>
<tr>
<td>Prof. development, $\gamma_{030}$</td>
<td>.15 (.99)</td>
<td>.884</td>
</tr>
<tr>
<td>Degree, $\gamma_{040}$</td>
<td>-1.42 (.80)</td>
<td>.074</td>
</tr>
<tr>
<td>Instructional resources, $\gamma_{050}$</td>
<td>-.97 (.47)</td>
<td>.041*</td>
</tr>
<tr>
<td>Class size, $\gamma_{060}$</td>
<td>.25 (.46)</td>
<td>.586</td>
</tr>
<tr>
<td>School variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base, $\gamma_{000}$</td>
<td>191.20 (.69)</td>
<td>278.12***</td>
</tr>
<tr>
<td>Pct free lunch, $\gamma_{001}$</td>
<td>-1.36 (.37)</td>
<td>-3.73***</td>
</tr>
<tr>
<td>Pct LEP, $\gamma_{002}$</td>
<td>-1.01 (.46)</td>
<td>-2.20*</td>
</tr>
<tr>
<td>Location, $\gamma_{003}$</td>
<td>-.21 (.34)</td>
<td>.528</td>
</tr>
<tr>
<td>Pct Black, $\gamma_{004}$</td>
<td>-1.19 (1.08)</td>
<td>.268</td>
</tr>
<tr>
<td>Pct Hispanic, $\gamma_{005}$</td>
<td>-2.02 (.74)</td>
<td>.008*</td>
</tr>
</tbody>
</table>

Note: * p<.05; ** p<.01; p<.001

**HO_{4D}: ELLs will have higher NAEP reading achievement when their teachers have more advanced academic degree, more content knowledge (major), and professional development.**

This hypothesis was not supported. As shown in Table 21, none of the teacher variables mentioned in the hypothesis was significant. A teacher’s highest academic degree had a negative effect on ELLs’ reading achievement ($\gamma_{040}=-1.42$, t-ratio=-1.79, p=.074), meaning ELLs who have teachers with higher academic degree received lower reading scores, but the effect was not
significant. Whether a teacher majored or minored in reading or a related field and whether a teacher received professional development had positive effects on ELLs’ reading, but they were not significant either ($\gamma_{010} = 0.82$, t-ratio = 1.48, p = .582; $\gamma_{015} = 0.15$, t-ratio = 0.15, p = .884).

In addition to the hypothesized teacher variables, there are three additional variables used to predict ELLs’ reading achievement. The number of years of teaching experience was a significant predictor for ELLs’ reading performance ($\gamma_{020} = 1.51$, t-ratio = 3.02, p = .006). Students who have teachers with more teaching experiences earned higher reading scores. Instructional resources also had a significant effect on ELLs’ reading achievement. The more instructional resources teachers get, the higher ELL students’ reading performance was. ELLs’ reading performance increased as their teachers had access to more instructional resources. Class size was not a significant predictor for ELLs’ reading.

**$H_{04E}$: ELLs will have higher NAEP reading achievement when the mean-school SES is high and/or school has a lower LEP percentage.**

This hypothesis was supported. HLM results indicate that a school’s mean SES and LEP percentage were significant predictors for ELLs’ reading achievement. ELLs obtained higher reading scores when they went to a school with lower percentages of free-lunch eligible students ($\gamma_{001} = -1.36$). ELLs also tended to get higher reading scores when they attend a school with lower percentage of LEP ($\gamma_{002} = -1.01$).

The percentage of Hispanic students in a school was another school variable that significantly predicted ELLs’ reading achievement. ELLs earned higher reading scores as the percentage of Hispanic students in their schools decreased.
Student-, teacher-, and school- effects on NAEP reading for students in urban areas.

This section addresses the fourth research question: How does 4th grade NAEP reading achievement vary between ELLs and non-ELLs in schools located in urban areas? Does the variation remain when controlling for student-, teacher-, and school-level demographic variables? For this question, a full conditional model (fixed and random slopes model) was created using students who attend schools in urban areas. This model is the same as the one depicted on pages 66-67 for all students that was used. The results of the model are presented in Table 22.

\[ H_{05}: \text{ELLs will perform lower in reading than non-ELLs when their schools are located in urban areas.} \]

This hypothesis was supported. Table 22 shows that the estimated average of the within-school effect of English proficiency on reading performance with all predictors equal to zero was -16.46 with a standard error of 1.38. This implies that ELLs got an average score that was 16.46 points lower than non-ELLs when controlling for student, teacher, and school variables. Table 22 also indicates that the achievement gap between ELLs and non-ELLs is larger for students living in urban areas (|16.46| > |14.27|).

School race was the only variable found to be significant for within-school effect of English proficiency on reading performance in urban areas. Table 22 indicates that ELLs got an average 4.04 points higher than non-ELLs when the school has a higher percentage of Black students (\( \gamma_{703} = 4.04 \)). Table 18 shows that students living in urban areas had lower reading scores than students in other areas (204.79 < 217.08). It also shows that the influences of the student demographics are not too much different from each other, except the variable ‘language other than English spoken at home’. Urban students tended to get higher reading scores when they spoke a language other than English at home more frequently (\( \gamma_{300} = 1.43 \)).
### Table 22

**Random English Slope Model for Urban Students**

<table>
<thead>
<tr>
<th>Fixed effect</th>
<th>Urban students</th>
<th>All students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient (se)</td>
<td>t-ratio</td>
</tr>
<tr>
<td><strong>Student variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLE, $\gamma_{100}$</td>
<td>1.77 (0.25)</td>
<td>7.08***</td>
</tr>
<tr>
<td>Reading engagement, $\gamma_{200}$</td>
<td>5.07 (0.36)</td>
<td>14.24***</td>
</tr>
<tr>
<td>Language at home, $\gamma_{300}$</td>
<td>1.43 (0.29)</td>
<td>4.94***</td>
</tr>
<tr>
<td>Free lunch eligibility, $\gamma_{400}$</td>
<td>-10.38 (0.79)</td>
<td>-13.23***</td>
</tr>
<tr>
<td>Black, $\gamma_{500}$</td>
<td>-8.78 (1.02)</td>
<td>-8.65***</td>
</tr>
<tr>
<td>Hispanic, $\gamma_{600}$</td>
<td>-8.37 (0.83)</td>
<td>-10.06***</td>
</tr>
<tr>
<td><strong>School mean achievement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base, $\gamma_{000}$</td>
<td>204.79 (0.59)</td>
<td>348.86***</td>
</tr>
<tr>
<td>Pct free lunch, $\gamma_{001}$</td>
<td>-1.77 (0.29)</td>
<td>-6.06***</td>
</tr>
<tr>
<td>Pct LEP, $\gamma_{002}$</td>
<td>-.37 (0.35)</td>
<td>-1.04</td>
</tr>
<tr>
<td>Pct Black, $\gamma_{003}$</td>
<td>-4.90 (0.64)</td>
<td>-7.67***</td>
</tr>
<tr>
<td>Pct Hispanic, $\gamma_{004}$</td>
<td>-1.80 (0.67)</td>
<td>-2.67**</td>
</tr>
<tr>
<td>Teacher’s major, $\gamma_{010}$</td>
<td>-.28 (1.11)</td>
<td>-0.25</td>
</tr>
<tr>
<td>Years of teaching, $\gamma_{020}$</td>
<td>.85 (0.35)</td>
<td>2.43*</td>
</tr>
<tr>
<td>Prof. development, $\gamma_{030}$</td>
<td>-.16 (0.81)</td>
<td>-0.20</td>
</tr>
<tr>
<td>Degree, $\gamma_{040}$</td>
<td>.01 (0.64)</td>
<td>.01</td>
</tr>
<tr>
<td>Instructional resources, $\gamma_{050}$</td>
<td>-.49 (0.34)</td>
<td>-1.42</td>
</tr>
<tr>
<td>Class size, $\gamma_{060}$</td>
<td>1.95 (0.38)</td>
<td>5.12***</td>
</tr>
<tr>
<td><strong>Model for ELL-reading slopes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base, $\gamma_{700}$</td>
<td>-16.46 (1.38)</td>
<td>-11.96***</td>
</tr>
<tr>
<td>Pct free lunch, $\gamma_{701}$</td>
<td>.08 (0.74)</td>
<td>.10</td>
</tr>
<tr>
<td>Pct LEP, $\gamma_{702}$</td>
<td>-.10 (0.58)</td>
<td>-0.18</td>
</tr>
<tr>
<td>Pct Black, $\gamma_{703}$</td>
<td>4.04 (1.56)</td>
<td>2.59*</td>
</tr>
<tr>
<td>Pct Hispanic, $\gamma_{704}$</td>
<td>.21 (1.00)</td>
<td>0.21</td>
</tr>
<tr>
<td>Teacher’s major, $\gamma_{710}$</td>
<td>.072 (2.29)</td>
<td>0.31</td>
</tr>
<tr>
<td>Years of teaching, $\gamma_{720}$</td>
<td>1.28 (0.79)</td>
<td>1.62</td>
</tr>
<tr>
<td>Prof. development, $\gamma_{730}$</td>
<td>-2.36 (1.67)</td>
<td>-1.41</td>
</tr>
<tr>
<td>Degree, $\gamma_{740}$</td>
<td>-3.21 (1.83)</td>
<td>-1.75</td>
</tr>
<tr>
<td>Instructional resources, $\gamma_{750}$</td>
<td>-.77 (0.78)</td>
<td>-0.99</td>
</tr>
<tr>
<td>Class size, $\gamma_{760}$</td>
<td>-.77 (0.94)</td>
<td>-.82</td>
</tr>
</tbody>
</table>

Note: * p<.05; ** p<.01; p<.001
However, in general, school demographics had lower coefficients for students in urban areas, meaning the within-school differences are not as salient when compared with students in urban areas. The estimated variance of the expected reading performance for the population of students across all schools with all predictors equal to zero after the effects of students, teacher, and school variables have been removed was 77.28 with a $p$-value of <.001. The estimated variance of the expected reading performance across the population of teachers was 103.32 with a $p$-value of <.001. Therefore, it was concluded that the significant differences in the reading performance variance for students in urban areas remained unexplained after controlling the student, teacher, and school variables. The variance between the performance slopes of ELLs vs. non-ELLs has a $p$-value smaller than 0.05 across teachers and greater than 0.05 across schools.

Consequently, it was concluded that significant variation in the within teacher effects of ELL students vs. non-ELLs in urban areas remains unexplained even after controlling student, teacher, and school variables. However, it appears that most of the variation in the within-school effects on ELLs vs. non-ELLs was well-explained after controlling the selected student, teacher, and school variables.

**Student-, teacher-, and school- effects on reading engagement for ELLs.** This section addresses the fourth research question: How does reading engagement vary among ELLs when controlling for student-, teacher-, and school-level demographic variables? For this question, a full conditional model was constructed for ELLs using reading engagement as a dependent variable. The models are described below and Table 23 and 24 present the results:

**Level 1:**

$$Y_{ijk} = p_{0jk} + p_{1jk} (Reading\ performance) + p_{2jk} (HLE) + p_{3jk} (Black) + p_{4jk} (Hispanic) + p_{5jk} (Language\ at\ home) + p_{6jk} (SES) + e_{ijk}$$

**Level 2:**

$$p_{0jk} = \beta_{00k} + \beta_{01k} (major) + \beta_{02k} (Years\ of\ teaching) + \beta_{03k} (professional\ development) + \beta_{04k} (degree) + \beta_{05k} (Instructional\ resources) + \beta_{06k} (class\ size) + r_{0jk}$$
Level 3: \[ \beta_{00k} = \gamma_{000} + \gamma_{001} \text{(Pct Free Lunch)} + \gamma_{002} \text{(Pct LEP)} + \gamma_{003} \text{(location)} + \gamma_{004} \text{(Pct Black)} + \gamma_{005} \text{(Pct Hispanic)} + u_{00k} \]

Table 23

Fixed Effects From ELLs’ Reading Engagement

<table>
<thead>
<tr>
<th>Fixed effect</th>
<th>Coefficient</th>
<th>se</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading performance, ( \gamma_{100} )</td>
<td>0.00</td>
<td>0.00</td>
<td>5.10</td>
<td>.000***</td>
</tr>
<tr>
<td>HLE, ( \gamma_{200} )</td>
<td>0.15</td>
<td>0.01</td>
<td>16.70</td>
<td>.000***</td>
</tr>
<tr>
<td>Black, ( \gamma_{300} )</td>
<td>0.10</td>
<td>0.07</td>
<td>1.42</td>
<td>.155</td>
</tr>
<tr>
<td>Hispanic, ( \gamma_{400} )</td>
<td>0.04</td>
<td>0.03</td>
<td>1.45</td>
<td>.147</td>
</tr>
<tr>
<td>Language at home, ( \gamma_{500} )</td>
<td>0.07</td>
<td>0.01</td>
<td>6.71</td>
<td>.000***</td>
</tr>
<tr>
<td>SES, ( \gamma_{600} )</td>
<td>0.04</td>
<td>0.03</td>
<td>1.13</td>
<td>.258</td>
</tr>
<tr>
<td><strong>Teacher variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher’s major, ( \gamma_{010} )</td>
<td>0.05</td>
<td>0.03</td>
<td>1.52</td>
<td>.128</td>
</tr>
<tr>
<td>Years of teaching, ( \gamma_{020} )</td>
<td>0.00</td>
<td>0.01</td>
<td>0.09</td>
<td>.931</td>
</tr>
<tr>
<td>Prof. development, ( \gamma_{030} )</td>
<td>0.02</td>
<td>0.02</td>
<td>1.25</td>
<td>.211</td>
</tr>
<tr>
<td>Degree, ( \gamma_{040} )</td>
<td>-0.00</td>
<td>0.01</td>
<td>-0.33</td>
<td>.741</td>
</tr>
<tr>
<td>Instructional resources, ( \gamma_{050} )</td>
<td>0.01</td>
<td>0.01</td>
<td>0.59</td>
<td>.552</td>
</tr>
<tr>
<td>Class size, ( \gamma_{060} )</td>
<td>-0.01</td>
<td>0.01</td>
<td>-0.83</td>
<td>.406</td>
</tr>
<tr>
<td><strong>School variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base, ( \gamma_{000} )</td>
<td>2.68</td>
<td>0.01</td>
<td>179.61</td>
<td>.000***</td>
</tr>
<tr>
<td>Pct free lunch, ( \gamma_{001} )</td>
<td>0.01</td>
<td>0.01</td>
<td>1.19</td>
<td>.234</td>
</tr>
<tr>
<td>LEP percentage, ( \gamma_{002} )</td>
<td>0.00</td>
<td>0.01</td>
<td>0.22</td>
<td>.826</td>
</tr>
<tr>
<td>Location, ( \gamma_{003} )</td>
<td>0.01</td>
<td>0.01</td>
<td>0.64</td>
<td>.519</td>
</tr>
<tr>
<td>Pct Black, ( \gamma_{004} )</td>
<td>0.04</td>
<td>0.02</td>
<td>1.71</td>
<td>.087</td>
</tr>
<tr>
<td>Pct Hispanic, ( \gamma_{005} )</td>
<td>0.03</td>
<td>0.02</td>
<td>2.21</td>
<td>.027*</td>
</tr>
</tbody>
</table>

Note. *** = p < .000; ** = p < .01; * = p < .05

\( H_{06a} \): ELLs who have attended schools with high mean SES and/or low LEP percentages will have higher reading engagement.

This hypothesis was not supported. The results show that school mean SES and LEP percentage in a school were not significant predictors for reading engagement (\( \gamma_{001} = .01, t=1.19, p=.234; \gamma_{002} = .00, t=.22, p=.826 \)). However, the percentage of Hispanic students was found to be statistically significant (\( \gamma_{003} = .03, t= 2.21, p=.027 \)). ELLs who go to schools with higher
percentage of Hispanic students tend to have higher reading engagement. The results indicate that the other selected school variables, such as school location and percentage of Black students, did not have any significant effects on ELLs’ reading engagement. The expected ELLs’ reading engagement for the population of students across all schools with all predictors equal to zero was $\gamma_{000} = 2.68$, with a standard error of 0.01. The average school mean was still significantly different from zero. Thus, the null hypothesis is highly implausible ($p < .001$), which indicates variation still exists in students’ NAEP reading engagement among schools after controlling student-, teacher-, and school-level characteristics.

$H_{06b}$: ELLs will have higher reading engagement when their teachers have higher academic degrees, more content knowledge, and professional development.

This hypothesis was not supported either. The results show that a teacher’s academic degree, major, and professional development were not significant predictors for reading engagement ($\gamma_{040} =-.00$, $t=-.33$, $p=.741$; $\gamma_{010} =.05$, $t=1.52$, $p=.128$; $\gamma_{030} =.02$, $t=1.25$, $p=.211$). The results indicate that the other selected teacher variables, the number of years of teaching, availability of instructional resources, and class size also did not have any significant effects on ELLs’ reading engagement.

$H_{06c}$: ELLs who have better home literacy environments will have a higher reading engagement.

This hypothesis was supported. Table 23 indicates that HLE is related to reading engagement positively with $\gamma_{200} =.15$, $t=16.70$, $p=.000$. The frequency of a language other than English spoken at home was also found to be statistically significant to reading engagement when teacher and school variables were controlled. Students had higher reading engagement the more often they spoke a language other than English at home. Students’ race, SES, and English proficiency appeared not to have an effect on ELLs’ reading engagement. Students’ reading
performance was also found to be significantly related to reading engagement ($\gamma_{100} = .00, t=5.10, p=.000$). ELLs who have higher reading performance scores achieved higher reading engagement.

Table 24

<table>
<thead>
<tr>
<th>Random Effect Variance Component</th>
<th>df</th>
<th>$\gamma^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-1, $e_{ijk}$</td>
<td>.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-2, $r_{0kj}$</td>
<td>.02</td>
<td>2,364</td>
<td>2,386.34</td>
</tr>
<tr>
<td>L-3, $u_{0kj}$</td>
<td>.03</td>
<td>2,525</td>
<td>2,883.16</td>
</tr>
</tbody>
</table>

Note. *** = $p < .000$; ** = $p < .01$; * = $p < .05$

Table 24 shows that the estimated variance of the expected reading engagement for ELLs across all schools with all predictors equal to zero was .03, with a $p$-value of <.001 after the effects of student, teacher, and school variables were removed. The estimated variance of the expected reading engagement across the population of teachers was .01 with a $p$-value of .378. Consequently, it was concluded that significant variation in reading engagement in response to school effects remains unexplained even after controlling student, teacher, and school variables.

**Comparison between high engagement ELLs and low engagement non-ELLs.**

Lastly, a series of three-level HLM models were created to examine the relationship between English proficiency and reading achievement while controlling for demographic and other relevant variables, using only ELLs with high engagement and non-ELLs with low engagement in order to examine how much reading engagement affected the reading achievement gap between ELLs and non-ELLs in the dataset. I began by running a traditional null model, followed by a model with an English proficiency variable only. Then, student-, teacher-, and school-level variables were added to examine how much the demographics and other
environmental variables explained the school achievement disparities in the prior model. Table 25 presents the results of the four three-level HLM models. Standards errors are included for the intercept and English proficiency coefficient, given that this is of primary interest.

Table 25

*English Proficiency and Demographic Variables Predicting 4th Grade Reading Scores*

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 1 Null Model</th>
<th>Model 2 ELL status only</th>
<th>Model 3 ELL + Level 1</th>
<th>Model 4 ELL + Level 1 + Level 2</th>
<th>Model 5 ELL + All Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept - School Mean achievement</td>
<td>208.62*** (0.42)</td>
<td>208.94*** (0.41)</td>
<td>208.48*** (0.39)</td>
<td>208.41*** (0.39)</td>
<td>208.04*** (0.21)</td>
</tr>
<tr>
<td>English proficiency</td>
<td>-14.16*** (1.16)</td>
<td>-10.12*** (1.46)</td>
<td>-10.22*** (1.46)</td>
<td>-9.16*** (1.58)</td>
<td></td>
</tr>
<tr>
<td>HLE</td>
<td>2.74***</td>
<td>2.74***</td>
<td>2.54***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>-15.17***</td>
<td>-14.84***</td>
<td>-11.72***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>-8.00***</td>
<td>-7.97***</td>
<td>-7.20***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>1.53***</td>
<td>1.51***</td>
<td>1.52***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-13.02***</td>
<td>-12.68***</td>
<td>-10.36***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching years</td>
<td>1.22**</td>
<td>1.11**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>0.92</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prof. Developpt</td>
<td>0.29</td>
<td>0.51</td>
<td></td>
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<tr>
<td>Degree</td>
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<td>-0.71</td>
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<tr>
<td>Resources</td>
<td>-0.53</td>
<td>-0.39</td>
<td></td>
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<tr>
<td>Class size</td>
<td>1.42***</td>
<td>1.02***</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>School Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pct Black</td>
<td></td>
<td>-2.47***</td>
<td></td>
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</tr>
<tr>
<td>Pct Hispanic</td>
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<td>-0.63</td>
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<tr>
<td>Location</td>
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<td>-0.43***</td>
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<tr>
<td>Mean SES</td>
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<td>-1.58***</td>
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<td></td>
<td></td>
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<tr>
<td>Pct LEP</td>
<td></td>
<td>0.02</td>
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</tbody>
</table>

Note: * p<.05; ** p<.01; p<.001
Model 1, the traditional HLM null model, indicates that the school reading mean for all of the schools averaged 208.62 points. This score is about 10 points lower than the one with the whole population. Model 2 indicates that without controlling for any demographic or other differences, non-ELL students’ reading achievement was 14.16 points higher than ELLs. The reading achievement gap between ELLs and non-ELLs got about 10 points smaller, compared to the whole population analysis. This indicates that higher reading engagement helped for ELLs to get higher reading scores.

Model 3 adds student demographic controls, revealing that after adjusting for such differences among students, the reading achievement gap between ELLs and non-ELLs got even smaller to 10.12. Compared to Table 17, Table 21 indicates that language other than English at home was a positive predictor for reading. Students got higher reading scores when they spoke languages other than English at home more frequently. Model 4 and Model 5 indicate that the reading achievement gap between ELLs and non-ELLs did not change much at all after teacher- and school-level variables were controlled, meaning school and teacher variables did not affect ELLs’ lower reading achievement scores.
Overview

Inclusion of ELLs in standardized tests is an area of growing interest in light of standards-based legislative reforms. There have been a number of studies into ELLs’ low achievement on standardized tests, mostly focusing on their limited English proficiency. Within school, classroom, and student groupings, there are numerous variables that can have significant relationships to students’ reading achievement. The purpose of this study was to identify the impact of student-, teacher-, and school characteristics on ELLs and non-ELLs’ standardized reading achievement and to gain additional knowledge and insight into how these characteristics impact on their reading achievements differently. This study compared achievement in ELLs and non-ELLs using the 2005 NAEP reading assessment database. When compared with other subjects such as mathematics, reading is more heavily influenced by a student’s experiences at home as well as those at school and of the teacher, thus studying reading achievement provides clearer insights into the relative performance of ELLs and non-ELLs in terms of student’s different home environment (Lubienski & Lubienski, 2006).

This study analyzed scores from un-weighted 10,813 ELLs, enrolled in 5,129 classrooms of 2,653 schools and 135,664 non-ELLs enrolled in 25,517 classrooms of 8,270 schools. The analysis of this study utilized advanced statistical techniques (hierarchical linear modeling) to investigate the relationship between students’ English proficiency and reading achievement while controlling demographic differences in the populations served by the schools.
Major findings are summarized in the first part of this chapter, which are then followed by their implications, recommendations for future research, and limitations of the study. The following research questions guided the analyses: (a) how is NAEP 4th grade reading achievement related to the student-, teacher-, and school characteristics? Do these relationships differ for ELLs and non-ELLs; (b) how does NAEP 4th grade reading achievement vary among ELLs, when controlling for students-, teacher-, and school-level demographic variables? To what extent do these demographic factors correlate with ELLs’ reading achievement; (c) how does NAEP 4th grade reading achievement vary between ELLs and non-ELLs in schools located in urban area? Does it persist when controlling for students-, teacher-, and school-level demographic variables; (d) how does reading engagement vary among ELLs, when controlling for student-, teacher-, and school-level demographic variables? Research hypotheses associated with each of these questions are presented in Chapter 2.

Summary of Study

Regardless of whether student, teacher, and school background differences were controlled, non-ELLs scored higher than ELLs as expected. However, this study examined these patterns further, determining the extent to which the gaps persist after controlling for potential student-, teacher-, and school-level confounding variables. The results of this study clarified (a) the impacts of student, teacher, and school characteristics on reading performance, (b) the different impacts of those factors on ELLs’ and non-ELLs’ reading performance, and (c) the relationship between ELLs’ reading performance and their reading engagement. The HLM techniques employed for this study took advantage of the nested nature of the data in order to produce highly precise coefficients.
Descriptive analysis suggests that non-ELLs received higher reading scores than ELLs in all levels of variables. Both groups of students had higher scores when they had better home language environments, high reading engagement, and high-SES. Minority students had lower scores than others. ELLs tended to speak languages other than English more frequently at home than non-ELLs. ELLs had higher scores when they spoke languages other than English at home more frequently, but the opposite was true for non-ELLs. They earned lower scores, in general, when they spoke languages other than English at home more frequently. Non-ELLs had relatively more teachers who majored in reading or related field, had higher degrees and more years of teaching experience, and access to more instructional resources than ELLs. Non-ELLs were also taught in smaller classrooms than ELLs. ELLs tended to go to schools with higher percentage of Hispanics, LEP, low school mean-SES, and to be located in large cities.

Descriptive results highlight the question of whether some of the different patterns are due to a student’s English-proficiency, or the extent to which the achievement disparities persist after controlling for differences in demographics or school environments.

HLM results suggest: (a) students’ reading performance was related to certain student-, teacher-, and school-level variables and these relationships differ for ELLs and non-ELLs; (b) students who went to schools located in urban areas had lower scores than those in rural areas and the achievement gap between ELLs and non-ELLs in urban areas was bigger than non-urban areas; and (c) students’ home language environment, the frequency of speaking languages other than English spoken at home, and the Hispanic percentage in schools were significantly related to ELLs’ reading engagement after controlling other student, teacher, and school variables.

The HLM results indicate that student characteristics occupied the majority of the variance component, compared to teacher and school characteristics and this was even more
salient for ELLs. English-proficiency was the most significant variable out of other students’ characteristics. But interestingly, English proficiency added only 1% of the total variance component of schools. This implies that other than English proficiency, variables like students’ demographics and prior schooling may be more responsible for students’ reading scores.

Students’ reading achievement was related to home language environments, reading engagement, SES, and race. Students with higher home language environments, reading engagement, and SES got higher reading scores. Black and Hispanic students had significantly lower scores than others. The frequency of languages other than English spoken at home was the only student variable for which ELLs and non-ELLs displayed different results. The frequency of languages other than English spoken at home had an insignificant negative effect on non-ELLs’ reading. On the contrary, ELLs tended to have higher reading scores when they spoke languages other English at home more frequently.

Across numerous studies, parental education levels have been strong predictors of child academic outcomes (Connor, 2006). Some studies even indicated that in addition to inheritable aspects of children’s learning, maternal education is associated with the quality of the home environment, parental teaching, and exposure to a variety of resources that promote learning (Guo and Harris, 2000). Parents’ educational level could have helped to explain why speaking languages other than English at home is not an issue, however in this study, the NAEP 4th grade reading dataset does not provide parents’ educational level or their involvement in children’s learning.

The results of this study proved the significant effects of motivation and engagement in relation to reading. It was particularly true for learning ELLs. Due to the complex nature of language, L2 motivation has been conceptualized as a multifaceted construct that comprise
number of components (Csizer and Dornyei, 2005). Some researchers found language-minority students were less likely to engage in academic behaviors outside of school that facilitate higher academic reading achievement (Paret, 2006). However, the results of this study suggest that ELLs did not have lower engagement in reading, compared to their non-ELL peers. Instead, ELLs had higher reading engagement. This was a different result from some of the previous literature on reading engagement: poor readers have poorer intrinsic motivation than good readers.

The HLM results from the relationship between ELLs’ reading performance and reading engagement indicate that there was a positive relation among ELLs’ reading performance, home language environment, and reading engagement. ELLs who had better home language environments, higher reading performances, and who spoke languages other than English at home more frequently had higher reading engagement. ELLs who like to read tended to achieve higher reading performance and ELLs who have more books around their home and talk about studies at home more frequently tended to achieve higher reading performance. It was also shown that ELLs’ reading engagement and Hispanic student percentage in schools had a positive relation. This confirms the descriptive statistical results shown earlier: Hispanic students tended to have higher reading engagement than other students.

Years of teaching, the extent of professional development, and class size were the teacher variables that affected students’ reading significantly. Students had higher reading scores when their teachers had more teaching experiences, more professional development, or when their classrooms were bigger. Often times research has shown that small classes work better. However, some researchers have found that teachers with more years of experience were more likely to have more students in their classroom (Connor et al., 2005). Thus, the HLM results
may indicate the influence of years of teaching experience to the class size. A teacher’s degree, major in content area, and availability of the instructional resources were not significantly related to reading. These results were somewhat different from some of the previous studies. Studies have shown that the type and amount of college education that teachers receive is related to students’ achievement for student learning (Darling-Hammond & Youngs, 2002; Greenwald et al., 1996). The HLM results obtained from only analyzing ELLs indicate that years of teaching and instructional resources were the only teacher-variables significantly related to ELLs’ reading.

All of the school variables in the study – school-mean SES, percent LEP, location, percent Black, and percent Hispanic – were significantly related to students’ reading scores. The results showed that students who go to a school with more minority, LEP students, or free-lunch eligible students got lower reading scores. It was also found that students in rural schools got lower reading scores than those in urban areas. However, HLM results obtained from only analyzing ELLs yielded slightly different results. School location and Black student percentage were not significantly related to ELLs’ reading performance due to the fact that only small percent of ELLs are Black and majority of ELLs tend to go to schools located in urban areas.

ELLs and non-ELLs’ reading performance gap was only related to school-mean SES and Black student percentages in school after controlling student and teacher effects. The reading performance gap between ELLs and non-ELLs decreased when the school had lower school-mean SES or a larger percentage of Black students. Considering only small percentages of ELLs are Black, increase of Black students may mean the increase of low-achieving non-ELLs. On the contrary, the reading performance gap between the two groups increased when the school had a larger percentage of Hispanic students. Majority of ELLs are Hispanic and the increase of
Hispanic students can mean the increase of low-achieving ELLs. Students in urban areas had lower reading scores than students in other areas. The reading score gap between ELLs and non-ELLs increased when the data were analyzed using only students in urban areas.

It is noticeable that non-ELLs’ score gap between the lowest LEP percentage schools and the highest LEP percentage schools is not as salient as ELLs’. Although all of the school variables were significantly related to non-ELLs’ reading achievement, school-mean SES, LEP, and Hispanic percentages were the only school variables that significantly predicted ELLs’ reading scores. It appeared that most of the variation in the within school effects on ELLs vs. non-ELLs was well-explained after controlling the selected student, teacher, and school variables. However, significant variation in the within student and teacher effects of ELLs vs. non-ELLs remains unexplained even after controlling student, teacher, and school variables. This suggests that more detailed teacher and classroom knowledge such as classroom instruction method may be more useful to explain students’ reading achievement. In addition, more information on students, such as their prior schooling and first language proficiency, might be helpful to account for the significant variation in the reading performance variance which remained unexplained after controlling for student, teacher, and school variables.

The findings affirmed that the majority of ELLs belonged to other risk factor groups such as minority and low SES. Score gaps between urban and rural areas were also revealed again. In addition, far more variations within schools than between schools were found. Despite the significant influences of school demographics on students’ reading achievement scores, it was shown that students’ race and SES as well as English proficiency were by far the most significant factors for students’ reading achievement. Overall, English proficiency was a significant predictor for reading performance but it explained only small percentage of variance to students’
reading after controlling for student, teacher, and school variables, implying ELLs have more risk factors other than English proficiency on their low reading scores.

Lastly, the results of this study demonstrated the effectiveness of multilevel modeling, namely HLM, for examining the hierarchical nature of various characteristics associated with reading performance. The study ameliorates the limitations of non-multilevel studies related to misestimated standard errors, aggregation bias, and heterogeneity of regression. In addition, the investigation of differentiating effects of student characteristics on achievement requires multilevel modeling in order to draw appropriate conclusions that require cross-level inference as demonstrated in this study (i.e., the influence of school-level factors on the relationship between reading performance and student characteristics). Therefore, the use of HLM procedures was of great benefit to this study.

Implications

This study’s descriptive analyses supports findings from previous research, namely that ELLs tend to have more hardship measures than non-ELLs. Non-ELLs had relatively better HLE, higher SES, more qualified teachers and instructional resources in smaller classrooms than ELLs. ELLs tended to be minorities who attended schools in large cities with higher percentages of Hispanics, LEP students, and low school mean-SES. These findings are nothing new. Studies have shown that there is a high correlation between limited English proficiency and other hardship measures. However, these results highlight the question of the extent to which the achievement disparities persist after controlling for differences in demographics or school environments. This study brought a few important implications on ELLs’ literacy and their reading achievement.
Implications for bilingual education. The present findings have important implications for bilingual education for ELLs. This study’s HLM analyses determined that some factors were related to ELLs’ and non-ELLs’ reading achievement differently after controlling for student, teacher, and school variables. Specifically, the frequency of languages other than English spoken at home yielded different results for ELLs and non-ELLs. The frequency of languages other than English spoken at home was a significant, positive predictor of reading achievement for ELLs but not for non-ELLs, implying a positive effect of first-language speaking on ELLs’ reading achievement. This result supports Cummin (1981)’s linguistic interdependence hypothesis: the literacy-related aspects of a bilingual’s proficiency in first language and second language are seen as common or interdependent across languages. Student’s bilingualness can explain that the students who are bilingual are doing better than those who are not. In addition, this result can be extended to the support for the first-language instruction and its beneficial effects on the literacy development of second-language learners.

Language transfer refers to speakers or writers applying knowledge from their native language to a second language. Genesee et al. (2006) argue that we should rethink transfer as “preparedness for future learning” and that “use of knowledge from the first language is evidence of resourcefulness (p.161). Yeung et al. (2000) asserted that bilingualism itself does not interfere with performance in either language. August et al. (2006) and Genesee et al. (2006) discussed the benefits of teaching ELLs in a language the students understand. There has been a great deal of evidence that students’ reading proficiency in their native language is a strong predictor of their ultimate English reading performance (Fitzgerald, Garcia, Jimenez & Barrera, 2000; Lee & Schallert, 1997; Reese, Gamier, Gallimore, & Goldenberg, 2000). The results of this study add empirical evidence to the benefits of bilingual education. Researchers and instructors should
acknowledge that instruction in the students’ first language does not prevent their ability from developing literacy skills in their second language.

Implications for opportunity to learn. Another implication that this study brought is the importance of providing equal opportunity to learn to all students. Opportunity to learn refers to equitable conditions or circumstances within the school or classroom that promote learning for all students, including learning materials, facilities, teachers, instructional experiences that enable students to achieve high standards, and the absence of barriers that prevent learning (National Comprehensive Center for Teacher Quality [TQ Center], 2009). Stevens (1993) asserts that “opportunity to learn the designated curriculum for a grade level or age group is a major equity issue for students who are at risk of not developing academically to their fullest potential” (p. 1). When students are tested with high-stakes assessments, evidence must be provided that the students have had adequate opportunity to learn the material on which they are being tested. Thus, in connection with assessment, opportunity to learn relates to providing adequate and timely instruction of specific content and skills prior to taking a test (Winfield, 1987).

However, the results from this study showed that ELLs had less learning resources than non-ELLs. ELLs had lower home language environmental resources (number of books, availability of computer, etc.) than non-ELLs. In particular, the HLM results indicated that out of five teacher-level factors, only availability of instructional resources significantly affected ELLs’ reading achievement other than teachers’ years of teaching experiences. Other teacher variables, such as teachers’ professional development was only significant for non-ELLs.

Overall, the results of this study implied that ELLs not only have less time to overcome limited English proficiency before taking standardized content area tests but also have less
educational resources. Although opportunity to learn is an important factor for reading achievement for all students, it was not equally distributed between ELLs and non-ELLs.

**Limitations of the Study**

The size and representativeness of the NAEP data support for the reliability of this analysis. However, NAEP data has limits. One of the limitations is the fact that NAEP data are cross-sectional, not longitudinal. It is impossible to examine individual student growth in achievement over time with NAEP data. Thus, it is hard to conclude from this analysis that some of the student, teacher, and school characteristics are more influential at promoting student growth over time than others.

Another caution is the classification of ELLs and non-ELLs. In this study, students were divided to ELLs and non-ELLs depending on their English proficiency. If students were categorized as LEP (Limited English Proficiency) in NAEP data, they were named as ELLs in this study. If students were not categorized as LEP, then they were named as non-ELLs. However, the problem of the lack of an operational definition of LEP has been criticized. Abedi (2004) indicated that NAEP does not provide a definition of the LEP population, instead, it presents criteria for the inclusion of LEP students who must be identified by their schools. Schools are sometimes unable to provide accurate information on the areas that NAEP uses as criteria for including ELLs.

Lastly, NAEP offers detailed student, teacher, and administrator survey data regarding a variety of student and school characteristics. However, NAEP data has replicate weights for only each student and school in order to account for the clustered sampling, but not for teachers. Since NAEP selects samples of students and then surveys their teachers, teacher weights are not assigned. Teacher data are linked to student data and can be interpreted at the student level. For instance, the
analyses of this study can indicate that 70% of students had teachers who had professional development instead 70% of teachers had professional development. Although teacher data do not have replicate weights like students and schools, in this study teacher data were analyzed and interpreted their own level to provide the analyses using the three-level nested setting.

**Suggestions for Future Studies**

The results of this study provided much insight into the student, teacher, and school characteristics that impact the reading performances of students in the 4th grade. However, findings from this study can only be generalized to reading performance, leaving one to wonder what impacts these variables may have on different subject assessments. An investigation of a similar model utilizing NAEP databases is warranted in order to examine the impact these characteristics have on differing subject performances (i.e., math; writing). A comparison of model results with this study would provide useful information about the effects of student and school variables on multiple subject areas.

In addition, if more extensive data were available, a Hierarchical Linear Growth model could have been performed. NAEP provides a fine resource for secondary data analysis for many reasons: its size, the quality of its ability measures, its representativeness, and its importance in the politics of education. However, it is not longitudinal. Hence, NAEP data do not allow for examinations of individual student growth in achievement over time. Using longitudinal data, capturing individual growth over time would allow for the tracking of students and schools. If such a model is to be developed, a three-level Hierarchical Linear Growth model would comprise individual growth trajectories at level-1, variation among individuals within schools at level-2, and the variation among schools at level-3 (Bryk & Raudenbush, 1992).
Lastly, there has been criticism on unintentional function of English as a language proficiency tests in content area tests for ELLs. Messick (1989) criticized it as construct-irrelevant variance, meaning the degree to which the language of the test questions contaminates the validity of the test. For this problem, logically there could be two solutions. The first one is to take steps to remove the language proficiency effect such as using accommodations. Although there have been issues with validity of some of the accommodations, it will be still very interesting to apply different accommodation methods to ELLs after controlling student, teacher, and school factors and investigating how different accommodations can influence students’ reading scores would give some ideas of useful accommodation for different ELLs. Another solution that can be used to eliminate the unintentional function of English is building standardized content area tests that embrace it as a second target construct. That way, English will not be construct-irrelevant variance.
References


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Chang, H. (2003). Improving the DIF detection procedures for NAEP data analysis. Proposal Submitted to U.S. Department of Education Application for a Grant under the National Assessment of Educational Progress Secondary Analysis Program (CFDA Number: 84.902B)


Appendix A

Increase of ELLs Between 1979 and 2004

Number and percentage of children ages 5–17 who spoke a language other than English at home and who spoke English with difficulty: Various years, 1979–2004

<table>
<thead>
<tr>
<th>Year</th>
<th>Total population ages 5-17</th>
<th>Spoke a language other than English at home</th>
<th>Spoke English w/ difficulty¹</th>
<th>% change compared with 1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% of total population</td>
<td>N</td>
<td>% of total population</td>
</tr>
<tr>
<td>1979</td>
<td>44.7</td>
<td>3.8</td>
<td>8.5</td>
<td>1.3</td>
</tr>
<tr>
<td>1989</td>
<td>42.3</td>
<td>5.2</td>
<td>12.3</td>
<td>1.8</td>
</tr>
<tr>
<td>1992</td>
<td>47.7</td>
<td>6.3</td>
<td>13.2</td>
<td>2.2</td>
</tr>
<tr>
<td>1995</td>
<td>47.5</td>
<td>6.7</td>
<td>14.1</td>
<td>2.4</td>
</tr>
<tr>
<td>1999</td>
<td>52.7</td>
<td>8.8</td>
<td>16.7</td>
<td>2.6</td>
</tr>
<tr>
<td>2000</td>
<td>52.5</td>
<td>9.5</td>
<td>18.1</td>
<td>2.9</td>
</tr>
<tr>
<td>2001</td>
<td>53.0</td>
<td>9.8</td>
<td>18.5</td>
<td>2.8</td>
</tr>
<tr>
<td>2002</td>
<td>53.0</td>
<td>9.8</td>
<td>18.5</td>
<td>2.8</td>
</tr>
<tr>
<td>2003</td>
<td>53.0</td>
<td>9.9</td>
<td>18.7</td>
<td>2.9</td>
</tr>
<tr>
<td>2004</td>
<td>52.9</td>
<td>9.9</td>
<td>18.8</td>
<td>2.8</td>
</tr>
</tbody>
</table>

% change compared with 1979

<table>
<thead>
<tr>
<th>Year</th>
<th>% change compared with 1979</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>18.3</td>
</tr>
</tbody>
</table>

Note: ¹Respondents were asked if each child in the household spoke a language other than English at home. If they answered “yes,” they were asked how well each child could speak English. Categories used for reporting were “very well,” “well,” “not well,” and “not at all.” All those who reported speaking English less than “very well” were considered to have difficulty speaking English.

### Appendix B

#### Percentage of Children who Speak a Language Other Than English at Home

Number and % of children ages 5-17 who spoke a language other than English at home and who spoke English w/ difficulty, by selected characteristics: 2004

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>Spoke a language other than English at home</th>
<th>% of population</th>
<th>Spoke English w/ difficulty</th>
<th>% of population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Spoke a language other than English at home</td>
<td>N</td>
<td>% of population</td>
<td>N</td>
</tr>
<tr>
<td>Total</td>
<td>52,876</td>
<td>9,949</td>
<td>18.8</td>
<td>2,776</td>
<td>5.3</td>
</tr>
<tr>
<td>Language spoken at home</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>7,091</td>
<td>7,091</td>
<td>100</td>
<td>2,080</td>
<td>29.3</td>
</tr>
<tr>
<td>Other Indo-European</td>
<td>1,434</td>
<td>1,434</td>
<td>100</td>
<td>345</td>
<td>24.0</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>1,139</td>
<td>1,139</td>
<td>100</td>
<td>311</td>
<td>27.3</td>
</tr>
<tr>
<td>Other</td>
<td>286</td>
<td>286</td>
<td>100</td>
<td>41</td>
<td>14.2</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>31,659</td>
<td>1,679</td>
<td>5.3</td>
<td>430</td>
<td>1.4</td>
</tr>
<tr>
<td>Black</td>
<td>7,817</td>
<td>367</td>
<td>4.7</td>
<td>92</td>
<td>1.2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9,538</td>
<td>6,432</td>
<td>67.4</td>
<td>1,885</td>
<td>19.8</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2,015</td>
<td>1,266</td>
<td>62.8</td>
<td>336</td>
<td>16.7</td>
</tr>
<tr>
<td>American Indian</td>
<td>412</td>
<td>58</td>
<td>14.1</td>
<td>8</td>
<td>1.8</td>
</tr>
<tr>
<td>Poverty status&lt;sup&gt;3&lt;/sup&gt;</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>9,109</td>
<td>2,549</td>
<td>28.0</td>
<td>903</td>
<td>9.9</td>
</tr>
<tr>
<td>Near-poor</td>
<td>11,065</td>
<td>3,030</td>
<td>27.4</td>
<td>900</td>
<td>8.1</td>
</tr>
<tr>
<td>Non poor</td>
<td>31,913</td>
<td>4,254</td>
<td>13.3</td>
<td>927</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Notes: 1 Respondents were asked if each child in the household spoke a language other than English at home. If they answered “yes,” they were asked how well each child could speak English. Categories used for reporting were “very well,” “well,” “not well,” and “not at all.” All those who reported speaking English less than “very well” were considered to have difficulty speaking English; 2 Percentage of the total population for that particular subgroup. For example, 14.1 percent of all American Indians spoke a language other than English at home, and 1.8 percent of all American Indians spoke a language other than English at home and spoke English with difficulty; 3 “Poor” is defined to include those families below the poverty threshold; “near-poor” is defined as 100–199 percent of the poverty threshold; and “non poor” is defined as 200 percent or more than the poverty threshold.


Appendix C

NAEP Reading 2005 Grade 4 Background Questionnaire

STUDENT

Section 3: In this section, please tell us about yourself and your family. The section has 11 Q.

1. Are you Hispanic or Latino? Fill in one or more ovals. (Hispanic/non-Hispanic)
   a. No, I’m not Hispanic or Latino.
   b. Yes, I am Mexican, Mexican American, or Chicano.
   c. Yes, I am Puerto Rican or Puerto Rican American.
   d. Yes, I am Cuban or Cuban American.
   e. Yes, I am from some other Hispanic or Latino background.

2. Which of the following best describes you? Fill in one or more ovals. (Race)
   a. White
   b. Black or African American
   c. Asian
   d. American Indian or Alaska Native
   e. Native Hawaiian or other Pacific Islander

3. Does your family get a newspaper at least four times a week? [B017001]
   a. Yes
   b. No
   c. I don’t know.

4. Does your family get any magazines? [B000905]
   a. Yes
   b. No
   c. I don’t know.

5. About how many books are there in your home? [B013801]
   a. Few (0-10)
   b. Enough to fill one shelf (11-25)
   c. Enough to fill one bookcase (26-100)
   d. Enough to fill several bookcases (more than 100)

6. Is there a computer at home that you use? [B017101]
   a. Yes
   b. No

7. Is there an encyclopedia in your home? It could be a set of books, or it could be on the computer. [B017201]
   a. Yes
   b. No
   c. I don’t know.
8. About how many pages a day do you have to read in school and for homework? 
[B001151]
   a. 5 or fewer
   b. 6-10
   c. 11-15
   d. 16-20
   e. More than 20

9. How many days were you absent from school in the last month? [B018101]
   a. None
   b. 1 or 2 days
   c. 3 or 4 days
   d. 5 to 10 days
   e. More than 10 days

10. How often do you talk about things you have studied in school with someone in your family? 
[B017451]
    a. Never or hardly ever
    b. Once every few weeks
    c. About once a week
    d. Two or three times a week
    e. Every day

11. How often do people in your home talk to each other in a language other than English? [B018201]
    a. Never
    b. Once in a while
    c. About half of the time
    d. All or most of the time

Section 4
1. When I read books, I learn a lot. [R830601]
   a. This is not like me.
   b. This is a little like me.
   c. This is a lot like me.

2. Reading is one of my favorite activities. [R830701]
   a. This is not like me.
   b. This is a little like me.
   c. This is a lot like me.

3. How often do you read for fun on your own time? [R831001]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day
4. How often do you talk with your friends or family about something you have read? [R831101]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

5. How often do you read stories or poems for fun outside of school? [R831501]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

6. How often do you read to learn about real things (such as facts about dinosaurs or other countries) for fun outside of school? [R831601]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

7. How often do you read stories or articles that you find on the Internet for fun outside of school? [R831701]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

8. For school this year, how often do you have a class discussion about something that the class has read? [R831801]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

9. For school this year, how often do you work in pairs or small groups to talk about something that you have read? [R831901]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

10. For school this year, how often do you write in a journal about something that you have read for class? [R832001]
    a. Never or hardly ever
    b. Once or twice a month
    c. Once or twice a week
    d. Almost every day
11. So far this year, how many times have you written a book report? [R832101]
   a. Never
   b. Once
   c. 2 or 3 times
   d. 4 or 5 times
   e. 6 or more times

12. So far this year, how many times have you made a presentation to the class about something that you have read? [R832201]
   a. Never
   b. Once
   c. 2 or 3 times
   d. 4 or 5 times
   e. 6 or more times

13. So far this year, how many times have you done a school project about something that you have read (for example, written a play, created a poster)? [R832301]
   a. Never
   b. Once
   c. 2 or 3 times
   d. 4 or 5 times
   e. 6 or more times

14. For school this year, how often have you been asked to write long answers to questions on tests or assignments that involved reading? [R832801]
   a. Never
   b. Once or twice this year
   c. Once or twice a month
   d. At least once a week

15. When you have reading assignments in school, how often does your teacher give you time to read books you have chosen yourself? [R832901]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

16. – 19. How often do you read paperbacks, softcover books, or magazines for reading, science, social studies or history, and math? [R832401, R832501, R832601, R832701]
   a. Never or hardly ever
   b. Once or twice a month
   c. Once or twice a week
   d. Almost every day

20. How hard was this test compared to most other tests you have taken this year in school? [R836601]
   a. Easier than other tests
   b. About as hard as other tests
   c. Harder than other tests
   d. Much harder than other tests
21. How hard did you try on this test compared to how hard you tried on most other tests you have taken this year in school? [R836701]
   a. Not as hard as on other tests
   b. About as hard as other tests
   c. Harder than other tests
   d. Much harder than other tests

22. How important was it to you to do well on this test? [R836801]
   a. Not very important
   b. Somewhat important
   c. Important
   d. Very important

TEACHER

Part I: Background, Education, and Training

1. Are you Hispanic or Latino? Fill in one or more ovals. (Hispanic/non-Hispanic)
   a. No, I am not Hispanic or Latino [TA21101]
   b. Yes, I am Mexican, Mexican American, or Chicano [TB21101]
   c. Yes, I am Puerto Rican or Puerto Rican American [TC21101]
   d. Yes, I am Cuban or Cuban American [TD21101]
   e. Yes, I am from some other Hispanic or Latino background [TD21101]

2. Which of the following best describes you? Fill in one or more ovals. (Race)
   a. White [TA21201]
   b. Black or African American [TB21201]
   c. Asian [TC21201]
   d. American Indian or Alaska Native [TD21201]
   e. Native Hawaiian or other Pacific Islander [TE21201]

3. Counting this year, how many years have you worked as an elementary or secondary teacher? Include any full-time teaching assignments, part-time teaching assignments, and long-term substitute assignments, but not student teaching. If less than 4 months total experience, enter “00”. [T077101]

4. What type of teaching certificate do you hold in the state where you currently teach? [T070201]
   a. Regular or standard state certificate or advanced professional certificate (Go to Question 5)
   b. Probationary certificate (Go to Question 5)
   c. Provisional or other type of certificate given to persons who are still participating in what the state calls an “alternative certification program” (Go to Question 5)
   d. Temporary certificate (Go to Question 5)
   e. Emergency certificate or waiver (Go to Question 5)
   f. No certificate (Go to Question 6)

5. Do you hold a currently valid regular or standard certification from a state other than the one in which you are currently teaching? (teaching certificate) [T087201]
   a. Yes
   b. No
6. What is the highest academic degree you hold? [T056301]
   a. High-school diploma
   b. Associate’s degree/vocational certification
   c. Bachelor’s degree
   d. Master’s degree
   e. Education specialist’s or professional diploma based on at least one year’s work past
      master’s degree
   f. Doctorate
   g. Professional degree

7. Did you have a major, minor, or special emphasis in any of the following subjects as part of your
   undergraduate coursework? Fill in one oval on each line. (major)
   [Yes, a major / Yea, a minor or special emphasis / No]
   d. Reading, language arts, or literacy education [T077305]
   e. English [T077306]
   f. Other language arts-related subject [T077307]
   l. Education (including elementary or early childhood) [T077312]

8. Did you have a major, minor, or special emphasis in any of the following subjects as part of your
   graduate coursework? Fill in one oval on each line. (major)
   [Yes, a major / Yea, a minor or special emphasis / No]
   d. Reading, language arts, or literacy education [T077405]
   e. English [T077406]
   f. Other language arts-related subject [T077407]
   l. Education (including elementary or early childhood) [T077412]

9. As part of either your undergraduate or graduate coursework, how many advanced mathematics
   courses (such as trigonometry, calculus, or statistics) did you take?

10. As part of either your undergraduate or graduate coursework, how many mathematics education
    courses (such as trigonometry, calculus, or statistics) did you take?

11. Consider all of the professional development activities you participated in during the last two
    years. To what extent did you learn about each of the following topics? Fill in one oval on each
    line.
    [Not at all/ Small extent/ Moderate extent/ Large extent]
    a. Preparation of students for district and state assessments [T087710]
    l. Strategies for teaching math to students from diverse backgrounds [T087712]

12. During the last two years, did you participate in or lead any of the following professional
    development activities related to the teaching of language arts, science, or mathematics?
    Language arts refers to reading, writing, literature, and related topics. Fill in one or more ovals on
    each line. (training)
    [Yes, related to language arts/ Yes, related to science/ Yes, related to math/ No]
    a. College course taken after your first certification [T087801/04]
    b. Workshop or training session [T087805/08]
    c. Conference or professional association meeting [T087809/12]
    d. Observational visit to another school [T087813/16]
    e. Mentoring and/or peer observation and coaching as part of a formal arrangement
    [T087817/20]
f. Committee or task force focusing on curriculum, instruction, or student assessment
   [T087821/24]
g. Regularly scheduled discussion or study group [T087825/28]
h. Teacher collaborative or network (such as one organized by an outside agency or over the
   Internet) [T087820/32]
i. Individual or collaborative research [T087833/36]
j. Independent reading on a regular basis (e.g., educational journals, books, or the Internet)
   [T087837/40]
k. Co-teaching/team teaching [T087841/44]
l. Consultation with a subject specialist [T087845/48]

13. Some states and districts have recently initiated school improvement efforts directed at issues
    such as adequate progress and state accountability standards. These activities are usually led by
    personnel from outside the particular school. During the last two years have you participated in
    such activities?
    a. Within your school (Yes/ No) [T087901]
    b. As part of a team outside your school (Yes/ No) [T087902]

Part III: Reading/Language Arts

Classroom Organization and instruction

1. How many students are in this class? [T092401]
   a. 15 or fewer
   b. 16-18
   c. 19-20
   d. 21-25
   e. 26 or more

2. Which best describes your role in teaching language arts to this class? Language arts refers to
   reading, writing, literature, and related topics. Fill in one oval. [T086501]
   a. I do not teach language arts to this class
   b. I teach all or most subjects, including language arts
   c. The only subject I teach is language arts
   d. We team teach, and I have primary responsibility for teaching language arts

3. Which best describes how language arts instruction is organized? Language arts refers to reading,
   writing, literature, and related topics. Fill in one oval. [T083401]
   a. Language arts is taught primarily as a discrete subject with little or no integration with
      instruction in other subjects
   b. Some language arts instruction is integrated with other subjects, and some language arts
      instruction is presented as a discrete subject
   c. Language arts lessons are primarily integrated with instruction in other subjects

4. About how much time in total do you spend with this class on language arts instruction in a
   typical week? Language arts refers to reading, writing, literature, and related topics. [T089801]
   a. Less than 3 hours
   b. 3-4.9 hours
   c. 5-6.9 hours
   d. 7-9.9 hours
   e. 10 or more hours
5. On what basis do you create instructional groups for reading in this class? [T068351]
   a. I don’t create groups for reading in this class
   b. Ability
   c. Interest
   d. Diversity
   e. Other

6. How often do you do the following things as part of reading instruction with this class? (reading instruction)
   [Never or hardly ever/ Once or twice a year, month, week]
   a. Ask students to read aloud [T089901]
   b. Ask students to talk with each other about what they have read [T089902]
   c. Ask students to write about something they have read [T089903]
   d. Ask students to work in a reading workbook or on a worksheet [T089904]
   e. Ask students to read silently [T089905]
   f. Give students time to read books they have chosen themselves [T089906]
   g. Ask students to do a group activity or project about what they have read [T089907]
   h. Ask students to discuss different interpretations of what they have read [T089908]
   i. Ask students to explain or support their understanding of what they have read [T089909]
   j. Watch movies, videos, filmstrips, television; or listen to tapes, CD, or records [T089910]
   k. Help students understand new words [T089911]
   l. Ask students to answer questions about what they have read in writing [T089912]
   m. Ask students to make predictions about what they have read as they are reading it [T089913]
   n. Ask students to make generalizations and draw inferences based on what they have read [T089914]
   o. Ask students to describe the style or structure of the text they have read Ask students to make predictions about what they have read as they are reading it [T089915]

7. How often do you use each of the following to assess student progress in reading? (reading assessment)
   [Never or hardly ever/ Once or twice a year, month, week]
   a. Multiple-choice tests [T070151]
   b. Short-answer tests [T070152]
   c. Paragraph length written responses about what students have read [T070153]
   d. Individual or group projects or presentations [T070154]
   e. Reading portfolios [T070155]
   f. Extended essays/papers on assigned topics [T070156]
   g. Oral reading assignment [T070157]

LEP TEACHER

What is your relationship to the student named on the front cover?
   a. Classroom (general education) teacher [XL00101]
   b. Bilingual education/ESL classroom teacher [XL00102]
   c. Bilingual education/ESL pullout teacher [XL00103]
   d. Guidance/school counselor [XL00104]
   e. Principal/assistant principal [XL00105]
   f. Other (specify) [XL00106]
1. What is this student’s first or native language? (Spanish or not) [X013801]
   a. Spanish
   b. Other language (specify)

Question 2-5. How would you characterize this student’s English proficiency? (English proficiency)
[Good (LEP advanced), Fair (LEP intermediate), Poor (LEP beginning), No proficiency, I don’t know]

2. Student’s Listening comprehension proficiency in English [XL00201]

3. Student’s Speaking proficiency in English [XL00301]

4. Student’s Reading proficiency in English [XL00401]

5. Student’s Writing proficiency in English [XL00501]

6. Including the current school year, how long has this student been receiving academic instruction primarily in English? (years of instruction with English) [XL00601]
   a. This student does not receive academic instruction primarily in English in this subject
   b. Less than 1 year
   c. 1-2 years
   d. 2-3 years
   e. 3 years or more
   f. I don’t know

7. Refer to the front cover to determine the subject in which this student is being assessed by NAEP, and fill in the oval for that subject below. [XL00701]
   [Civics, Economics, Math, Reading, Science, U.S. history]

8. What grade level of instruction is this student currently receiving in the subject identified in question 7? (grade level: above or below) [XL00801]
   a. This student is currently not receiving instruction in this subject
   b. At or above grade level
   c. One year below grade level
   d. Two or more years below grade level
   e. I don’t know

9. Is this student participating in the same curriculum content in the English language as English-speaking students in the subject identified in question 7? (same curriculum with non-ELLS or not) [XL00901]
   a. This student is currently not receiving instruction in English in this subject
   b. Same curriculum content
   c. Different curriculum content
   d. I don’t know

10. During this school year, what type of instruction for LEP students has this student received in the subject identified in question 7? (type of instruction for ELL students) [XL01001]
    a. No specially designed instruction for limited-English-proficient students
    b. Specially designed instruction in English (e.g., ESL, simplified English)
    c. Native-language instruction
    d. I don’t know
11. How does this student participate in the regular state academic assessment in the subject identified in question 7? If your state does not have an assessment in the subject identified in question 7, indicate how this student participates in your state’s reading/language arts assessments. (accommodations) [XL01101]
   a. This student does not participate in the regular state academic assessment
   b. Regular assessment without accommodations
   c. Regular assessment with direct and/or indirect linguistic support accommodations

12. Direct linguistic support accommodations in native language or English? (direct accommodations)
   a. No direct linguistic support accommodations [XL01201]
   b. Native-language version of test [XL01202]
   c. Bilingual version of test [XL01203]
   d. Bilingual word lists or glossaries [XL01204]
   e. Bilingual dictionary without definitions [XL01205]
   f. Directions translated aloud into native language or presented by audiotape [XL01206]
   g. Passages, other stimulus material, or test questions translated aloud into native language or presented by audiotape [XL01207]
   h. Student’s oral or written responses translated into written English [XL01208]
   i. Directions read aloud in English or presented by audiotape [XL01209]
   j. Passages, other stimulus materials, or test questions read aloud in English or presented by audiotape [XL01210]

13. Indirect linguistic support accommodations? (indirect accommodations)
   a. No indirect linguistic support accommodations [XL01301]
   b. Tested in small group [XL01302]
   c. Tested individually [XL01303]
   d. Receives extended time [XL01304]
   e. Receives professional seating [XL01305]

14. In your judgment, can this student participate in NAEP in the subject selected in question 7? [XL01401]
   a. Yes, without accommodations
   b. Yes, with accommodations permitted in NAEP
   c. No, this student cannot demonstrate knowledge in the subject being assessed even with accommodations permitted in NAEP

SCHOOL

Part I: School characteristics and Policies

1. What grades are taught in your school? Fill in all ovals that apply.
   a. Pre-kindergarten
   b. Kindergarten
   c. 1st grade -12th grade

2. Do all students in your school follow the same school calendar?
   a. Yes
   b. No
3. Please indicate the number of hours of instruction that fourth-grade students in your school completed as of Feb. 1, 2005. [CS051201]

4. For each group of students following a separate calendar, please indicate the number of hours of instruction that fourth-grade students in your school completed as of Feb. 1, 2005.

5. What is the current enrollment in your school? [C038101]

6. Of the students currently enrolled in your school, what percentage has been identified as limited-English proficient? [C046501]

7. What type of school is this? Fill in ovals for all that apply. [type of school: similar to SSCHTYP & SPUBPRV]
   a. Regular elementary school
   b. A regular school with a magnet program
   c. A magnet school or a school with a special program emphasis, e.g., science/math school, performing arts school, talented/gifted school, foreign language immersion school, etc.
   d. Special education: a school that primarily serves students with disabilities
   e. Alternative: a school that offers a curriculum designed to provide alternative or nontraditional education, not clearly categorized as regular or special education
   f. Private (independent)
   g. Private (religiously affiliated)
   h. Charter school
   i. Privately run public school

8. Does your school participate in the National School Lunch Program? [C038301]
   a. Yes (Go to Question 9)
   b. No (Skip to Question 12)

9. How does the school operate the program? [C051401]
   a. Student eligibility is determined individually, and eligible students receive free or reduced-price lunch (Skip to Question 11)
   b. All students in school receive free lunch under special provisions (Go to Question 10)

10. If your school distributes free lunch to all students under Provision 2 or 3, what was the base year during which individual student eligibility was collected? (SES)
    a. This school does not distribute free lunch to all students under Provision 2 or 3-eligibility is determined annually.
    b. 2004-1999 or earlier

11. During this school year, about what percentage of students in your school was eligible to receive a free or reduced-price lunch through the National School Lunch Program? [C051601]

12. Does your school receive Title I funding? (Title I is a federally funded program which provides educational services, such as remedial reading or remedial math, to children who live in areas with high concentrations of low-income families) [C051701]
   a. No
   b. Yes, our school receives funds, which are targeted to eligible students
   c. Yes, our school receives funds, which are used for school-wide purposes
13. Approximately what percentage of students in your school receives the following services? Fill in one oval on each line. Students who receive more than one service should be counted for each service they receive.

[None, 1-5%, 6-10%, 11-25%, 26-50%, 51-75%, 76-90%, over 90%]

a. Targeted Title I services [C051801]
b. Gifted and talented program
c. Instruction provided in student’s home language (non-English) [C046702]
d. English as a second language (not in a bilingual education program) [C044006]
e. Special education

Part III: Reading and Science

2. During the last two years, to what extent have professional development activities offered to teachers in your school focused on the following? (Curriculum)

[Not at all, Small extent, Moderate extent, Large extent]

a. Use of language arts across the curriculum [C049201]
b. Interpreting and analyzing literature [C049202]
c. Understanding the process of reading or writing [C049203]
d. Instructional strategies for teaching language arts [C049204]