EFFECTS OF TEACHER DIVERSITY AND STUDENT-TEACHER RACIAL/ETHNIC MATCHING IN ELEMENTARY SCHOOLS ON EDUCATIONAL OUTCOMES

by

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ABSTRACT

NEENA BANERJEE. Effects of teacher diversity and student-teacher racial/ethnic matching in elementary schools on educational outcomes. (Under the direction of DR. STEPHANIE MOLLER)

This dissertation investigates the implications of student-teacher racial/ethnic matching on two educational outcomes. The fourth chapter investigates whether assignment to same-race teachers affects students' math and reading achievement growth in early elementary grades and whether the overall racial/ethnic composition of the teaching workforce in school moderates the relationship between matching and achievement growth. The fifth chapter investigates the relationship between student-teacher racial matching and students' placement in ability groups.

The findings show that Black students experience marginal improvements in both math and reading achievement growth by third grade when they are placed with non-Black teachers. Hispanic students also experience marginal gains in reading achievement growth when placed with non-Hispanic teachers. White students' math and reading achievement growth, however, remain unaffected by their placement with White or non-White teachers. This study also finds evidence that the overall racial/ethnic composition of teachers in schools moderates the effect of assignment to same-race teachers on math and reading achievement growth for Hispanic students. Hispanic teachers are most effective educators for Hispanic students when these teachers also teach in schools where their representation ranges from anywhere between greater than zero and less than fifty percent. In Kanter's terminology, such a range represent schools where representation of minority teachers reflect anywhere from token to racially and ethnically balanced.

Hispanic teachers are least effective educators for Hispanic students when these teachers work in schools that are either racially uniform (i.e. either all White teacher or all minority teacher schools) and schools where minority teachers constitute the majority of the teaching workforce.

Findings in chapter five show that Hispanic students in kindergarten and first grade are more likely to be placed in higher ability groups when they are assigned to Hispanic teachers. The chapter also finds that placement in higher ability groups in first grade is a strong and positive predictor of placement in high ability groups in third grade for Hispanic students. These findings suggest that the benefits of racial and cultural matching depend on school contextual factors. There is need for more nuanced considerations when matching minority students with teachers from same race or ethnicity.

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CHAPTER 1: INTRODUCTION

Like many other industrialized nations across the world that have experienced voluntary and involuntary immigration during the past 200 years, the United States is facing pronounced cultural gaps between students and teachers in schools. These cultural gaps have grown largely because the school-aged population has become more racially, culturally and linguistically diverse while the teaching workforce remains predominantly White (Guarino, Santibanez, & Daley, 2006; Little & Bartlett, 2010; Murnane & Steele, 2007). This has led to renewed calls for policies to diversify the teaching workforce and recommendations in support of specific policy levers in the form of same-race teacher assignment for minority students (see for instance Dee, 2005). While advocates who argue in favor of diversification of the K-12 teacher workforce take an affirmative action perspective, supporters of same-race teacher assignment typically highlight how teachers of color can act as role models, have positive expectations and improve learning experiences and educational opportunities for students who share their racial and cultural identities (Davis, 2003; Dee, 2004; Delpit, 2006; Finn & Voelkl, 1993; Graham, 1987; Irvine, 1990; Johnson, Crosnoe, & Elder Jr, 2001; King, 1993; Quiocho & Rios, 2000; Villegas & Irvine, 2010). Further, the broader literature on racial mismatch highlights the short and long-term implications on the persistence of racial and socioeconomic gaps in achievement on standardized tests, college enrollment and retention rates (Dee, 2004;

Eubanks & Weaver, 1999; Hess & Leal, 1997; Ladson-Billings, 1995a, 1995b; Oates, 2003).

Although, many schools across the nation routinely assign minority students to same-race teacher classrooms, the consequences of this strategy are not thoroughly understood. The empirical evidence on the benefits of matching on students' educational outcomes is mixed. Some researchers demonstrate that academic achievement is higher among students who are matched with teachers (Dee, 2004; Hanushek, Kain, & Rivkin, 2004; Oates, 2003), others find that minority students do not necessarily benefit in terms of achievement scores from assignment to same-race teachers (McGrady & Reynolds, 2012; Morris, 2005; Ehrenberg, Goldhaber, & Brewer, 1995; Farkas et al. 1990).

Numerous qualitative research studies have questioned the simplistic assumption that underlies the notion of racial matching. Through interviews with minority teachers and ethnographic research on their daily professional lives, these studies argue that even when minority teachers are matched with students from their own racial or ethnic backgrounds, their interactions are often more complicated and nuanced. These teachers find it difficult to tap into their cultural resources and incorporate them into their teaching practices (Achinstein & Aguirre, 2008; Delpit, 2006; Foster, 1993; Kelly, 2007; Mabokela & Madsen, 2007; Maylor, 2009; Villegas & Lucas, 2002). Despite their limited sample size and near exclusive reliance on interview data, these qualitative studies offer important clues about school level factors that could potentially influence the ability of minority teachers to become effective educators for minority students (Achinstein & Aguirre, 2008; Hernandez-Sheets, 2001). The overall racial/ethnic composition of the

teaching workforce in schools is one such school contextual factor because it influences the professional experiences of minority teachers.

Studies that have examined the experiences of minority teachers have identified the racial/ethnic composition of their peers in the work setting as a dominant factor, which can influence their experiences and ultimately effectiveness (Mabokela & Madsen, 2007). Teachers of color often constitute a small isolated minority referred to as "tokens" (Kanter, 1977) in schools with overwhelmingly White teachers. Qualitative research has demonstrated feelings of isolation and performance pressure among minority teachers working in token positions. Ethnographic studies have also brought out the difficult process of assimilation many minority teachers experience as they constantly struggle to make their voices heard and distinguish their classroom management and pedagogical practices from that of the dominant group (Achinstein & Aguirre, 2008; Kanter, 1977; Mabokela & Madsen, 2007; Mabokela & Madsen, 2003a, 2003b). These negative experiences often make minority teachers less effective even when they are assigned to teach students sharing their racial or ethnic backgrounds. There has been no systematic investigation about how minority teachers' contact with diverse colleagues in schools moderates their effectiveness when teaching same-race students in the classroom context. This is an important line of inquiry because extant empirical studies have not yet found conclusive evidence as to whether racial matching between teachers and students improves students' academic achievement and if so, under what conditions.

In addition to the general scholarly neglect in estimating the magnitude of the impact of student-teacher matching on academic achievement and the extent to which this relationship is conditioned by school organizational context, there is limited insight into

the benefits of matching on outcomes that are beyond test scores. One such outcome is students' placement in higher ability groups in elementary grades and advanced classrooms in higher grades. There is a great deal of evidence documenting how teachers' race affects their perception of students from different race (Downey and Pribesh, 2004; McGrady and Reynolds, 2012). The social and institutional power that is bestowed on teachers allows them to use their racialized perceptions in evaluating student behavior and academic potential (Lewis and Watson-Gegao, 2004; Lewsi and Kim, 2008, Whitney, 2009). Teachers' perceptions about students are important determinant of students' placement in higher ability groups or advanced classrooms. However, no study has examined the effect of assignment to same-race teachers on students' placement in higher ability groups in elementary grades. Given the important role that early exposure to rigorous curriculum plays on students' future academic success and labor market earnings (Klopfenstein, 2005; Adelman, 1999; Rose and Betts, 2001), this is clearly a policy question that deserves urgent attention.

This study investigates the implications of student-teacher racial/ethnic matching on two educational outcomes. First, this study investigates whether assignment to same-race teachers affects students' math and reading achievement growth. Second, it examines whether the overall racial/ethnic composition of the teaching workforce in school moderates the effect of student-teacher racial/ethnic matching on students' math and reading achievement growth. Specifically, it tests whether teachers who are racially or ethnically matched with students are more effective in improving students' achievement score when they also teach in schools with a diverse teaching staff as opposed to schools where they are just *token* minorities or schools that are racially

uniform. Finally, this study investigates the relationship between student-teacher racial matching and students' placement in ability groups. In particular, the study examines whether students who are assigned to same-race teachers are more likely to be placed in higher reading ability groups.

The study contributes to the extant literature in several ways. First, drawing from Kanter's (1977) theory on tokenism in the workplace, this study brings in a contextual dimension in understanding the effects of student-teacher racial matching on students' learning outcomes. The literature on this topic has neglected investigating how school context might moderate the mismatch effects on students' academic achievement (McGrady & Reynolds, 2012; Morris, 2005). Second, moving beyond achievement scores, this study examines the effect of assignment to same-race teacher on students' placement in ability groups in the elementary grades. Third, the study focuses on a cohort of early elementary grade students who are followed from kindergarten through third grade. A focus on early elementary grades is important because studies have shown that students who are unable to develop reading and math skills in early grades face increased likelihood of later school failure (Tach and Farkas, 2006; Dee, 2004). A focus on early elementary grades is also important because most work that has been done in the area of matching have focused on adolescent years when the interactions between students and teachers are more meaningful and consequential (Downey and Pribesh, 2004). Fourth, the study specifically focuses on three racial and ethnic groups, namely, White, Black and Hispanic students. It brings in new insights about the experiences of Black and Hispanic students when they are assigned to same-race teachers. There is ample evidence suggesting that Black and Hispanic students begin kindergarten with

disadvantages that accumulate over time (Ferguson, 2003; Phillips, Crouse, and Ralph, 1998). There are also achievement and opportunity gaps among Black and Hispanic students and their White peers. Fifth, the study a methodologically sophisticated modeling technique: cross-classified growth curve modeling (Goldstein, 2010; Raudenbush & Bryk, 2002) to examine the above research questions. Finally, it answers several important policy questions ranging from the appropriateness of a singular focus on assigning minority students to same-race teachers for improving their learning outcomes to finding out school contextual factors that more likely alter the effects of matching between minority students and their same-race teachers.

This study utilizes a national sample survey known as the Early Childhood Longitudinal dataset (ECLS-K). The dataset contains longitudinal data on a nationally representative sample of students who are systematically followed from kindergarten through Eighth grade with repeated information being collected about students' achievement scores, family background, teacher quality, classroom composition and school characteristics. In order to examine the independent and joint effects of assignment to same-race teachers and the overall racial/ethnic composition of the teacher workforce on student's math and reading achievement growth between kindergarten and third grades, the study uses a cross-classified growth model. This model is particularly suitable as it permits analysis of achievement scores over more than two time periods when the number of time periods is limited, trajectories are nonlinear, and students change schools (Raudenbush & Bryk, 2002). For examining the relationship between assignment to same-race teacher and students' placement in higher reading ability groups,

this study utilizes a simple hierarchical linear regression model on cross-sectional grade specific data.

The findings show that Black students experience marginal improvements in both math and reading achievement growth by third grade when they are placed with non-Black teachers. Hispanic students also experience marginal gains in reading achievement growth when placed with non-Hispanic teachers. White students' math and reading achievement growth, however, remain unaffected by their placement with White or non-White teachers. This study also finds evidence that the overall racial/ethnic composition of teachers in schools moderates the effect of assignment to same-race teachers on math and reading achievement growth for Hispanic students. Hispanic teachers are most effective educators for Hispanic students when these teachers also teach in schools where their representation ranges from anywhere between greater than zero and less than fifty percent. In Kanter's terminology, such a range represent schools where representation of minority teachers reflect anywhere from token to racially and ethnically balanced. Hispanic teachers are least effective educators for Hispanic students when these teachers work in schools that are either racially uniform (i.e. either all White teacher or all minority teacher schools combined into one single category) and schools where minority teachers constitute the majority of the teaching workforce.

With regard to the effect of assignment to same-race teachers on the likelihood of students' placement in higher ability groups, this study's findings show that Hispanic students in kindergarten and first grade are more likely to be placed in higher ability groups when they are assigned to Hispanic teachers. The study also finds that placement in higher ability groups in first grade is a strong and positive predictor of placement in

high ability groups in third grade for Hispanic students. The findings suggest that the benefits of racial and cultural matching depend on school contextual factors and the need for more nuanced consideration when matching minority students with teachers from same race or ethnicity.

CHAPTER 2: LITERATURE REVIEW

Several theoretical perspectives in sociology and psychology have explained why having a teacher with similar racial or ethnic backgrounds might improve students' academic achievement and influence the likelihood of students' placement in higher ability groups in elementary grades. Theories that explain matching effects on student achievement are the attachment theory (Bowlby, 1990), the socio-cognitive motivational theories (Bandura, 1986; Maehr, 1984; Ames, 1992), the role model hypothesis (Graham, 1987; King, 1993); the stereotype threat hypothesis (Spencer and Steele, 1994; Steele, 1997), and the socio-cultural theories (Ladson-Billings, 1992; Goldstein, 1999; Davis, 2003). Theories that provide explanation for effects of matching on students' placement in ability groups locate the problem in teacher bias, perceptions and expectations of students and how these are conditioned by race (Downey and Pribesh, 2004; Alexander, Entwisle, and Hernan, 1999; Ferguson, 1998). The benchmarks of conditional and unconditional race neutrality are often used to make assessments of the extent of teacher bias (Ferguson, 2003). In addition to teacher bias, researchers have also tried to locate the problem in students' behavior towards teachers. The oppositional culture theory (Ogbu, 1991) has been widely cited in explaining matching effects on student placement in advanced classes.

2.1. Student-Teacher Racial and Ethnic Matching and Academic Achievement

The importance of teachers' race or ethnicity in improving students' learning outcomes has been highlighted by several theoretical traditions. Together, these theoretical traditions provide an attachment, motivation, cultural synchronization, and activist rationale to make the case for matching teachers and students by their racial or ethnic identities. The attachment, motivation and cultural synchronization perspectives are particularly well-suited to explain child-teacher interactions in the early elementary grades, which is the focus of this study. This is because in early elementary grades, the role of teachers is more of nurturing and motivating instead of an activist for preserving minority culture and history through teaching.

Attachment theory (Bowlby, 1990) focuses on teacher-student relationships in pre-school through elementary grades. It views the teacher-child relationship as an extension of the parent-child relationship (Davis, 2003). According to the attachment perspective, the quality of the child-teacher relationship as early as preschool can go a long way toward influencing children's social and cognitive development and shape their ability to forge future relationships with peers and teachers. Empirical research based on this perspective demonstrates that children who have early exposure to affective and secure relationships with their teachers are more likely to adjust quickly in school, be academically engaged in school, develop visual and language skills, demonstrate pro-social behavior, experience higher levels of achievement and are likely to have fewer behavioral problems (Davis, 2003; Howes, Hamilton, & Matheson, 1994; Howes, Hamilton, & Philipsen, 1998; Pianta & Steinberg, 1992; Pianta, 1994).

The development of early child-teacher relationships, however, is a two-way process. It depends on how teachers nurture and respond to children's developmental

needs and the ability of children to reciprocate based on their understanding of "relational schemas" (Davis, 2003, p. 211). A central tenet of the attachment perspective is that when younger children first enter the school setting, they bring with them certain understandings of social relationships and their social worlds. Once in school, these understandings shape their interpretations of teacher initiations and responses during interaction. Studies show that the quality of child-teacher relationships is also influenced by teachers' race/ethnicity, gender, and socioeconomic status (Birch & Ladd, 1997; O'Connor & McCartney, 2006; Steele, 1997). Teachers' race or ethnicity can be important in forging strong affective ties with children because students' feelings of attachment and sense of belongingness to school are aided by teachers who share their racial identity (Finn & Voelkl, 1993; Johnson et al., 2001). Teachers who share racial and ethnic background of children are more likely to understand children's social and cultural world, and are, therefore, more likely to be accurate in interpreting their behavior in classroom. These teachers may also be in a better position to respond to the development needs of children with whom they share racial or ethnic identities. It is well established that the quality of the relationship that children share with their teachers has long term implications in terms of children's future achievement, engagement and behavioral outcomes (Howes, Hamilton, and Matheson, 1994; Meehan, Hughes, and Cavell, 2003; Pianta, Steinberg, and Rollins, 1995; Finn & Rock, 1997; Johnson et al., 2001; Lee & Smith, 1995; Roscigno & Ainsworth-Darnell, 1999; Steinberg, Lamborn, Dornbusch, & Darling, 1992).

Apart from being nurturers, elementary school teachers can also serve as motivators to young children. The sociocognitive theories (Bandura, 1986; Zimmerman,

Bandura, and Martinez-Pons, 1992) attribute student achievement to their motivation levels. The level of motivation is determined by students' self-set goals and aspirations in life. The process of goal setting and aspiration building is in turn influenced by students' self-efficacy beliefs (Zimmerman et al., 1992; Zimbardo & Gerrig, 1996). Studies have found little evidence for racial differences in self-efficacy beliefs among children after controlling for socioeconomic status (Graham, 1994). Research indicates that self-efficacy beliefs begin to develop among children even before they enter formal schooling (Bandura, 1997; Meece, 1997). Such beliefs are, however, not limited to academic efficacy. In fact, self-efficacy beliefs in early years may become evident in non-academic domains such as children's level of curiosity, exploration, social attitudes and interest in extra-curricular activities (Bandura, Barbaranelli, Caprara, and Pastorelli, 1996).

There are several intrinsic and extrinsic factors that are likely to influence children's self efficacy beliefs and aspirations. Some of the intrinsic factors are race, ethnicity and gender (Ainsworth-Darnell and Downey, 1998; Goldsmith, 2004). Among the extrinsic factors, the role of family and schools are important. The different home environments and the experiences that parents offer to children right from childhood can influence the development of children's self-efficacy (Meece, 1997; Schunk and Pajares, 2001). While supportive and warm home environment can encourage children's level of curiosity and exploration, parents can actively provide self-efficacy information to children by engaging in rich set of activities that enhance children's cognitive development and expose them to varied opportunities (Bandura, 1997; Meece, 1997; Schunk and Pajares, 2001). Zimmerman et al. (1992) argued that it is possible that

children's personal goal setting is influenced jointly by their self-efficacy beliefs and the goals and aspirations of their parents. Parental goals and aspirations are in turn determined by their education, socioeconomic status and privileges (Goldsmith, 2004).

Organizations can also influence personal goal setting (Locke and Latham, 1990). As organizations, schools are entrusted with the primary responsibility of educating young children. In that capacity, schools influence students' perceived self efficacy beliefs, aspirations and eventually their academic success. Teachers are an important part of school organizations as they work in close proximity of students. Since elementary level students mostly remain with the same teachers throughout the school day, the role of teachers in developing self-efficacy among elementary graders become all the more significant (Schunk and Pajares, 2001). As educators, teachers are able to influence students' beliefs, aspirations, and academic success in both passive and active ways (Goldsmith, 2004; Dee, 2004).

Teachers' can motivate students by being *role models* to them. The role model effect can be triggered by teachers' racial identity and not necessarily by any act or particular behavior toward students (Graham, 1987; King, 1993; Ladson-Billings, 1992). For example, the mere presence of Black teachers in schools can motivate underprivileged Black students to aspire and set higher goals. In the context of elementary grades, young minority children can become more engaged academically just by being comfortable in the presence of a same-race teacher (Dee, 2004).

Teachers can also actively engage in race-specific patterns of behavior that can shape students' social and intellectual experiences within classrooms. Such patterns

are evident in the allocation of class time attending to individual children's progress and by having positive expectations and perceptions about minority students (Pintrich and Schunk, 1996). It can also be rooted in the design of classroom teaching-learning materials by teachers (Dee, 2004; Ferguson, 1998). The sociocultural theories, the culturally relevant pedagogy, and the culturally responsive pedagogy are important theoretical constructs that help explain how teacher ethnicity might affect the teaching-learning process. These theories also suggest how teachers of color can improve achievement among students of color (Sleeter and Milner, 2011).

The sociocultural theories recognize that teacher-student relationship is more than just an individual level relationship that is dependent on reciprocity between students and teachers. Instead, this relationship is rooted in the larger society and larger societal norms, values and academic culture are influential (Goldstein, 1999; Davis, 2003). According to the sociocultural theories, quality relationships are forged when students and teachers are able to jointly construct meaning of cognitive and non-cognitive activities within classrooms through a process of negotiation. In this process of negotiation, teachers who can easily connect with student's own cognitive and non-cognitive understanding are more likely to emerge as effective guides in their students' journey to academic success.

The quality of the student-teacher relationship also depends on the racial and cultural backgrounds of students (Davis, 2003). According to Ogbu (1993, 1994), minority students are more likely to feel alienated and disengaged with schools because they may hold different cultural frames of reference. When minority students perceive a difference between their cultural identities and the dominant cultural identity in school,

they are more likely to start dis-identifying from schools. Such difference in cultural frames of reference is likely to influence teacher-student relationships. The role of teachers is critical because they are capable of helping students integrate the two cultural identities and operate within two different cultural frames of reference (Ogbu, 1993, 1994; Delgado-Gaitan, 1986).

There are several ways that teachers can effectively re-engage minority students whose cultural identities differ from the dominant cultural identity represented in school. If teachers and students have different cultural identities, they are more likely to encounter difficulties in interpreting each other's non-verbal cues and are more likely to have misunderstandings about each other's world views and belief systems (Davis, 2003; Feldman and Saletsky, 1986; Brewer and Gardner, 1996). On the other hand, if teachers share their students' race/ethnicity, they may find it easier to understand cultural differences and assumptions. It is also likely that students will be more receptive towards teachers who share their racial identities and backgrounds (Davis, 2003). Teachers can also engage their students by more actively pursuing cultural integration through their teaching strategies and by introducing culturally relevant pedagogy (Irvine, 1990; Ladson-Billings, 1995a 1995b; Gay, 2000).

Together, the above theoretical traditions highlight the critical role of teacher race and ethnicity in improving students,' especially minority students' experiences inside school and ultimately their learning outcomes.

2.2. Empirical Literature on Student-Teacher Racial and Ethnic Mismatch and Student Achievement

The empirical evidence on the benefits of matching on students' learning outcomes is, however, mixed. Some research studies demonstrate higher academic achievement among students who are matched with teachers (Dee, 2004; Hanushek, Kain, & Rivkin, 2004; Hanushek, 1992; Oates, 2003). Using experimental data from the Tennessee class-size project, Dee (2004) found evidence indicating an achievement gain among both Black and White students as a result of their placement with a same-race teacher. The benefits of matching are particularly noticeable among students in the most segregated schools and the effect size increases with time. Dee (2004) discussed several potential passive and active factors to explain the possible mechanisms for his findings. While some of these factors are rooted in theory, others are more empirically grounded. Key among these factors is the ability of Black teachers' to serve as role models for academic success of Black student. Furthermore, given their past racial history, Black students are more likely to feel comfortable with same-race teachers as they are less likely to feel stereotyped and Black teachers are more likely to hold higher expectations for the success of Black students. Among the active factors, Dee (2004) highlights actions that Black teachers are more likely than White teachers to pursue non-traditional but culture-specific teaching techniques in order to improve learning outcomes for Black students. Some of the actions are use of examples relatable to Black students and inclusion of cultural context in the use of instructional methods and in designing classroom materials.

Hanushek (1992) also found significant positive effects of Black teachers on Black students' achievement in reading and vocabulary. Examining the effect of teacher race on student achievement using Texas data, Hanushek, Kain, & Rivkin (2004) found

that minority teachers are generally more effective educators for minority students and Black teachers are remarkably more effective instructors when assigned to teach Black students. Black teachers' frequent use of cultural artifacts as instructional tools help them motivate Black students in the classroom and enhance their academic achievement (Ladson-Billings, 1995a 1995b). Studies also find that Black teachers are more successful in teaching Black students because of their ability to convey political messages with ease to their students (Foster, 1990, 1997). Through a series of interviews with Black teachers, Foster (1990, 1997) was able to capture their strong sense of commitment to alter the status-quo in power relations by helping the next generation of Black students understand and appreciate the causes and consequences of racial inequalities (Foster, 1990, 1997; Goldsmith, 2004). Using a nationally representative sample of students from the National Educational Longitudinal Survey dataset with an addition of the 1992 follow-up data, Oates (2003) found that teacher race is an important factor for students' achievement in standardized tests. This led the author to conclude that "the (mis)match between teachers' and students' race seems primarily consequential to the standardized test performance of African-American students-shaping both the way teachers feel about students, and (to a lesser degree) the extent to which these perceptions ultimately matter." (Oates, 2003; p. 520).

In contrast, Ehrenberg, Goldhaber, & Brewer (1995) did not find any significant effect of assignment with a same-race teacher on student achievement gains in reading, science, history, social studies and mathematics in 8^{th} and 10^{th} grades through analysis of an earlier wave of National Education Longitudinal Survey (NELS:88). Using the early Childhood Longitudinal data and focusing on students in kindergarten and first grades,

Fryer and Levitt (2004) tested whether Black students with White teachers lose more ground than Black students with Black teachers in terms of academic achievement. The findings from their analyses reveal that Black children who have at least one Black teacher start out somewhat worse relative to their White peers on math, and slightly better on reading, than Black students who have no Black teachers. By the end of first grade, however, the Black-White test score gap is greater across the board for students who have at least one Black teacher. In other words, their finding is exactly the opposite of what one would predict from a racial bias story (Fryer and Levitt, 2004). Reanalyzing data from Alexander et al. (1987) Baltimore study, Ferguson (1998) found higher learning outcomes among Black students when matched with high-SES White teachers. Zhang (2007) also found the absence of any significant relationship between same-race teacher assignment and academic outcomes of Black kindergarteners.

The extant literature provides inconclusive evidence regarding the effect of same-race teacher assignment on students' academic achievement. Therefore, the first hypothesis the present study examines is:

Hypothesis 1: Minority students who are assigned to same-race teachers are more likely to experience higher math and reading achievement growth compared to minority students who are assigned to different-race teachers

2.3. The Racial/Ethnic Composition of Teachers in Schools: The Experiences of "token" Minority Teachers

Clearly, the limited evidence that currently exists on the benefits of same-race teacher assignment for student achievement is often contradictory and confusing. The

contradictory evidence has led scholars to believe that other contextual factors might moderate this relationship. Indeed, numerous qualitative studies have alluded to the challenges that teachers of color navigate even when they teach students from their own community. These studies find that social class, language, educational opportunities, regionalism, cultural capital and schooling experiences often moderate the ability of teachers of color to tap into their cultural resources when teaching students of same race (Achinstein & Aguirre, 2008; Au & Blake, 2003; Gordon, 2000; Quiocho & Rios, 2000). Others note that school organizational context also moderates the mismatch effect on student achievement (McGrady & Reynolds, 2012; Morris, 2005).

An important organizational contextual factor is the overall racial/ethnic composition of the teaching faculty in schools. The presence of a racially/ethnically diverse teaching faculty can moderate the mismatch effects on student outcomes by shaping the daily experiences of all teachers, especially teachers of color. It can also serve as a cushion to bolster the effectiveness of teachers of color who often work as tokens in schools with predominantly White teachers. Schools with a racially and ethnically diverse teaching faculty are also better equipped to provide the necessary support structure by developing informal networks and by generating rich cultural resources that teachers of color can easily tap into in order to effectively meet the needs of students of color (Achinstein & Aguirre, 2008; Hernandez-sheets, 2001; Ingersoll & May, 2011a; 2011b; Kelly, 2007; Mabokela & Madsen, 2007).

Although the recruitment of teachers of color has increased at a faster pace in recent decades, the majority of these teachers still continue to work in “token” situations in schools that have predominantly White teachers (Frankenberg, 2006; Madsen &

Mabokela, 2000). Recent statistics show that teachers of color are not represented at all in 40 percent of schools across the nation (Aud et al., 2011; Boser, 2011; Coopersmith & Gruber, 2009; Milner, 2010). A Harvard Civil Rights Report published in 2006 found that states like California, Arizona and Texas, which have a diverse student population lack proportional representation from teachers of color. Apart from their relative paucity, teachers of color are also highly segregated. They constitute a very small and isolated minority in majority White schools and also tend to be minority in predominantly non-White schools. They comprise the majority only in heavily segregated schools that cater to children from low socioeconomic status and with lower levels of achievement (Frankenberg, 2006). Indeed, recent studies have indicated heightened levels of dissatisfaction and turnover among teachers of color than White teachers, especially those who are newly recruited into the profession (Achinstein, Ogawa, Sexton, & Freitas, 2010; Frankenberg, 2006; Ingersoll & May, 2011b).

A sizable body of research has associated the heightened dissatisfaction among minority teachers with their professional experiences in schools since the majority of their peers continue to be White teachers (Achinstein & Aguirre, 2008; Flores, 2011; Kelly,2007; Mabokela & Madsen, 2007; Mabokela & Madsen, 2003b; Madsen & Mabok ela, 2000; Maylor, 2009). Most of these studies have drawn their theoretical foundation from Kanter's (1977) seminal work on tokenism in the workplace and Cose's (1995) research on minority workers' perceived racial equality in majority organizations. Together, these studies bring out the underlying reasons that could push teachers of color to opt out of the profession or make them less effective in their jobs.

Kanter (1977) studied gender tokens in the workplace and focused on White females' experiences in White male dominated organizations. A central argument derived from Kanter's original work and applied in the context of racial minorities is that workplace dynamics are intricately shaped by the proportional representation of different racial/cultural groups in the workforce (Mabokela and Madsen, 2003). Four distinct types of groups emerge when Kanter's theorization is applied with respect to racial minorities in majority organizations. Organizations representing *Uniform* groups are the ones that have either all White teachers or all minority teachers. Such organizations can be termed as homogenous with respect to race or ethnicity. Next, organizations can have *skewed* groups if proportional representation of minority teachers' is less or equal to 15 percent. Minority teachers belonging to such organizations are often called "tokens." Tokens can also be solos if the absolute size of the minority group is very small. Organizations can also have *tilted* groups. It refers to organizations where the proportional representation of minority teachers hinges between 15 and 35 percent. Minority teachers in such organizations are no longer considered as "tokens" but they become a "minority" because of their ability to forge potential alliances, coalitions among themselves in way that can affect the culture of organizations. Finally, organizations with a *balanced* group are the one where the proportional representation of minority teachers lies somewhere between 35 and 50 percent. The culture and interactions in such organizations reflect this balance in the representation from minority and majority groups.

Kanter analyzed organizations where women's representation constituted tokenism. She focused on the internal dynamics of such organizations in terms of the treatment meted out women by men and the resultant behavior of the minority group

members. Kanter identified three obstacles that minority group members are more likely to experience because of the unequal dynamics between them and the majority group. Minority group members are more likely to experience performance pressure due to high visibility of their work and from being subjected to different standards within the organization. Performance pressure could also arise because of their efforts to maintain the normative cues of the organization. A second obstacle, known as "boundary heightening" is defined as polarization or exaggeration of differences by the majority group in the presence of a relatively small number of minorities within the organization. When majority group members feel less threatened by the relatively small number of minority group members and their ability to contest the racial stereotypes that are applied against them, they often resort to exaggeration of differences between them and the minority groups. A third and final obstacle is called "role entrapment." This refers to the feeling among minority group members that they are often entrapped in certain stereotypical roles as experts of their culture, which may not always benefit them professionally (Mabokela & Madsen, 2003a, 2003b; Madsen & Mabokela, 2000).

Teachers of color often experience many of the same obstacles that Kanter mentioned four decades back. Since they are often recruited to better serve the educational needs of students of color, teachers of color find themselves thinly spread across numerous schools and their classroom settings are typically characterized by low-income students of color who are deemed under-performing (Achinstein et al., 2010; Achinstein, Ogawa, & Speigelman, 2004; Dixson & Dingus, 2008). Being part of a non-dominant minority in the workplace, these teachers remain isolated in the workplace and their voices are not always heard in management and policy decisions of schools. Token

minority teachers also experience performance pressure from being treated as representatives of their race and feel entrapped in their role as experts of their culture. They were often the subject of conversation, questioning, gossip and scrutiny (Kanter,1977). The pressure to perform also stems from their being treated as symbols of their culture rather than as individuals. Many of these teachers are recruited with the inherent assumption that they are experts in teaching culturally relevant pedagogy and therefore they can easily apply them in classroom settings (Achinstein & Aguirre, 2008; Gandara & Maxwell-Jolley, 2000; Moll, Amanti, Neff, & Gonzalez, 1992; Quiocho & Rios, 2000; Villegas & Irvine, 2010; Villegas & Lucas, 2002). However, as one scholar has pointed out, even though these teachers may possess valuable cultural resources, their ability to translate them into classroom teaching needs to be developed rather than assumed (Hernandez-Sheets, 2001).

The overall racial/ethnic composition of the teaching workforce in schools is critical for developing cultural resources among all teachers, and especially, among teachers of color (Achinstein et al., 2010). Teachers of color may particularly benefit from working in schools that have balanced representation of teachers from various racial/ethnic groups because they are less likely to feel the pressure of losing their cultural identity and conform to the values and norms of the majority culture within schools (Cose, 1995; Cox, 1994; Madsen & Mabokela, 2000; Morrison, 1996). By working alongside a diverse group of teachers, teachers of color can also build many informal networks in schools instead of remaining isolated. These networks can eventually help them develop cultural resources and navigate the sociocultural challenges while working with students of color (Achinstein & Aguirre, 2008; Mabokela & Madsen,

2003a, 2003b; Madsen & Mabokela, 2000). As Ladson-Billings (1994) rightly pointed out, schools that are infused with a culturally relevant curriculum are more likely to have a diverse teacher workforce where minority teachers can feel comfortable experimenting with innovative and culture-specific teaching strategies that will enable them to become effective educators for minority students.

Therefore, based on the theoretical and empirical literature, this study proposes that the overall racial/ethnic composition of the teaching workforce in schools is likely to moderate the relationship between minority students' assignment with same-race teachers and their academic achievement. The primary mechanism via which overall teacher diversity in schools is likely to moderate this relationship is by offering minority teachers a more caring and culturally infused school climate where these teachers feel more appreciated for their work and less alienated. Minority teachers' voices are more likely to be heard in decision-making when these teachers work with diverse peers rather than in majority White teacher schools. When working in schools with diverse teacher workforce, minority teachers are more likely to freely experiment with culturally relevant teaching strategies in their classrooms that they think might be effective for teaching minority students. This leads to the second hypothesis that the present study examines:

Hypothesis 2: Minority teachers when matched with minority students are more likely to improve their students' math and reading achievement growth if these teachers also work in schools that have a racially and ethnically balanced teaching workforce as opposed to schools where they are tokens.

2.4. Literature on Racial Bias in Teachers' Perceptions, Expectations and Evaluations of Students

The lack of conclusive evidence concerning the effect of same-race teacher assignment on students' academic achievement has led scholars to examine if having same-race teachers influences outcomes other than standardized achievement test scores. Since children spend a significant amount of time each day interacting socially with their teachers, scholars have sought evidence for the proposition that teacher behavior towards students, their perception and evaluations of students' academic potential can be racially biased and may have profound implications on students' schooling experiences (Ferguson, 2003; McGrady and Reynolds, 2012; Downey and Pribesh, 2004). Scholars interested in this hypothesis have mostly examined outcomes such as accuracy of teachers' evaluation of students' future performance, extent of student disciplining by teachers, students' placement in advanced track classes, and teachers' evaluation of students' academic potential.

A key contention in the literature on teacher bias is defining what constitutes "bias." Ferguson (2003) discusses three different conceptions of bias that have appeared in the debate over White teacher bias towards student from minority groups. Ferguson (2003) defines bias as "deviation from some benchmark that defines neutrality" (p. 462). One type of racial bias emerges when teachers follow the benchmark of "unconditional race neutrality" in setting expectations from students and in their evaluation of students in the classroom. A key requirement for unconditional race neutrality is that teachers' perceptions, expectations, and treatment of students be uncorrelated with race. This benchmark generates racial bias because teachers expect the same on average from all students without taking into account their past performances or unobserved potential. Several experimental studies that have used the benchmark of unconditional race

neutrality in analyzing teachers' expectations of students, have found them to have racially biased expectations and perceptions of students (Baron et al. 1985; DeMeis and Turner, 1978). However, the generalizability of the experimental studies in real classroom settings remains questionable (Ferguson, 2003).

Contradicting the above findings, several studies have found evidence suggesting that teachers' perception of students and their expectations for students are generally accurate (Egan and Archer, 1985; Haller, 1985; Irvine, 1990; Gaines, 1990; Brophy and Good, 1974; Willis, 1972). These studies have measured accuracy in teachers' perception by examining the correlations between teachers' predictions and students' achievement scores in actual tests. For example, Haller (1985) found a very high correlation (.71) between teachers' subjective assessments of reading proficiency among Black and White fourth, fifth and sixth graders and their actual scores in a Comprehensive Test of Basic Skills. Irvine (1990) also found high correlation between teacher ratings of academic ability of 213 fifth, sixth and seventh graders and the scores of these students in the California Achievement Test. Gaines (1990) also found that teachers in Iowa schools accurately predicted the performances of both Black and White students in the Iowa Test of Basic Skills. The similarity in correlations indicates that teachers can accurately assess both racial groups in an identical manner (Ferguson, 2003).

A second benchmark that has been utilized to measure teacher bias is known as "racial neutrality conditioned on observables" (Ferguson, 2003, p. 466). According to this benchmark, teachers' perception or expectations from students are unbiased if it is based on legitimate observable factors such as students' past performance, test score, attitudes about schooling, and self-efficacy beliefs. There is ample empirical evidence

that suggests the presence of teacher bias on the above benchmark, although contradictory findings are also prevalent. Ehrenberg, Goldhaber, & Brewer (1995) found that students who are matched with teachers of their same race, ethnicity, and gender receive modestly higher-than-average evaluations compared to students who are not after controlling for students' past performance. In testing racial stereotype bias of teachers on a sample of sixth graders, Jussim, Eccles, and Ladon (1996) found no evidence that such bias exists in teachers' perception of students' current performance, talent or effort once they controlled for previous test scores, self-concept of math ability, self-reported level of effort, and self-reported time devoted to homework. However, these authors also found that teachers' perceptions affect the performance of racial groups differently. Teachers' perceptions are more likely to have a greater impact on Black students from low income families compared to White students. Alexander, Entwisle, and Thompson (1987) found that students' race often interacts with teachers' social class background, regardless of their race. This finding suggests that net of students' academic competence, teachers from middle-class backgrounds, regardless of race are more likely to negatively evaluate Black students, particularly from lower socioeconomic status. The authors attribute this pattern to teachers' lack of comfort and unfamiliarity with the usual practices of students from lower socioeconomic backgrounds. Teachers from working class backgrounds, regardless of their race, however, are more likely to pursue fair evaluations of students (Goldsmith, 2004). In a study of seventh and eighth grade students from a Dallas school district, Farkas et al. (1990) found that White teachers' evaluations of Black students are often more negative than Black teachers' evaluations of Black students. Compared to White teachers, Black teachers rated Black students higher

in terms of absenteeism and better work habits. However, Black students are also rated as more disruptive in classroom by their Black teachers (Farkas et al. 1990). The importance of teacher race in classroom evaluations of students also found support from a recent study by Downey and Pribesh (2004). The findings from their study show that when Black and White students from similar backgrounds are placed with same-race teachers, Black students receive more favorable evaluations from Black teachers compared to White students who are assigned to White teachers.

A third type of benchmark that Ferguson (2003, p. 467) mentions is known as "racial neutrality conditional on potential." This benchmark extends the concept of "racial neutrality conditional on observables" by making a further distinction between past performance and future potential, both demonstrated and latent. Per this benchmark, teachers' perceptions and expectations from students are considered racially biased if teachers underestimate either the demonstrated or the latent potential of one racial group compared to another. While teachers' perception about students' latent potential may be difficult to estimate reliably, nonetheless, underestimation of students' potential by teachers can have serious long term ramifications for students.

In making decisions about student placements in ability groups in elementary grades and advanced tracks in higher grades, teachers often make assessment of students' readiness, past performance as well their demonstrated and latent potential. The possibility of racial bias in teacher assessments, therefore, exists based on the criteria of racial neutrality conditional on observables and potential. Ability grouping in early elementary years and tracking in middle and high schools are commonly used organizational tools for grouping students for instructional purposes, with the former

beginning as early as kindergarten (Gamoran et al. 1995; Farkas, 2003; Buttaro et al. 2010). Ability grouping refers to within-class grouping of young children based on their reading skills. The reading groups usually differ in terms of level and pace of instruction. Children who can read difficult texts are placed in a more advanced group where they progress through materials more quickly, whereas struggling readers are placed in a different group where materials are less difficult and covered at a slower pace (Condron, 2008; Gamoran, 1992; Baker & Stevenson, 1986; Gamoran, 1990). Previous studies have found that social class, race, prior achievement and gender are important factors that predict group placement (Gamoran & Mare, 1989; Hallinan, 1991; Jones, Vanfossen, & Ensminger, 1995; Oakes, 1985; Rosenbaum, 1980; Useem, 1992). Scholars have also not ruled out the possibility of racial biases on the part of teachers in ability group and track placement decisions (Tyack, 1974; Mickelson, 2001). With regard to track placements in higher grades, empirical evidence indicates that counseling and information sessions mostly help White students from higher social status. Working class parents from minority groups often do not get the necessary guidance and counseling in such matters from school and their requests are often ignored (Spade, Columba, & Vanfossen, 1997). As a result, minority students find themselves disproportionately represented in lower tracks, which negatively affects their achievement in mathematics and science (Ferguson, 1998; Lucas, 1999; Mickelson, 1998; Oakes, 1990, 1993; Wheelock, 1992). Studies have also highlighted how tracking reproduces racial and class inequalities in society by creating unequal opportunities for students in lower track classrooms (Oakes, 1990). Klopfenstein (2005) used Texas Schools Microdata Panel and found that higher percentage of Black mathematics teachers in a school increases the likelihood that a

Black geometry student will subsequently enroll in a rigorous math course. While most studies have focused on track placement in higher grades given the consequential nature of such placements, very few have investigated whether teacher biases influence decisions about ability group placement in elementary grades, and whether assignment to same-race or ethnic teachers' classes will enhance minority students' chances of placement in higher ability groups. This is important because early placement in higher ability groups is likely to have sustained effects on students' later learning and success. Therefore, the third and final hypothesis that the present study examines is:

> *Hypothesis 3: Minority students who are assigned to same-race teachers are more likely to be placed in higher reading ability groups compared to minority students who are assigned to different-race teachers*

CHAPTER 3: DATA AND METHODS

3.1. Study Sample:

The study analyzes data from the Department of Education's Early Childhood Longitudinal Study (ECLS-K). This study began in 1998 with a nationally representative sample of 19,680 kindergarteners. On an average, 23 students were selected from each participating school in kindergarten. The survey followed the cohort again when they entered first (1999-2000), third (2002) fifth (2004) and finally eighth grades (2007). In each wave students were tested and parents, teachers, and school administrators were surveyed, making this an ideal data set to examine students' achievement trajectories in light of family, classroom and school characteristics Students are included in the study sample if they participated in the first three waves of data collection. The study excludes fifth and eighth grades from the sample because school administrators were no longer asked to provide information regarding the proportion of teachers belonging to different racial and ethnic categories in their schools.

Hypotheses 1 and 2 are tested on a longitudinal dataset consisting of students who participated in the first three waves. The longitudinal nature of the data allows for examining achievement growth trajectories for each student. A total of 10,950 students participated in the first three waves. While non-response bias is small in ECLS-K, it is minimized with appropriate panel weights (Tourangeau et al., 2009). The study's sample is further limited to White, Black, and Hispanic students because of smaller sample sizes

for Asian, Native American and Hawaiian Natives in the data. The exclusion of Asians, Native Americans and Hawaiian Natives narrows the sample to 9,590 students (64% White, 16% Black, and 20% Hispanic). A final adjustment was needed because in case of several schools, the proportion of teachers belonging to different racial categories was either not adding up to 100 or exceeding 100. Only those cases were retained in the sample where the proportions added up to between .90 and 1.10. This further reduces the sample size to 7,450. Once the final sample was selected, a proportional scaling technique was applied to scale up (down) the proportions so that they all added up to 100. The final weighted non-missing sample with all predictors consisted of 6,350 students who were systematically followed from kindergarten through third grade between 1998 and 2002.

Hypothesis 3 is tested using cross-sectional data when students were in kindergarten year (1998-99), First (1999-2000) year and third (2002) grade year. The testing of this hypothesis is made possible because kindergarten, first and third grade teachers were asked whether they used ability grouping for reading in their classrooms, the number of such groups they had and what the group placement of each child in the study's sample. The sample is restricted to only those students for whom data is available for all the variables of interest. The kindergarten sample consisted of 11,260 students in 2,180 classrooms. The first grade sample consisted of 12,410 students in 3,730 classrooms and finally, the third grade sample consisted of 11,860 students in 5,570 classrooms.

3.2. Missing Data:

Additional missing data are imputed through multiple imputations approach (Allison 2002; Schafer 1997).[1] Unlike simple mean imputation, multiple imputations replaces each missing value with a set of plausible values that are determined after examining the statistically appropriate distribution of all possible values in the sample (Rubin, 1987). This approach accounts for any bias that may exist between observed and unobserved values. The entire process helped in reducing the uncertainty that is generally associated with any imputation. To ensure efficiency in imputations, following Moller, Mickelson, Stearns, Banerjee, & Bottia, (2013) several steps are taken. First, I consider five imputations to maximize efficiency given the amount of missing data. Additionally, data are imputed within wave to ensure that the efficiency of imputation is not compromised by attrition. Within each wave, teacher, child and school data are imputed separately. In addition, only variables with less than 20% missing data within waves are imputed. The imputation is greater than 93% efficient for all imputed variables. A comparison of the final imputed sample with the initial sample of Black, White, and Hispanic students show that the students are comparable in race (16% Black and 20% Hispanic, and 64% White in the imputed sample whereas 15% Black, 20% Hispanic, and 65% Whites in the original sample), socio-economic status (30% of the final sample are lower SES compared to 33% in the original sample and 35% are higher SES in the final sample compared to 34% in the original sample), and math scores (the average kindergarten and third grade scores were 36.6 and 99.7 in the initial sample, and they are 37.6 and 100.8, respectively, in the final sample). Therefore, the final sample is

[1] Scaled variables are imputed with the Markov Chain Monte Carlo method because we have an arbitrary missing data pattern Schafer, Joseph L. 1997. *Analysis of incomplete multivariate data*. London etc.: Chapman & Hall.. Categorical variables are imputed with a logistic regression method.

not substantially different from the initial sample of Black, Hispanic, and White students.

3.3. Variables:

The two primary independent variables are a measure of racial/ethnic matching between teachers and students in classrooms and racial/ethnic diversity of teachers across schools. Together, these two variables capture the individual and contextual dimension of racial/ethnic composition of teachers in schools.

Teacher-Student Racial/Ethnic Mismatch: The second independent variable is a dummy variable indicating if a student is taught by a teacher of his/her own race or ethnicity. This variable is derived using information on student and teachers' race/ethnicity from the ECLSK dataset.

Racial/Ethnic Composition of Teachers in Schools: The study measures the racial and ethnic composition of teachers in schools in two ways.

Simpson's Diversity Index: Following Simpson (1949), the study creates an index of diversity: $D_c = 1-\sum_{i=1}^{g} pi^2$, where D_c represents racial/ethnic diversity. It depends on the proportion (p) of teachers in a school from each race/ethnicity (i). The proportions are squared and summed across the total number of racial/ethnic groups in the school, denoted by g. The resultant index is then subtracted from 1 to give it an intuitive meaning. This index takes values from 0 to approximately 1 with higher values representing greater diversity (Benner & Crosnoe, 2011). This diversity index is based on the number of racial groups and their distribution within the school. Consequently, schools where more racial groups are represented in its teacher body get a higher diversity. Additionally, if two schools have equal number of racial/ethnic groups

represented among its teachers, then the schools with a balanced distribution get a higher diversity score.

Kanter's Diversity Measure: The study uses a second measure of teacher diversity based on Kanter's conceptualization of minority representation in majority organizations. This categorical measure takes four values. The first category represents those schools where minority teachers' representation is greater than zero but less than or equal to 15 percent. Minority teachers' representation in such schools is termed as "tokens." The second category represents those schools where minority teachers' representation is anywhere between greater than 15 and less or equal to 50 percent. Minority teachers' representation in such schools is termed as "tilted-balanced." A third category of schools are those where minority teachers' representation is greater than 50 percent but less than 100 percent. These schools are termed as "minority-majority" schools. A fourth and final category consists if schools that either consists of all White teachers (percentage of minority teachers is zero) or schools with all minority teachers (percentage of minority teachers is 100). The present study combines schools with all White teachers and all minority teachers into one single category and term it as "racially uniform" schools. This category of schools is used as the excluded category in all the analytic models. In order to make the excluded category relevant for each group, this study combines schools with all White teacher schools with schools that have 100 percent minority teachers.

The dependent variables for testing hypotheses 1 and 2 are achievement scores in mathematics and reading in kindergarten, first and third grades. The reading score is a measure of students' print familiarity, ability to recognize letters and words, beginning and ending sounds, rhyming sounds, vocabulary, listening comprehension, and ability to

use words in context. The mathematics scores are a measure of students' sense of numbers, their properties, operations, measurement, geometry, statistics, probability and understanding of patterns (Tach and Farkas, 2006). This study utilizes Item Response Theory (IRT) scale scores because these scores permit evaluation of achievement trajectories over time even though the tests changed to reflect age-appropriate measures. The IRT math and reading scores assess the probability of a correct response by estimating the number of correct answers expected if the students had answered all questions for the math and reading test in all waves (Tourangeau, Christine Nord, Alberto Sorongon, & Elvira Germino, 2009). By using these scores, it is possible to examine growth in achievement over time.

The dependent variable in case of hypothesis 3 is reading ability group placement for each student in kindergarten, first and third grades. This study follows Tach and Farkas's (2006) conceptualization to construct a standardized measure of ability group placement using two questions from the ECLS-K teacher survey questionnaire. In the ECLS-K, teacher of each sampled child is asked to provide information on two questions: (1) how many achievement groups in reading do you currently have in this child's class? (2) In which reading group is this child currently placed? Teachers' response to the first question ranges from zero to five groups. With regard to the specific group placement of the sampled child, teacher responses are captured along several categories with the value 1 indicating the highest group placement in the classroom. Teacher responses are, however, not directly comparable across classrooms. This is because teachers may use varying number of ability groups. Therefore, in order to accurately assess each child's relative ability group placement one needs to account for the number of ability groups in

each classroom. Following Tach and Farkas (2006), the study converts each student's placement into a z-score. The resultant z-score measure demonstrates each student's relative placement in the classroom. The standardized measure also allows comparison across classrooms. Students who are in classrooms without ability groups will have their ability group placement z-score set to zero (p. 1075).

For hypotheses 1 and 2, all models control for variables, which are of two types: time-varying and time-invariant controls. These control variables belong to the individual, teacher/classroom, and at the school level. The time variant controls include, student diversity in classroom, parental expectation, school size (logged), school type (1=private), teacher's highest education (coded 1 for master's degree, education specialist, or doctorate), teacher experience in years, teacher certification (1=regular and advanced certification), and rural/suburban (urban is excluded). Other time varying controls that are used in the analyses are if a child's school is a "choice" school, whether the school principal is Black, if a school receives Title1 funds, and the percentage of students in a school who are tested at or above grade level nationally in reading and math. Each of the time-varying control variables are centered around their means.

One particularly important time varying control is the racial composition of the classroom. Racial composition of students is important at it captures potential peer effects on achievement growth. Additionally, racial composition of students is likely to be associated with the racial composition of teachers within a school. The study uses two different measures of racial composition of students using the Simpson's (1949) index of diversity. These are created at the school level and at the classroom. The variables

student diversity in school and student diversity in classroom are correlated at 0.77. Moreover, student diversity in school is correlated with teacher diversity in school at 0.43 and student diversity in classroom is correlated with teacher diversity in school at 0.30. To avoid potential problems with multi-collinearity, the study includes only student diversity in classroom as a control variable in all the models.

The time invariant controls are gender, race, family's socioeconomic status when the student is in kindergarten, English as a second language in kindergarten, and the region where the child initially started schooling. Race/ethnicity is coded as White, Black, and Hispanic/a. SES is coded as low (in the bottom third), middle (in the middle third), and high (in the top third). SES is a composite of five variables: father's education and occupation, mother's education and occupation, and household income. Data on socio-economic status is asked of parents in each wave, permitting change in socio-economic status over time. Initial analysis suggests that less than 10% of the sample has a substantial, lasting change in socio-economic status over time. Therefore, the present analysis utilizes SES in kindergarten, to assess how SES at school entry impacts achievement growth. Each of these time-invariant variables is interacted with time in the analysis to account for achievement trajectories of students of different genders, English language status, socioeconomic status, and regional location. Further information on these control variables that are used for testing hypotheses 1 and 2 can be found in Table 1 in Appendix. In addition, means and standard deviations for variables used in the analyses can be found in Table 2 in Appendix.

For testing hypothesis 3, several control variables are used in the analyses. These control variables are at the student and classroom level. The student level control

variables include the student's race/ethnicity, gender, age in months and socioeconomic status of student's family, reading and math achievement scores in the fall and spring of kindergarten, and Spring of first grade, and learning behavior. The variable learning behavior is a composite score developed based on teachers' reports of child's attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization (Tourangeau, Christine Nord, Alberto Sorongon, & Elvira Germino, 2009). All the individual level control variables are group-mean centered since teachers' decision to place each student in ability groups is based on comparing this students' performance relative to all other students in the class. Additionally, the study also includes classroom level means for all the individual student level variables. This is necessary to allow for the fact that students' ability group placement may be due to their own absolute performance (Tach and Farkas, 2006; p. 1057). These variables are average age of students in class, proportion of male students in class, proportion of Black and Hispanic students in class, Average SES of the class, average math and reading score of students in class, and finally average learning behavior score in class. Further information about the control variables that are used for testing hypothesis 3 can be found in Table 3 in Appendix.

3.4. Statistical Lags:

Following the extant literature, the study applies lags to the teacher/classroom and school level variables in the analytic models for testing hypotheses 1 and 2. The application of lags is necessary to ensure that students' achievement trajectories reflect their cumulative experiences from multiple teachers and schools. It also takes into account the fact that school and teacher effects persists into the future (Heck, 2007;

Krueger & Whitmore, 2001; Moller et al., 2013). Also, since placement with same-race teachers in a particular grade is determined to some extent by students' performance in the previous grade (Hanushek et al., 2004), application of a lag was necessary in this case. While the literature suggests that a lag is necessary, the degree of the lag necessary remains disputed (Kane & Staiger, 2008; Konstantopoulos, 2007, 2008). Therefore, following (Moller et al., 2013), this study empirically identifies the lag by fitting a series of exponential decay curves to the data:

$$decay = 100 * e^{-.\pi}$$

where τ is the rate of decay and t reflects time elapsed. Decay curves are widely used across the physical and social sciences to explain fade out of a variety of phenomenon. In analyzing teacher effects on student achievement, Kane & Staiger (2008) suggests a constant rate of fade-out at 50% (or 50% at t=1 and 25% in t=2). This rate is reflective of a decay curve where the rate of decay is .69. Following (Moller et al., 2013), this study tests decay rates ranging from τ=.001 (no decay) to τ=1 and compare the fit statistics across models. The results show that a decline in model fit begins once the decay rate reaches τ=.5. Based on the application of the decay, the cumulative lag variables are calculated as follows. There is no lag given that kindergarten is the first year—100% of the lag variables in kindergarten are based on kindergarten. In the first grade, the lag variables are calculated as 61% kindergarten and 39% first grade. The third grade values are calculated as 29% third, 39% first, and 32% kindergarten. The lagged measures for the key variables are better for establishing a causal link (Moller et al., 2013).

Since hypothesis 3 is tested on cross-sectional data from kindergarten, first and third grades separately. In models predicting ability group placement in the spring of

kindergarten, this study controls for each students' reading, math achievement and learning behavior scores from fall of kindergarten in the previous year. Similarly, in models predicting ability group placement in the spring of first grade, the study controls for reading, math and learning behavior scores from spring of kindergarten.

3.5. Analytic Technique:

The analytic technique for hypotheses 1 and 2 is a cross-classified growth model. Cross-classified growth models permit analysis of achievement scores over more than two time periods when the number of time periods is limited, trajectories are nonlinear, and students change schools (Goldstein 1999; Raudenbush and Bryk 2002). The use of cross-classified models is warranted in this study because the nesting structure of the data is not strictly hierarchical (i.e. students nested within classrooms within schools). Since students are tracked over multiple time points, they are likely to encounter multiple teachers over time and are also likely to change schools overtime. The presence of cross-classification violates the typical assumption in multilevel models (Raudenbush & Bryk, 2002; Goldstein, 1999).

The cross-classified growth modeling approach has several advantages over cross-sectional as well as value-added models (Bressoux & Bianco, 2004; Raudenbush, 2004; Rowan, Correnti, & Miller, 2002). Growth models can incorporate more information about students' previous learning than any other approaches because it uses achievement scores from multiple time periods (McCaffrey, Lockwood, Koretz, & Hamilton, 2003). This can help improve the stability of the growth estimates (Palardy, 2010). Growth models can simultaneously estimate students' initial learning as well as the shape of the change (i.e. growth curves) if there is achievement data for at least three

points in time (Rowan et al., 2002). Growth models can account for student mobility by attributing the annual gains in growth to the school attended at each time point (May & Supovitz, 2006; McCaffrey et al., 2003). The presence of repeated data on student achievement and other background characteristics can control explicitly for student heterogeneity based on unobserved factors.

In using cross-classified growth models, at level 1 are the repeated measurements of student achievement across three time points consisting of kindergarten, first and third grades. At level 2, growth in achievement among students within schools is modeled as a function of student-level fixed and random effects and school-level fixed and random effects as students are cross-classified across the schools. Since students aren't nested within schools, level 2 includes student and schools. This analytic strategy permits the investigation of the effects of students' placement with a same-race teacher, and overall teacher diversity in schools on student achievement, controlling for students' initial scores:

$$y_{t(ij)} = \beta_o + \sum_{q=0}^{3} \pi_{q(ij)} x_{qt(ij)} + \sum_{p=1}^{p} \lambda_p w_{pi} + \sum_{p=1}^{p} \beta_p z_{pj} + \sum_{q=0}^{3} \pi_{q(ij)} x_{qt(ij)} (\sum_{p=1}^{p} \lambda_p w_{pi} + \sum_{p=1}^{p} \beta_p z_{pj}) + e_{t(ij)} + u_{1i} + \mu_{2j}$$

The outcome variables are math and reading scores at time t for student i in school j, $y_{t(ij)}$, where i and j are placed in parentheses to reflect cross-classification. Math and reading scores are a function of time, $x_{qt(ij)}$, student variables, $\lambda_p w_{pi}$, and school variables, $\beta_p z_{pj}$. Time, (coded, 0, 1, 2, for K, first, and third grades, respectively) is also interacted with student and school variables. The direct effects of the student and school variables, then, are the effects at time 0, when students are in kindergarten. The interactive effects reflect the impact of student and school variables at each time period. Growth in achievement

by race is measured through interactions between race/ethnicity and time. The effect of same-race teachers on achievement for each racial/ethnic group is measured through interactions between race/ethnicity, time, and same-race teacher. The effect of overall teacher diversity on achievement for each racial/ethnic group is also measured through interactions between race/ethnicity, time, and teacher diversity. The equation includes a between-student error term, $e_{t(ij)}$, and random components for students and schools, u_{1i} and u_{2j} (Littell, Milliden, Stroup, & Wolfinger, 1996; Moller et al., 2013; Raudenbush & Bryk, 2002). This study does not include a random effect for teacher/classroom. The inclusion of an additional random effect for teacher/classroom has both pros and cons. Addition of a random effect for teachers/classrooms can address the mobility of students across teachers and classrooms across different time periods in a better way. However, models fail to converge due to memory intensive nature of growth models. The challenges also increase exponentially because the models run on five different imputed datasets. To overcome the computational challenges associated with growth models and to test if the final models (without the additional random effects for teacher/classroom) are robust to the inclusion of the extra random effects at the teacher level, separate analysis (not shown) is done on one single imputed dataset. The results from the previous models hold even after the inclusion of the extra random effect for teachers. The analytic technique utilized to test hypothesis 3 is a three-level hierarchical linear regression model. The conversion of discrete dependent variable into standardized scores allows the use of this modeling technique. The modeling structure proposed by Tach and Farkas (2006), p. 1057: Ability group placement for the i^{th} student in j^{th} classroom is

predicted by student's own background characteristics, previous achievement scores in math and reading, and prior learning behavior as reported by teachers for each student.

$$(\text{Reading Ability Group Placement})_{ij} = B_{0j} + B_{1j}\,(\text{Background Characteristics})_{ij} + B_{2j}\,(\text{Prior Reading Achievement})_{ij} + B_{3j}\,(\text{Prior Math Achievement})_{ij} + B_{4j}\,(\text{Prior Learning Behavior})_{ij} + e_{ij}$$

To account for the fact that student's placement in ability groups is based on their performance in the class relative to all other students as well as their absolute performance, the independent variables in the above equation are group-mean centered and classroom-level means of the student-level variables are included as predictors in the intercept of the model, B_{0j}.

$$B_{0j} = ¥_{0j} + ¥_{1j}\,(\text{Average Background Characteristics})_{ij} + ¥_{2j}\,(\text{Average Prior Reading Achievement Score})_{ij} + ¥_{3j}\,(\text{Average Prior Math Achievement Score})_{ij} + ¥_{4j}\,(\text{Average Learning Behavior Score})_{ij} + u_{ij}$$

CHAPTER 4: THE EFFECTS OF ASSIGNMENT TO SAME-RACE TEACHERS AND TEACHER DIVERSITY IN SCHOOLS ON MATH AND READING ACHIEVEMENT GROWTH

4.1. Findings:

Table 4 in Appendix presents the distribution of students from different racial and ethnic groups by their assignment to same-race teachers in kindergarten, first and third grades. Among Black students, 31 percent were assigned to Black teachers in kindergarten, 32 percent in first grade and around 24 percent were assigned to Black teachers in third grade. Among Hispanic students, 33 percent were assigned to Hispanic teachers when they were in kindergarten, and approximately 24 percent were assigned to Hispanic teachers when they were in first and third grades respectively. Among White students, 92 percent were assigned to White teachers in kindergarten, 94 percent in first grades and 87 percent were assigned to White teachers in third grade.

Table 5 in Appendix presents the distribution of students across schools representing varying levels of teacher diversity. Among all kindergartners, 42 percent went to racially uniform schools, 33 percent went to schools where minority teachers' representation in the overall teacher workforce reflects tokenism. Approximately, around 17 percent went to schools with tilted-balanced representation of minority teachers and finally, around 8 percent kindergartners went to schools where minority teachers represent the majority. Among first graders in the sample, approximately 45 percent went to racially uniform teacher schools, 28 percent went to token minority teacher schools,

approximately, 16 percent went to school with tilted-balanced representation of minority teachers, and 11 percent of first graders went to schools where minority teachers are the majority. Among third graders, approximately 37 percent went to where teachers are racially uniform, 31 percent went to token minority teacher schools, 19 percent went to tilted-balanced minority teachers, and finally, 13 percent of third graders went to schools where minority teachers constitute the majority of the teacher workforce.

Table 6 in Appendix presents results of cross-classified growth models with all control variables discussed above, with the exception of same-race teacher and teacher diversity in school. This table illustrates that Black and Hispanic students begin kindergarten with lower math and reading scores compared to White students. For Black students in particular, this disadvantage accumulates over time as their math and reading achievement growth trails behind White and Hispanic students in third grade. Unlike Blacks, Hispanic students are able to catch up with fellow White students to a large degree in third grade. There are also initial differences by socioeconomic status. Students from low SES status begin kindergarten with a disadvantage in math and reading compared to middle SES students. High SES students on the other hand, begin kindergarten with significant advantages in terms of both math and reading achievement scores compared to middle SES students irrespective of race or ethnicity.

Table 7 in Appendix presents a series of models to examine the effects of same-race teachers and teacher diversity in school on students' math achievement growth. The study initially focuses on Simpson's measure of teacher diversity in schools. However, the final model shows results that are based on Kanter's more nuanced measure of teacher diversity in schools. Given the moderate correlation (.30) between the variables

teacher diversity in schools and student diversity in classrooms, in order to disentangle any potential confounding effects the paper introduces these variables sequentially in models 1, 2 and 3. Model 1 includes same-race teacher and teacher diversity in schools along with all control variables, with the exception of the variable indicating student diversity in classrooms. Model 1 illustrates that assignment to same-race teachers is not a significant predictor of math achievement growth among students between kindergarten and third grade. Similarly, overall racial and ethnic diversity of the teacher workforce in schools, also, did not turn out to be significant predictor of math achievement growth in model 1.

Model 2 in Table 7 introduces student diversity in classrooms and leaves out teacher diversity in schools. All other variables from model 1 are retained in model 2. Student diversity in classrooms shows a positive and significant effect on math achievement growth between kindergarten and third grade. When the variables same-race teachers, teacher diversity in schools and student diversity in classrooms are entered simultaneously in model 3, student diversity in classrooms continues to be a positive and significant predictor of math achievement growth. However, the non-significance of the two primary independent variables indicates that neither assignment to same-race teachers nor overall teacher diversity have any effect on math achievement growth for students in general. However, these findings preclude any type of racialized differences in math achievement growth among early elementary graders. Therefore, model 4 examines if there are differences in math achievement growth among the three racial groups as a result of their assignment to same-race teachers or from attending schools with a diverse teacher workforce.

To better present the substantive interpretation of the interactions with race, in model 4, the predicted least square means are plotted in Figure 1 in Appendix. The growth in math achievement presented in these figures is calculated by subtracting predicted scores (i.e., least square means) in kindergarten from predicted scores in third grade. Figure 1 illustrates that Black students who are assigned to non-Black teachers perform slightly better in math achievement by third grade compared to Black students who are assigned to Black teachers. Black students who are in non-Black teachers' classrooms experience a modest 5 point improvement in math achievement by third grade compared to their Black peers who are assigned to Black teachers' classrooms. There is no significant difference in math achievement growth among Hispanic students who are assigned to Hispanic teachers from those who are assigned to non-Hispanic teachers. There is also no significant difference in math achievement growth among White students who are placed with White teachers versus non-White teachers. A comparison among racial/ethnic groups reveal that assigning Black students to non-Black teachers can minimize the Black-White and Black-Hispanic gaps in math achievement growth by third grade.

Model 5 in Table 7 examines the joint effects of teacher diversity in schools and assignment to same-race teachers on math achievement growth for Black, White and Hispanic students. This model illustrates significant differences across racial groups. Figures 2 and 3 in Appendix plots the predicted least square means from model 5. Figure 2 shows the effect of assignment to same-race/different-race teachers for Black, Hispanic and White students who also study in schools that do not have a diversified teacher workforce. Black students in such schools are better-off when assigned to non-Black

teachers. These students score approximately 7 points higher in math achievement growth compared to Black students who are assigned to Black teachers. Hispanic students in similar schools, however, perform equally well in terms of math achievement growth irrespective of their assignment to Hispanic versus non-Hispanic teachers. White students studying in schools with no teacher diversity do significantly better in math when they are assigned to White teacher classrooms compared to their White peers who are assigned to non-White teacher classrooms.

Figure 3 shows the effect of assignment to same-race/different-race teachers for Black, Hispanic and White students who also study in schools with a highly diverse teacher workforce. In schools with diverse teachers, the difference in math achievement growth between Black students who are placed with non-Black teachers and Black students with Black teachers narrows from 7 points to around 3 points and this difference is no longer statistically significant. This narrowing of the gap in achievement growth is partly attributed to the marginal improvement in achievement growth by third grade among Black students who are assigned to Black teachers' classrooms. There is no significant difference in achievement growth for Hispanic students who are placed with Hispanic versus non-Hispanic teachers depending on the overall teacher diversity in their schools. In schools with diverse teachers, White student are marginally better-off in terms of their math achievement growth when they are assigned to non-White teachers' classrooms compared to White students who are in similar schools but assigned to White teachers' classrooms. Therefore, these findings indicate that overall racial and ethnic diversity of the teacher workforce in schools moderate the relationship between same-race teacher assignment and math achievement growth among Black and White students.

Model 6 in Table 7 introduces Kanter's measure of teacher diversity instead of Simpson's teacher diversity index for schools. Model 6 examines whether the moderating role of teacher diversity in schools holds when the Simpson's index of teacher diversity in schools is replaced by Kanter's measure of teacher diversity in schools. The joint effect is significant for Hispanic students' math achievement growth. Therefore, the predicted least square means for Hispanic students are plotted in Figures 4, and 5.

Figures 4 and 5 in Appendix present the joint effects of assignment to same-race/different-race teachers and Kanter's overall teacher diversity in schools for Hispanic students' math achievement growth. Figure 4 shows math achievement growth trajectories of Hispanic students who are assigned to Hispanic teachers' classrooms but study in schools with varying degrees of minority teacher representation. Among the group of Hispanic students who are assigned to Hispanic teachers' classrooms, those who study in schools with token representation of minority teachers experience 22 points increase in math achievement growth compared to Hispanic students whose schools have racially uniform teacher workforce. This group of Hispanic students in token-minority teacher schools also outperforms their Hispanic peers studying in schools where minority teachers hold the majority by 15 points by third grade. Moreover, the math achievement growth among Hispanic students studying in racially balanced schools is also significantly higher by approximately 15 points compared to Hispanic students in schools with racially uniform teacher workforce. Substantively, figure 4 reveals that Hispanic students can attain higher math achievement trajectory when placed with Hispanic teachers, if their schools have some presence of minority teachers either as tokens or

tilted-balanced representation. The findings may indicate that Hispanic teachers might be able to derive some support from these schools that ultimately help them become more effective educators for Hispanic students. When Hispanic students are assigned to non-Hispanic teachers' classrooms, their math achievement trajectories do not significantly differ from each other depending on the overall racial and ethnic composition of teachers in their schools.

Table 8 in Appendix presents a series of models to examine the effects of same-race teachers and teacher diversity in school on students' reading achievement growth. The structure of the table is similar to Table 7. Model 1 includes the variables assignment to same-race teachers and Simpson's teacher diversity measure for schools along with all control variables, with the exception of the variable indicating student diversity in classrooms. Model 1 illustrates that assignment to same-race teachers is not a significant predictor of reading achievement growth among students between kindergarten and third grade. However, the overall racial and ethnic diversity of the teacher workforce in schools is a negative and significant predictor of reading achievement growth in third grade for all students.

Model 2 in Table 8 introduces student diversity in classrooms and leaves out teacher diversity in schools. All other variables from model 1 are retained in model 2. Neither of the two variables turned out to be significant predictors for reading achievement growth. Model 3 introduces the variables, same-race teachers, teacher diversity in schools and student diversity in classrooms simultaneously. Simpson's teacher student measure for schools continues to have a negative and significant effect on reading achievement growth in model 3. Model 4 examines if there are any racialized

differences in reading achievement growth as a result of students' assignment to same-race teachers or from attending schools with a diverse teacher workforce.

Figure 6 in Appendix plots the predicted least square means for reading achievement growth based on model 4. Figure 6 illustrates that there is significant difference in the reading achievement trajectory for Black students who are assigned to Black versus non-Black teachers. Black students who are assigned to Black teachers' classrooms perform at a significantly lower level in reading achievement compared to their Black peers who are assigned to non-Black teachers' classrooms. Black students who are in non-Black teachers' classrooms experience a significant 8 point improvement in reading achievement by third grade compared to Black students who are assigned to Black teachers' classrooms. By third grade, Hispanic students who are assigned to Hispanic teachers' classrooms also significantly lag behind their Hispanic peers who are assigned to non-Hispanic teachers' classrooms by approximately 8 points in reading achievement growth. There is also no significant difference in reading achievement growth among White students who are placed with White teachers versus non-White teachers. A comparison among the three racial/ethnic groups reveal that assigning Black students to non-Black teachers can minimize the Black-White and Black-Hispanic gaps in reading achievement growth by third grade.

Model 5 in Table 8 examines the joint effects of teacher diversity in schools and assignment to same-race teachers on reading achievement growth for Black, White and Hispanic students. Figures 7 and 8 in Appendix plots the predicted least square means from model 5. Figure 7 shows the effect of assignment to same-race/different-race teachers for Black, Hispanic and White students who also study in schools that do not

have a diversified teacher workforce. Black students in such schools are better-off when assigned to non-Black teachers. These students score approximately 19 points higher in reading achievement growth compared to Black students who are assigned to Black teachers. However, the reading achievement trajectories for Hispanic students in similar type of schools do not significant differ depending on their assignment to Hispanic versus non-Hispanic teachers. Similarly, the reading achievement trajectories of White students studying in schools with no teacher diversity do not significantly differ depending on these students' assignment to White versus non-White teachers' classrooms.

Figure 8 in Appendix shows the effect of assignment to same-race/different-race teachers on reading achievement growth for Black, Hispanic and White students who also study in schools with a highly diverse teacher workforce. In schools with diverse teachers, the difference in reading achievement growth trajectories for Black students who are placed with non-Black teachers and Black students with Black teachers narrows considerably and are no longer statistically significant. This narrowing of the gap in achievement growth is partly attributed to the marginal improvement in achievement growth by third grade among Black students who are assigned to Black teachers' classrooms. There is no significant difference in achievement growth for Hispanic students who are placed with Hispanic versus non-Hispanic teachers depending on the overall teacher diversity in their schools. In schools with diverse teachers, the reading achievement growth trajectories for White student assigned to White teachers' classrooms also do not significant differ from their White peers who are assigned to non-White teachers' classrooms. These findings indicate that overall racial and ethnic

diversity of the teacher workforce in schools moderate the relationship between same-race teacher assignment and reading achievement growth among Black students.

Model 6 in table 8 introduces Kanter's measure of teacher diversity instead of Simpson's teacher diversity index for schools. Model 6 examines whether the moderating role of teacher diversity in schools in the relationship between same-race teacher assignment and students' reading achievement growth holds when the Simpson's index of teacher diversity in schools is replaced by Kanter's measure of teacher diversity in schools. The joint effect is significant for Hispanic students' reading achievement growth. Therefore, the predicted least square means for Hispanic students are plotted in Figures 9, and 10 in Appendix.

Figures 9 and 10 present the joint effects of assignment to same-race/different-race teachers and Kanter's overall teacher diversity in schools for Hispanic students' reading achievement growth. Figure 9 shows reading achievement growth trajectories of Hispanic students who are assigned to Hispanic teachers' classrooms but study in schools with varying degrees of minority teacher representation. Among the group of Hispanic students who are assigned to Hispanic teachers' classrooms, those who study in schools with token representation of minority teachers experience 35 points increase in reading achievement growth compared to Hispanic students whose schools have racially uniform teacher workforce. This group of Hispanic students in token-minority teacher schools also outperforms their Hispanic peers studying in schools where minority teachers hold the majority by 23 points by third grade. Moreover, the reading achievement growth among Hispanic students studying in racially balanced schools is also significantly higher by approximately 23 points compared to Hispanic students in schools with a racially

uniform teacher workforce. Substantively, figure 9 reveals that Hispanic students can attain higher reading achievement trajectory when placed with Hispanic teachers, if the schools where they study have some presence of minority teachers either as tokens or tilted-balanced representation. When Hispanic students are assigned to non-Hispanic teachers' classrooms as shown in figure 10, their reading achievement trajectories do not significantly differ from each other depending on the overall racial and ethnic composition of teachers in their schools.

4.2. Summary and Discussion of Findings:

Studies in general have neglected exploring the role played by school contextual factors when studying the relationship between assignment to same-race teachers and students' learning achievement. Although, few studies have highlighted the important role of racial and socioeconomic composition of the student body in schools in understanding this relationship, none have examined how the overall racial and ethnic diversity of the teacher workforce in schools affects this relationship. Using Kanter's tokenism in the workplace as a theoretical backdrop, the present study examines the joint effects of assignment to same-race teachers and overall racial/ethnic composition of teachers in schools on mathematics and reading achievement growth in the elementary grades.

Results from cross-classified growth models bring out important insights on this issue. The study could not find evidence in support of the first hypothesis. The first hypothesis states that minority students are more likely to experience higher achievement when these students are assigned to same-race teachers' classrooms. The findings, however, suggest that between kindergarten and third grade, Black students who are

assigned to Black teachers' classrooms are actually worse-off compared to Black students who are assigned to non-Black teachers' classrooms. The math and reading achievement trajectories for Black students who are assigned to Black teachers' classrooms begin to diverge from their Black counterparts after Kindergarten entry and by third grade the two trajectories are significantly different from each other. This finding addresses the important policy question about whether assignment to same-race teachers is particularly beneficial for academic achievement of minority students. This finding is particularly important in light of previous findings, which show that Black students arrive at kindergarten with weaker reading and math skills compared to their White and Hispanic peers (Phillips, Crouse, & Ralph, 1998; Ferguson, 1998). Assignment to same-race teachers have also been highlighted as a mechanism that can positively influence Black early elementary graders' psycho-social development and later learning outcomes. However, as the findings from the present study suggest, assignment to Black teachers can in fact exacerbate the already existing disadvantages that Black students experience when entering kindergarten. Moreover, given the importance of early learning on later learning outcomes, the findings of this study are of particular significance to school administrators/principals who often have to take decisions regarding classroom assignments of teachers inside schools.

The findings of this study are consistent with several with other research studies that have used nationally representative samples of students. Fryer and Levitt's (2004) study where the authors utilized the same Early Childhood Longitudinal dataset to examine Black-White achievement gaps in kindergarten and first grades found that Black students who have at least one Black teacher start out with a relative disadvantage in

math compared to White peers. Their study also shows that by the end of first grade, the Black-White test score gap is greater across the board for students who have at least one Black teacher. Ehrenberg, Goldhaber, and Brewer's (1995) study of a nationally representative sample of high school students from the National Educational Longitudinal (NELS) dataset also showed no relationship between assignment to same-race teachers on high schools students' math, reading and science scores. Another study by Ferguson (1998) using Baltimore data also found having teachers of the same race did not necessarily help Black students' achievement. In particular, Ferguson (1998) found that Black students experience marginal gains in math achievement when these students are assigned to White teachers of high SES backgrounds and also to Black teachers of low SES backgrounds. Ferguson (1998) cautiously explained his finding by arguing that high SES White teachers and low SES Black teachers "might be the least threatened by Black children of low socioeconomic status, and the most inclined to believe that such children can achieve at high levels." (Ferguson 1998, p. 349) Moreover, even though the broader literature argues that Black students tend to benefit, at least perception-wise, when they are assigned to Black teachers, studies have not found conclusive evidence that suggests such positive perception actually leads to higher achievement among Black students. Even with regard to teacher perception, a recent study by McGrady & Reynolds (2012) found that only in very few instances, Black students are positively perceived even by non-White teachers.

The study's findings contradict the findings of one major study by Dee (2004) that is widely cited in the literature on this topic. Therefore, it is imperative to discuss the potential reasons behind the divergent findings. Dee (2004) found that both Black and

White students experience higher achievement gains in early grades when these students are placed with same-race teachers. Dee's findings are confirmed after taking into consideration student sorting that generates an association between assignment to same-race teachers and student characteristics. While Dee's study is methodologically sophisticated and utilizes experimental data from the Tennessee Project Star, the study's findings are generalizable only to a population that is specific to the schools located in the state of Tennessee and, therefore, cannot be generalizable to the entire nation. Another limitation of Dee's study is that the study considered only large schools that met the conditions of inclusion under the Star project (Howsen and Trawick, 2007). Replicating as well as extending Dee's (2004) work on third grade students from small as well large schools in Kentucky, Howsen and Trawick (2007) found that once students' innate abilities are controlled for in the models, matching between students and teachers of similar race does not yield to statistically significant effect on students' academic achievement.

Another important finding of this study is that there is no significant difference in Hispanic students' math achievement growth irrespective of whether they are assigned to Hispanic versus non-Hispanic teachers. This finding is consistent with a recent study by McGrady & Reynolds (2012) where the authors found that White teachers' perception of Hispanic students do not typically differ from those of White students. The same study also finds that Hispanic teachers are more likely than White teachers to have positive perceptions about Hispanic students. Unlike their performance in math, the reading achievement trajectories of Hispanic students who are assigned to Hispanic teachers lag behind their Hispanic peers who are assigned to non-Hispanic teachers. Further

examination of the data reveals that majority of those Hispanic students who are assigned to Hispanic teachers are English language learners. It is possible that Hispanic teachers lack the necessary support structure to effectively meet the unique needs of Hispanic English language learners even though they share racial/ethnic backgrounds of these students.

The above findings tell the story that simply matching minority students with teachers from similar racial and ethnic backgrounds can potentially be harmful for their academic achievement. It may be the case that school contextual factors shape this relationship. While some studies have indicated the role of racial and ethnic composition of the student body in schools as an important moderating factor, this study proposes that overall racial and ethnic composition of the teacher workforce in schools is a more appropriate moderating factor. This is because, overall racial and ethnic diversity of teachers in schools shapes minority teachers' daily professional experiences, as well as the support structure that they are likely to receive in order to be effective educators for all students, and especially minority students who often constitute the majority in the classrooms these teachers are assigned to teach.

This study's findings support hypothesis 2, which states that overall racial and ethnic composition of teachers in school moderates the effects of student-teacher racial/ethnic matching in the classroom context in predicting math and reading achievement growth. When Simpson's measure of overall teacher diversity is utilized, the interactive model shows that in schools with no teacher diversity, Black students generally perform poorly in math and reading when assigned to Black teachers' classrooms. However, when studying in schools with high levels of teacher diversity,

Black students perform marginally better and the differences in math and reading achievement growth between Black students who are assigned to Black versus non-Black teachers are no longer statistically significant in schools with overall teacher diversity levels are high.

Schools with high levels of teacher diversity can also benefit those White students who are assigned to non-White teachers. In fact, by third grade White student in these schools are marginally better-off in terms of their math achievement growth when they are assigned to non-White teachers' classrooms compared to White students who are assigned to White teachers' classrooms. Clearly, these findings lend some support to qualitative research evidence, which suggests that minority teachers are more effective educators for both minority and non-minority students when they work alongside a diverse group of colleagues in the workplace.

When Kanter's more nuanced measure of teacher diversity is used in place of Simpson's measure of teacher diversity, the interactive models show significant effect for only Hispanic students. Hispanic students when assigned to Hispanic teachers' classrooms perform poorly in math and reading only when their schools have racially uniform teacher workforce or when the overall representations of minority teachers in their schools constitute the majority. These Hispanic students who are taught by Hispanic teachers, however, perform better if their schools have either token or tilted-balanced representation of minority teachers in the overall teacher workforce. The findings do not fully support Kanter's hypothesis because Hispanic teachers are effective with Hispanic students even when their workplace have token representation of minority teachers. Hispanic teachers are also equally effective with Hispanic students when their

workplace have tilted-balanced representation of minority teachers. It is only in schools with racially uniform teacher workforce and in schools where minority teachers constitute the majority that Hispanic teachers are not very effective even when they get to teach Hispanic students.

To explain the mechanism behind the above finding, this study further examined the specific characteristics of Hispanic students who are assigned to Hispanic teachers. Additional analyses revealed that Hispanic students who are assigned to Hispanic teachers' classrooms are mostly English language learners. The broader literature has highlighted the unique educational needs of English language learners and the disadvantages they face during school years and beyond. Therefore, one plausible reason why Hispanic teachers are more effective with Hispanic English language learners in schools with some representation of minority teachers either as tokens or a more balanced representation perhaps lies in these schools' work environment. These schools may offer Hispanic teachers something beyond the knowledge they bring by virtue of sharing students' primary language, experiences, culture community, and interactional styles (Monzo & Rueda, 2001).

Further exploration of the data reveals the mechanisms through which schools with token or tilted-balanced representation of minority teachers help language minority students and also provide a better support structure to minority teachers who are often assigned to teach in classrooms where majority of students are language minority. Results show that schools that have some presence of minority teachers are more likely to have strong programs and support services for students and families of language minorities. These schools are more likely to have frequent communications with families

of LEP students through home visits by teachers, more likely to conduct special parent meetings and have outreach worker assist in enrolling children entering schools for the first time. These schools are also more likely to have translators available to parents for parent/teacher and parent/school staff meetings and/or have meetings conducted in the parents' non-English language or have translations of written communications provided to LEP families. Studies have shown that such practices on the part of schools can be particularly beneficial to Hispanic students given the central role that Hispanic mothers and their cultural and educational beliefs play in Hispanic/a children's successful adaptation/socialization in school and performance (Durand, 2011; Valdes, 1996; Falicov, 2005; Villenas, 2001; Delgado-Gaitan, 2005).

Hispanic teachers are likely to be more effective educators for Hispanic students in schools with some presence of minority teachers because such schools are more likely to provide the support structure that Hispanic teachers require to effectively utilize/translate their knowledge of Hispanic student's culture and community into classroom instructional strategies to improve academic performance among Hispanic LEP students. There are several mechanisms that are discussed in the literature on experiences of Hispanic teachers in majority White teacher schools. Qualitative studies on everyday experiences of Hispanic teachers have found that their experiences differ depending on whether they work White-teacher dominant schools or schools that are dominated by teachers of Hispanic origin (Flores, 2011; Olivos & Mendoza, 2009). Although, the present study does not specifically examine schools with predominantly Hispanic teachers due to small sample size, the findings from the literature can be extended to argue that Hispanic teachers are more likely to experience better work

environment, less alienation, positive social relations, feeling of appreciation and acceptance, and greater flexibility to try out innovative non-traditional teaching techniques if their school workplace has some level of diversity among teachers rather than racially uniform.

A related question that arises is why Hispanic teachers who are with Hispanic students are less effective in schools that have minority teachers as majority. To ensure that the socioeconomic status of schools is not playing a role here, separate analyses (not shown) were conducted after including a variable percentage of students with free and reduced lunch status in schools as a replacement for the variable denoting if a school is a Title1 schools. The previous results still holds in the new model. Most of the schools that have minority teachers as a majority in the workforce are located in urban areas. The unique challenges that urban schools face are well documented, which makes it difficult for teachers in these schools to personalize instruction and undermine opportunities to create supportive relationships with students. It is also likely that Hispanic teachers' perception about Hispanic students' may be more negative in schools where minority teachers are the majority. Similar evidence was found by Morris (2005) with respect to White students. Morris (2005) found that White students studying in predominantly minority schools are perceived differently by their White and Black teachers. While Black teachers perceived White students as middle class and good academically, the same White students are perceived as from "trailer trash" families by their White teachers.

Another plausible explanation for the apparent gains in math achievement growth among Black students with Black teachers in the above type of schools could be that

White teachers who are recruited in minority majority schools are of low quality. Another plausible explanation for the lower achievement levels among Hispanic students in Hispanic teachers' classrooms in the above type of schools may be that the Hispanic teachers who are recruited in minority majority schools are of low quality.

The study also sheds new light on the experiences of White students when placed with White versus non-White teachers. White students in general benefit from being in White teachers' classroom. However, when White students are in schools with more diverse teacher workforce, their math achievement trajectories are higher when they are in assigned to non-White teachers' classrooms compared to White students who are assigned to White teachers' classrooms. This finding suggests that the argument that diversifying the teacher workforce is likely to harm the majority group is not fully justified. However, further analysis is needed to examine the consistency of this finding.

4.3. Sensitivity analyses:

In order to test the consistency of the models, separate analyses, not shown, were conducted by testing regressions separately for each racial/ethnic group because the analyses presented in Tables 2 and 3 require a four-way interaction between time, race, same-race teacher, and a measure of teacher diversity in schools. Given that potential model instability could arise from this approach, the present study tested the results separately for each racial and ethnic category, and the results were found to be robust.

The interactive models were also tested for robustness after including a measure of school socioeconomic status in place of the measure that indicates if a school holds Title 1 status. The measure of school socioeconomic status is calculated as the percentage of students in schools who avail free and reduced priced lunch. This variable

is not included in the original model because substantial number of missing cases that prevented imputation. The original variable has more than 20 percent of cases as missing, which is way beyond the criteria that the study used to perform imputation. However, separate analyses with the school SES measure reveals that the original results are robust.

Previous studies on student-teacher racial and ethnic matching have highlighted potential threats to validity and bias in results emerging because students are not assigned randomly to various classes (Dee, 2004; Howsen & Trawick, 2007). To examine if student sorting is indeed a problem, Dee (2004) estimated OLS regression with a binary dependent variable indicating whether the student is matched with a same-race teacher and controlled for five basic student traits and school fixed effects. He found no within-school association between the observed student traits and exposure to an own-race teacher with the exception of student race. The student traits that Dee (2004) included were students' free and reduced lunch status, class size, student race, student gender, student age. Dee found that except for students' race, none of the other variables were significant predictors of assignment to same-race teachers. This led him to conclude that there is no association between assignment of an own-race teacher and student characteristics and therefore, assignment to same-race teacher is exogenously determined (Dee, 2004; p.200). Howsen & Trawick (2007) also followed Dee's methodology to check for the endogeneity in their Kentucky data. With the exception of students' free and reduced lunch status, these authors include all other student traits and school fixed effects. Their findings also led them to conclude absence of endogeneity that might bias the results.

In addition to the problem emerging due to non-random student sorting, teacher characteristics (including race) in a school are endogenously determined. Prior research has found evidence of systematic sorting among teachers that can confound the true effect. Teacher sorting both within and across schools that are driven by the preferences of teachers, parents and school administrators (Dee, 2004; Jackson, 2009; Kalogrides, Loeb, & Béteille, 2012; Rothstein, 2009). School principals generally assign teachers within schools using a complex process after taking into account short and long term organizational goals as well as preferences of teachers and parents. While some of the information about teachers and students that principals utilize in order to make decisions about teacher assignment are directly observable to researchers, others are unobservable (Rothstein, 2009, 2010). I address the issue of teacher sorting by controlling for a host of observable factors that have been mentioned in the literature on teacher sorting (for a detailed discussion on the observable factors that influence teacher assignment process, see Kalogrides et al. 2012). However, there may still be potential bias emerging from unobservable teacher characteristics.

A final limitation of the study lies in its use of Hispanic students and teachers as a uniform group. The study acknowledges the cultural and socioeconomic variation that exists within this broad group. However, due to lack of information and adequate sample size for the subcategories, only a broad category describing Hispanic students and teachers was utilized for the study's purposes.

CHAPTER 5: THE EFFECTS OF ASSIGNMENT TO SAME-RACE TEACHERS ON READING ABILITY GROUP PLACEMENT

Hypothesis 3 tests whether assignment to same-race teachers has a positive effect on students' placement in higher ability groups. The study focuses on ability grouping in reading because the Early Childhood Longitudinal dataset collects information about the number of reading ability groups that teachers create in each class and students' placement in these groups through the teacher questionnaire. Also, since kindergartners are unable to read, reading ability in kindergarten refers to children's pre-reading skills and not their actual reading abilities (Tach and Farkas, 2006). Unlike the hypotheses in the preceding chapter, hypothesis 3 is examined using cross-sectional data from kindergarten, first and third grades. This is because the nature of dependent variable in hypothesis 3 warrants a cross-sectional analysis rather than a longitudinal analysis for hypothesis 1and 2.

5.1. Findings

Table 9 in Appendix shows the means and standard deviations of the variables that are used to examine hypothesis 3. The three panels in table 9 present the means and standard deviations of the relevant variables based on the kindergarten, first and third grade samples. The dependent variable is a z-score measure of reading ability group placement for each student in the sample. Therefore, the mean value for this variable is

zero in each grade and the standard deviation is closer to one. The racial distribution of students in the kindergarten sample is 17 percent Blacks, 20 percent Hispanic, and 62 percent Whites. The racial distribution of students in the first and third grade sample is similar to that of the kindergarten sample. The gender distribution in the kindergarten, first and third grade sample shows equal representation of males and females. The average age of children is 66 months in the kindergarten sample, 87 months in first grade sample, and 111 months in the third grade sample. The average SES of students in the kindergarten, first and third grade sample is close to zero. This is because the composite SES measure is deviated from its mean. Following Tach and Farkas (2006), student level variables are group-mean centered because teachers' decision to place students into various ability groups is based on the students' relative performance vis-à-vis all other students in the classroom. The study also includes classroom level averages for student level variables. This is done to allow for the fact that student placement in ability groups may be based on students' absolute performance. The classroom level averages takes expected values as shown in Table 9. The descriptive statistics for the primary independent variable, same-race teacher, reveals that overall, 68 percent of students in the kindergarten sample were assigned to a same-race teacher. In the first and third grade samples, approximately 69 and 61 percent of students were assigned to same-race teachers.

Table 10 in Appendix presents the extent of reading ability grouping by grade, students' race and by socioeconomic status. Overall, 38 percent of kindergarten classes use ability grouping for reading. Around 71 percent of first grade classes and 51 percent of third grade classes use ability grouping in reading. The extent of ability group

placement by students' race reveals that 27 percent of Black kindergartners were placed in low ability groups compared to 25 percent of Hispanic kindergartners and 18 percent of White kindergarten students. Around 44 percent of Black and 46 percent of Hispanic first graders were placed in low ability groups compared to 37 percent of White first graders. Similarly, 38 percent of Black third graders and 34 percent of Hispanic third graders were placed in lower ability groups compared to 23 percent of White third graders. Clearly, Black and Hispanic students are more likely to be placed in lower ability groups compared to their White peers in early elementary grades. Moreover, compared to Black and Hispanic students, White students are also disproportionately represented in classrooms where teachers do not use ability grouping. Finally, the distribution of ability group placement by students' socioeconomic status also reveals similar patterns as in evident in case of race.

Table 11 in Appendix presents the hierarchical linear modeling (HLM) results for kindergarten ability group placement. The variables are entered sequentially starting with the most exogenous predictors of ability group placement, which are students' race, age and gender. Model 1 shows that both Black and Hispanic students are significantly less likely to be placed in higher reading ability groups compared to White students. This finding is consistent with previous studies that have found that Black and Hispanic students begin kindergarten with significantly lower levels of pre-reading skills relative to White students (Tach & Farkas, 2006; Lee and Burkam, 2002; West and Denton, 2002). Male kindergartners are significantly less likely to be placed in higher ability groups, and older children are significantly more likely to be placed in higher reading ability groups. The finding that males are less likely than females to be placed in higher

ability groups is consistent with previous literature that found lower levels of pre-reading skills among male students. Studies have also found that teacher perception about male children differs from female children. Teachers are more likely to perceive female students as more mature in terms of their behavior than male students. Among the classroom level variables, the higher the percentage of Black students in class, the more likely students will be placed in higher ability groups. This may be because teacher in classrooms with higher proportions of Black students are more likely to vigorously pursue creation of a number of ability groups. This benefits some students in high minority classrooms who are likely to find themselves in higher ability groups (Tach and Farkas, 2006). Finally, the higher the average age of students in class, the less likely it is for some students to find themselves in higher ability groups. Once again, teachers in classrooms where the average age of students is high are more likely to differentiate students using a number of ability groups. Some older students who in normal circumstances would have been placed in a higher ability group may find themselves in a lower ability group as a result of this process.

Model 2 introduces students' socioeconomic status as well as average classroom SES status. Students from higher socioeconomic status are more likely to be placed in higher ability groups. However, as the average classroom SES increases, students are significantly less likely to be placed in higher ability groups. As Tach and Farkas (2006) explained, this finding may be due to ability grouping being "over-subscribed" in classrooms where the average SES of students is high. As a result, some high SES students might end up in lower ability groups in these classrooms (Tach and Farkas, 2006: p. 1062) Model 3 introduces prior math and reading achievement scores for each

student as well as average reading and math scores in kindergarten classrooms. At the individual level, students with higher prior math and reading scores are significantly more likely to be placed in higher ability groups. However, when the classroom average math score is higher, students are less likely to be placed in higher reading ability groups. This effect is statistically significant. One interesting aspect of model 3 is that once students' prior math and reading achievement scores are controlled students' race is no longer a significant predictor of their placement in reading ability groups. However, students' gender, age and socioeconomic status continue to remain significant predictors of their ability group placement.

Model 4 introduces a measure of teachers' perception of students' prior learning behavior. This measure captures teachers' perception about students' attentiveness, task persistence, eagerness to learn, learning independence, and flexibility and organization. This measure also has a positive and significant effect on placement in higher ability groups. In model 4, since the measures for students' prior math, reading and learning behavior are all standardized, a comparison of the coefficients reveal that teachers' perception of students' learning behavior is the strongest predictor of ability group placement in kindergarten followed by prior math and reading achievement scores.

Model 5 introduces the key independent variable, which is students' placement with a same-race teacher, which turns out to be non-significant predictor for reading ability group placement in kindergarten. Finally, model 6 examines if placement with same-race teachers can have a positive effect on ability group placement for some racial or ethnic groups. However, the study did not find any racialized differences in higher ability group placement in kindergarten as a result of assignment to a same-race teacher.

Table 12 in Appendix presents the results for first grade reading ability group placement. The results for first grade follow a pattern that is similar to the results from kindergarten. One noticeable difference in case of first grade is that, among the three variables measuring students' abilities, prior reading achievement is the strongest predictor of first grade reading ability group placement followed by prior math scores and teachers' perception of students' learning behavior prior to their entering first grade. However, as shown in model 6, placement with same-race teachers has a strong positive and significant effect on Hispanic students' ability group placement and a marginally positive effect on Black students' ability group placement. Once previous ability group placement is controlled for in model 7, placement with same-race teachers continue to be a positive and significant predictor of Hispanic students' ability group placement.

Table 13 in Appendix presents results for third grade ability group placement. Assignment to same-race teachers is no longer a statistically significant predictor for students' placement in reading ability groups either for Blacks or for Hispanic students. However, students who have been placed in higher ability groups in the first grade are more likely to be placed in higher ability groups in third grade. Model 7 tests the above relationship in case of Hispanic students. Model 7 shows that Hispanic students who are placed in higher ability groups in first grade will be more likely placed in higher ability groups in third grade. This finding suggests that for Hispanic students, assignment to Hispanic teachers may not be necessary in every grade. Even if these students get a same-race teacher in one grade and get a place in higher ability group in that particular grade, the benefits in terms of ability group placement may help them in higher grades as well.

5.2. Discussion of Findings

Research on educational inequality has suggested that children belonging to minority groups and from low socioeconomic status tend to finish preschool years with lower levels of pre reading and pre mathematics skills compared to White students and students from middle and high socioeconomic status. The early differences in learning trajectories continue to widen as children from minority groups move through elementary, middle and high school years (Beron and Farkas, 2004; Tach and Farkas, 2006; Bayder et al. 1993). In an attempt to explain the differential learning trajectories, scholars have extensively studied practices that are followed inside schools and that perpetuate the existing societal inequalities through differential treatment of students based on racial and social class status. One such controversial practice that has been widely debated is the practice of ability grouping in early elementary grades.

Numerous studies find that low income and minority students, especially Blacks and Hispanics are disproportionately represented in lower ability groups indicating their lower levels of readiness (Lee and Burkam, 2002; Oakes, 1990; Oakes, 1993; Mickelson, 2001; Jencks & Phillips, 1998; Tach and Farkas, 2006; Condron, 2008). Given the important role of teachers in decisions regarding students' placement in higher ability groups, previous research has focused on teachers' perception and evaluation of students' behavior and learning capabilities. These studies find evidence that suggests that teachers' perceptions about students are shaped by teachers' race and students' race, and more importantly, whether they share racial and socioeconomic backgrounds (Downey and Pribesh, 2004; McGrady and Reynolds, 2012). While the previous chapter analyzed the effect of placement with same-race teachers on math and reading achievement

growth, this chapter analyzes whether placement in same-race teachers' classrooms has a positive and significant effect on minority students' chances of getting placed in higher reading ability groups.

The findings show that in general assignment to same-race teachers does not have any effect on students' placement in higher reading ability groups after controlling for prior reading and math achievement scores as well as teachers' perception of students' prior learning behavior. This finding is true for kindergarten, first and third grades. However, when racialized differences in placement in higher ability groups is considered, there is a strong evidence that Hispanic students are more likely to be placed in higher ability groups in first grade when they are assigned to Hispanic teachers' classrooms. This finding is robust even after the inclusion of prior achievement scores, students' prior learning behavior, and students' placement in ability groups in kindergarten along with all other individual and classroom level control variables.

In third grade, however, assignment to same-race teachers' classrooms no longer affects minority students' chances of getting a place in higher reading ability groups. However, three findings from the third grade sample deserve careful attention. The first is that, students who are placed in higher ability groups in first grade are significantly more likely to get a place in higher ability groups in third grade. Secondly, the positive relationship between ability group placement in first and third grade also holds even when the sample consists of only Hispanic students. Therefore, based on these two findings, it is reasonable to conclude that for Hispanic students, assignment to same-race teachers in any particular grade can have long term positive consequences. One such consequence is their greater likelihood of finding a place in higher ability

groups in future grades. Additionally, given the implications of higher ability group placement on future learning outcomes (Condron, 2008; Tach and Farkas, 2006), Hispanic students who manage to get an early start due to their placement in higher reading ability groups are more likely to experience reading gains throughout their elementary, middle and high school years. Finally, a key finding of this study is that teachers' perception about students' prior learning behavior is a positive and strong predictor of reading ability group placement in all the three grades. The extant literature has highlighted that teacher' perception about student abilities are biased by racial stereotypes and that students' social class, race, sex, and ethnicity influence teachers' perception of them within classroom environment. The present study explicitly controls for this factor in all the models. If the argument suggested by the literature is true, it is likely that some of the positive effects of having a same-race teacher on ability group placement is getting captured through the variable measuring teachers' perception of student prior learning abilities.

CHAPTER 6: CONCLUSION AND POLICY IMPLICATIONS

6.1. Summary and Conclusion:

Public school reform is one of the most salient public policy issues confronting policymakers, academicians and practitioners. The public school education system continues to face myriad challenges. There is growing dissatisfaction over the quality of learning in schools in terms of both the lower graduation rates and the consistent poor performance of students in Reading, Mathematics and Science as compared to their international peers (Peterson, 2010). At the same time, persisting inequities in student achievement and attainment across racial, ethnic and socioeconomic lines continue to dominate the domestic discourse on school reform. While there have been great improvements on several fronts such as the abolition of segregated schooling by law, overall improvement in achievement levels for all groups, declines in dropout rates, greater equity in resource allocation and greater awareness towards differently-able groups, yet the progress has remained slow and in some instances it has reversed.

According to a report by the U.S Department of Education, about 70 percent of White students attend schools that are at least 75 percent White and over 50 percent of Black children attend schools that are predominantly minority with over 90% minority students. This clearly indicates the existence of segregated educational opportunity. Moreover, in large urban neighborhoods, about 90 percent of Black children attend schools that are primarily non-White (Orfield & Yun, 1999). In case of center-city

schools, data shows that 61 percent of Black students attend school where over 75 percent of students are eligible for free and reduced lunch, an indicator of their low socio-economic status (US Department of Education and National Center for Educational Statistics, 2004). While the opportunity gap remains in spite of targeted efforts, the picture is more discouraging as regards educational outcomes.

There is significant racial and social class difference in educational outcomes. According to the same report published by the Department of Education and the National Center for Education Statistics (2004), around 17.3 percent of households with children under the age of 18 years lived below poverty level in the year 2004. The high school completion rate among individuals 25 years and older was 90.1 percent for Whites, 81.5 percent for Blacks and 58.5 percent for Hispanics. Similarly, the college completion rate for individuals 25 years and older was 30.5 percent for Whites, 17.7 percent for Blacks and 12.2 percent for Hispanics. According to the 2000 National Assessment of Educational Progress (NAEP) statistics, by the end of grade 4, Blacks are almost two years behind their White peers (Cooley, 2009). More recent NAEP 2007 statistics also shows the persistence of achievement gaps between Blacks, Hispanics and Whites in the US.

Disparities in educational outcomes are often a direct consequence of disparities in educational processes. The process of learning starts in the early years of children's life and continues on to their schooling years and beyond. Since learning is a cumulative process, those who start with an advantage tend to maintain that lead over time and are usually the ones to achieve significantly higher educational outcomes. Similarly, those who fall behind early in their lives, tend to experience lower levels of achievement

throughout their schooling years (Farkas, 2003). Therefore, any analysis of the disparities in educational outcomes must look for traces of disparities in the educational processes spanning the entire learning trajectory of a child's life. In other words, it is important to trace the disparities that children encounter before they enter schools and during their schooling years.

These challenges, however, are not new and have persisted in the last few decades of the twentieth century. The successive reform efforts have failed to contain the problems. As a result, there are vigorous calls for reform along with plethora of solutions. While there is a consensus that public schools need reform, the content and mechanism of reforms are widely contested (Ravitch, 2010). There is a substantial body of literature that has explored the underlying causes behind disparity in academic achievement. Researchers have identified several schools and non-school based factors that can help better understand the growing racial, ethnic and socioeconomic gaps in educational outcomes.

The focus of the present study is on one school based factor whose relevance is increasingly being felt in the whole nation and within its school education system. This school based factor is the lack of a racially and ethnically diverse teacher workforce. The nation is experiencing rapid demographic transition due to changing immigration patterns and birth rates. Nowhere is this change more clearly visible than in the nation's public schools. School districts across the country are confronted with the challenge to meet the individual needs of a racially, culturally and linguistically diverse student population with a teacher workforce that continues to be majority White. The persisting racial and socioeconomic gaps in academic achievement have also complicated the task for school

districts. The focus on closing the achievement gap places great emphasis on the qualities of teachers and the growing cultural gap between teachers and students (Lareau, 2003; Ladson-Billings, 1995a 1995b; Achinstein and Aguirre, 2008; Eddy and Easton-Brooks, 2011). While important progress has been made toward increasing the overall number and proportion of minority teachers in the public schools, those gains have been eclipsed by the rapid growth of the minority student population. As a result, the racial and ethnic gap between minority students and their teachers has actually grown over the years.

Recent statistics show that teachers of color are not represented at all in 40 percent of schools across the nation (Aud et al., 2011; Boser, 2011; Coopersmith & Gruber, 2009; Milner, 2010). A Harvard Civil Rights Report published in 2006 found that states like California, Arizona and Texas, which have a diverse student population lack proportional representation from teachers of color. Apart from their relative paucity, teachers of color are also highly segregated. They constitute a very small and isolated minority in majority White schools and also tend to be minority in predominantly non-White schools. They comprise the majority only in heavily segregated schools that cater to children from low socioeconomic status and with lower levels of achievement (Frankenberg, 2006). Indeed, recent studies have indicated heightened levels of dissatisfaction and turnover among teachers of color than White teachers, especially those who are newly recruited into the profession (Achinstein, Ogawa, Sexton, & Freitas, 2010; Frankenberg, 2006; Ingersoll & May, 2011b).

The general shortage in the supply of minority teachers have further complicated schools districts' efforts to achieve teacher diversity across the faculty. As an

intermediate intervention strategy to address the racial and cultural gap between minority students and teachers, school administrators are using a strategy of one-to-one matching between students and teachers on the basis of race or ethnicity. Some scholars have criticized a narrowly construed policy of racial/ethnic matching of teachers and students on the grounds that it could lead to greater segregated learning environment for students within and across schools (Cizek, 1995; Dee, 2004; Eubanks & Weaver, 1999). Others have posited that minority students may in fact flourish in schools if they share special bonding with teachers of same race or ethnicity. These scholars argue that such a strategy might limit racial prejudices, and ensure that minority students receive academic and socio-emotional support in schools (Dee, 2004; Hanushek, 1992; Ehrenberg and Brewer, 1995).

Qualitative studies based on interviews with several minority teachers have highlighted one negative consequence of matching minority teachers with minority students. These studies highlight the challenges minority teachers encounter because they are often single entities in majority White teacher schools or their proportional representation is miniscule. Furthermore, these studies question the simplistic assumption that underlies the matching argument and shows even when minority teachers are matched with students from their own racial or ethnic backgrounds, their interactions are often more complicated and nuanced. These teachers also find it difficult to tap into their cultural resources and incorporate them into their teaching practices. As a result even with after sharing students' racial, cultural or linguistic backgrounds, minority teachers are often ineffective in improving the educational outcomes of minority students. These studies conclude that school context moderate the relationship between student-

teacher matching and minority students' academic achievement. One such school contextual factor is the overall diversity of the teacher workforce.

The present study makes a first attempt to examine whether overall teacher diversity in schools alter the relationship between assignment to same-race teachers and minority students' math and reading achievement growth. Apart from examining the effect of same-race teacher assignment of math and reading achievement, the study also analyzes whether it affects students' placement in higher reading ability groups. The study focuses on early elementary grades and uses a nationally representative sample of students from the Early Childhood Longitudinal dataset. The first hypothesis is tested on longitudinal data on a cohort of kindergarten students who are systematically followed through first and third grades. The second hypothesis is tested on cross-sectional data for each of the three grades.

Results from cross-classified growth models show that simply matching minority students with teachers from similar racial and ethnic backgrounds can potentially be harmful for their academic achievement. In particular, the findings suggest that from kindergarten through third grade, Black students who are assigned to Black teachers' classrooms are worse-off compared to Black students who are assigned to non-Black teachers' classrooms. The math and reading achievement trajectories for Black students who are assigned to Black teachers' classrooms in to diverge from their Black counterparts after their kindergarten entry and by third grade the two trajectories are significant different from each other. In case of Hispanic students, there is no significant difference in their math achievement growth depending on their assignment to Hispanic versus non-Hispanic teachers' classrooms. However, the reading achievement trajectory

of Hispanic students who are assigned to Hispanic teachers lag behind their Hispanic peers who are assigned to non-Hispanic teachers. Therefore, with respect to Black and Hispanic students, the findings from the present study suggest that assignment to Black teachers and Hispanic teachers respectively can in fact exacerbate the already existing disadvantages that Black and Hispanic students experience in both math and pre-reading skills when entering kindergarten.

The findings support the hypothesis that overall racial and ethnic composition of the teacher workforce in schools moderates the effects of student-teacher racial/ethnic matching in the classroom context in predicting math and reading achievement growth. The moderation is particular noticeable in case of Hispanic students. Hispanic students when assigned to Hispanic teachers' classrooms perform the poorly in math and reading only when their schools have racially uniform teacher workforce or when the overall representations of minority teachers in their schools constitute the majority. These Hispanic students who are taught by Hispanic teachers, however, perform better if their schools have either token or tilted-balanced representation of minority teachers in the overall teacher workforce. The findings do not fully support Kanter's hypothesis because Hispanic teachers are effective with Hispanic students even when their workplace have token representation of minority teachers. Hispanic teachers are also equally effective with Hispanic students when their workplace have tilted-balanced representation of minority teachers. It is only in schools with racially uniform teacher workforce and in schools where minority teachers constitute the majority that Hispanic teachers are not very effective even when they get to teach Hispanic students.

The study also sheds new light on the experiences of White students when placed with White versus non-White teachers. White students in general benefit from being in White teachers' classroom. However, when White students are in schools with more diverse teacher workforce, their math achievement trajectories are higher when they are in assigned to non-White teachers' classrooms compared to White students who are assigned to White teachers' classrooms. This finding suggests that the argument that diversifying the teacher workforce is likely to harm the majority group is not fully justified. However, further analysis is needed to examine the consistency of this finding.

Finally, the study finds evidence that Hispanic first graders are more likely to be placed in higher ability groups when these students are assigned to Hispanic teachers. Moreover, Hispanic students who manage to get into higher reading ability groups in first grade are also more likely to get a placement in higher reading ability groups in third grade.

6.2. Policy Implications:

The study's findings have important implications for minority teachers' recruitment policies in school districts. The findings also have implications in the decision that school principals' make regarding assignment of minority teachers to minority students inside schools. A key policy implication of the present study is that assigning Black and Hispanic students to same-race teachers does not improve their math and reading achievement growth. In fact, these students are worse-off when they are assigned to same-race teachers' classrooms compared to their peers who are assigned to teachers of a different race/ethnicity. Therefore, simply matching minority students with

minority teachers is likely to have short and long term negative consequences on their academic achievement.

A second policy implication is that same-race teacher assignment may not have a direct benefit in terms of improving minority students' academic achievement, but it might positively affect their chances of placement in higher ability groups. There is some support that teachers' perception of minority students may have a racial dimension. Since, this evidence is only for Hispanic first graders, it is not conclusive.

A third policy implication is that the overall presence of minority teachers in the school must be taken into consideration when assigning Hispanic teachers to Hispanic students. This is important in order to eliminate feelings of alienation among Hispanic teachers. Since, these teachers mostly get to teach Hispanic English language learners, they need special assistance from their colleagues to effectively meet the needs of Hispanic LEP students. Such assistance can be in the form of mentoring from colleagues, more flexibility to allow Hispanic teachers to try out innovative non-traditional ways of instruction in their classes, and also to better engage with the families of Hispanic LEP students. Schools that have a diverse group of teachers are more likely to appreciate such efforts. The findings, therefore, clearly make the case for recruitment of more minority teachers and faculty diversification across the board. Until a desired level of teacher diversity is achieved in all schools across the nation, all teachers need professional development with special emphasis on diversity management so that they can effectively meet the needs of diverse students.

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APPENDIX: TABLES and FIGURES

Table 1: Description of the variables in the growth models predicting math and reading achievement growth in kindergarten, first and third grades

Variables	Description
Dependent variable	
Math IRT scale score	ECLSK dataset provides math scales score that are calculated using the Item Response Theory (IRT) procedure. IRT uses the pattern of right, wrong, and omitted responses to the items actually administered in a test and the difficulty, discriminating ability, and "guess-ability" of each item to place each child on a continuous ability scale. Unlike raw scoring, which, in effect, treats omitted items as if they had been answered incorrectly, IRT procedures use the pattern of responses to estimate the probability of correct responses for all test questions. Finally, IRT scoring makes possible longitudinal measurement of gain in achievement over time, even though the tests administered are not identical at each point.
Reading IRT scale score	Reading IRT scale score are calculated in the same manner as math IRT scores
Student variables	
Race	Hispanic, Black, White
Gender	Male=1, Female=0
Socioeconomic status	A composite of five variables: father's education and occupation, mother's education and occupation, and household income. SES is a continuous variable
Language spoken at home	Student speaks non-English language at home=1
Parental expectations	Dummy variable (1= to earn a Master's degree or more)
If the child's school is a choice school	Dummy variable (1= school is choice school)
Classroom level variables	
Same-race teacher	A dummy variable indicating whether a student shares racial/ethnic identity with the classroom teacher
Teacher experience (in years)	Number of years the teacher has been teaching in the current school
Teacher highest education level	Teacher's highest level of education (1=Master's and higher)
Teacher certification	Type of teaching certification (1=the highest certification available: regular, permanent or long term)
Student diversity in classroom	This measure is based on the Simpson's index of diversity. It is derived by taking the proportion of students in class that are Hispanic, African-American, White, Asian, American-Indian and Hawaiian native
School level variables	
Teacher diversity in school	This measure is based on the Simpson's index of diversity. It is derived by taking the proportion of teachers in school that are Hispanic, African-American, White, Asian, American-Indian and Hawaiian native
Kanter's measure of teacher diversity	Derived using the variable percentage of minority teachers in schools: 1.Racially Uniform (Percentage of minority teachers=0 or percentage of minority teachers=1), 2. Tokens (0<Percentage of minority teachers<=.15), 3. Titled/Balanced (.15<Percentage of minority teachers<=.50), 4: Minority-Majority (.50<Percentage of minority teachers<1).
School type (private vs. public)	Dummy variable (1=private)
School size	Log of total school enrollment
School principal is Black	Dummy variable (1=Principal is Black)
School is a Title1 school	Dummy variable (1=School receives Title1 funds)

Table 1 (continued)	
School quality	Percentage of students in school who are tested at or above grade level nationally in math and reading
Socioeconomic status of schools	Percentage of free & reduced lunch students in school
School location: urban (reference category)	Dummy variable (1=urban School)
School location: suburban	Dummy variable (1=suburban school)
School location: rural	Dummy variable (1=rural School)
School region: north-east	Dummy variable (1=north-east)
School region: mid-west	Dummy variable (1=mid-west)
School region: south (reference category)	Dummy variable (1=south)
School region: west	Dummy variable (1=west)

Table 2: Means and standard deviations for variables from the early childhood longitudinal survey (ECLS-K) predicting math and reading achievement growth in kindergarten, first and third grades

	Time-invariant variables		
Student level			
Black	.15 (.39)		
Hispanic	.16 (.39)		
Low SES	.34 (.57)		
High SES	.29 (.49)		
Male	.51 (.53)		
English as a second language	.09 (.34)		
	Time-varying variables		
	Kindergarten	First	Third
Math irt scale score	36.76 (13.74)	62.46 (19.29)	99.18 (25.3)
Reading irt scale score	46.42 (16.58)	77.49 (25.34)	126.83 (29.2)
Teacher diversity in school (simpson's index)	.13 (.30)	.16 (.25)	.17 (.21)
Minority teachers' representation reflects tokenism	.36 (.81)	.30 (.81)	.30 (.89)
Minority teachers' representation is tilted to balanced	.18 (1.02)	.19 (.83)	.22 (.87)
Minority teachers are the majority in schools	.07 (.32)	.10 (.41)	.11 (.49)
Racially uniform teacher schools (reference)	.39 (1.39)	.42 (.57)	.36 (.62)
Same-race teacher	.75 (.52)	.72 (.45)	.72 (.44)
Student level			
Parental expectations	.25 (.47)	.23 (.50)	.20 (.42)
Choice school	.48 (.55)	.48 (.51)	.47 (.56)
Teacher/classroom level			
Teacher experience (in years)	9.68 (.8.94)	9.43 (.8.40)	9.34 (.5.94)
Teacher highest education level	.98 (.13)	.86 (.20)	.86 (.22)
Teacher certification	.89 (.70)	.89 (.29)	.89 (.23)
Student diversity in classroom	.25 (.25)	.26 (.30)	.26 (.22)
School level			
School type (private vs. public)	.16 (.42)	.15 (.38)	.15 (.37)
School size (log of total school enrollment)	6.03 (.87)	6.11 (.59)	6.07 (.65)
Percentage of students in school who are tested at or above grade level nationally in math and reading			
School principal is black	.11 (.43)	.09 (.41)	.08 (.32)

Table 2 (continued)			
School is a title1 school	.65 (.68)	.65 (.53)	.64 (.46)
School quality	.63 (.45)	.63 (.40)	.64 (.23)
Suburban	.22 (.47)	.19 (.41)	.20 (.40)
Rural	.26 (.46)	.29 (.49)	.27 (.47)
Northeast	.15 (.38)	.14 (.36)	.13 (.35)
Midwest	.24 (.53)	.22 (.50)	.25 (.47)
West	.16 (.66)	.18 (.42)	.18 (.42)
Note: weighted			

Table 3: Description of the variables in the hierarchical linear models for explaining student placement in ability groups	
Variables	Description
Dependent variable	
Reading ability group placement z-score	Standardized reading group placement for child. This variable is calculated using two different variables: a) Total number of reading ability group present in the class and b) Child's placement in reading ability groups. Students not in ability grouped classrooms were set to zero. This variable is collected during the spring of kindergarten, first and third grades. Appendix A contains more details about this measure.
Student variables	
Race	Hispanic, Black, White
Gender	Male=1, Female=0
Socioeconomic status	A composite of five variables: father's education and occupation, mother's education and occupation, and household income. SES is a continuous variable
Age	Age of child in months at kindergarten entry
Reading achievement scale score	Standardized IRT test of reading achievement in Fall and Spring of Kindergarten, Spring of First and Third grades
Math achievement scale score	Standardized IRT test of reading achievement in Fall and Spring of Kindergarten, Spring of First and Third grades
Learning behavior of students	Standardized approaches to learning: a scale of six items measuring child's attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization
Classroom level variables	
Same-race teacher	A dummy variable indicating whether a student shares racial/ethnic identity with the classroom teacher
Average age of students in class	Classroom-level mean values for student-level variable 'age'
Male students (%)	Percentage of male students in class
Black students (%)	Percentage of Black students in class
Hispanic students (%)	Percentage of Hispanic students in class
American-Indian students (%)	Percentage of American-Indian students in class
Asian students (%)	Percentage of Asian students in class
Average SES in class	Average socioeconomic status of students in class
Average reading score in class	Average reading score of students in class
Average math score in class	Average math score of students in class
Average learning behavior score in class	Average learning behavior of students in class

Table 4: Distribution of students by assignment to same-race teachers

	Kindergarten	First	Third
Black	31	32	24
Hispanic	33	24	24
White	92	94	87

Table 5: Distribution of students by schools with varying levels of teacher diversity

	Kindergarten	First	Third
Racially uniform teacher schools	42	45	37
Token minority teachers	33	28	31
Tilted-balanced minority teachers	17	16	19
Minority-majority teachers	8	11	13

Table 6: Slopes and standard errors from cross-classified growth model predicting mathematics and reading achievement growth in kindergarten, first, and third grades

Mathematics achievement								
	Estimate	SE		Estimate	SE		Estimate	SE
Initial score in kindergarten	45	1.42***	Growth in first grade	30.04	1.49***	Growth in third grade	81.73	1.57***
Black	-4.26	0.88***	Black	-3.33	0.77***	Black	-14.03	0.93***
Hispanic	-2.55	0.93**	Hispanic	-1.01	0.96	Hispanic	-3.89	(1.13)***
Low SES	-1.80	0.63**	Low SES	-3.82	0.67***	Low SES	-6.96	0.70***
High SES	3.00	0.64***	High SES	4.28	0.65***	High SES	7.02	0.74***
Reading achievement								
Initial score in kindergarten	44.15	1.45***	Growth in first grade	30.27	1.63***	Growth in third grade	81.71	1.63***
Black	-4.00	0.82***	Black	-4.31	0.78***	Black	-14.29	0.97***
Hispanic	-2.25	0.92*	Hispanic	-1.51	0.96	Hispanic	-4.53	1.08***
Low SES	-2.67	0.65***	Low SES	-3.79	0.67***	Low SES	-6.75	0.68***
High SES	2.93	0.65***	High SES	4.03	0.68***	High SES	7.13	0.71***

Notes: *** p<.001, ** p<.01, * p<.05 ^ p<.10;
All control variables are applied in each model

Table 7: Slopes and standard errors from cross-classified growth model predicting mathematics achievement growth in kindergarten, first, and third grades

	Estimate	SE		Estimate	SE		Estimate	SE
Model 1								
Initial score in kindergarten	34.06	1.12***	Growth in first grade	24.38	1.28***	Growth in third grade	63.41	1.48***
Same-race teacher	.98	.56	Same-race teacher	.36	.68	Same-race teacher	-1.50	1.23
Simpson teacher diversity in school	.40	2.39	Simpson teacher diversity in school	.34	1.22	Simpson teacher diversity in school	1.53	1.65
Model 2								
Initial score in kindergarten	34.91	1.18***	Growth in first grade	23.81	1.17***	Growth in third grade	62.65	1.64***

Table 7 (continued)								
Same-race teacher	.15	.52	Same-race teacher	.78	.67	Same-race teacher	-1.39	1.20
Student diversity in classroom	.88	1.27	Student diversity in classroom	1.33	.98	Student diversity in classroom	5.76	1.27***
Model 3								
Initial score in kindergarten	34.68	1.20***	Growth in first grade	22.91	1.37***	Growth in third grade	62.82	2.21***
Same-race teacher	.57	.63	Same-race teacher	.71	.76	Same-race teacher	-1.31	1.61
Simpson teacher diversity in school	.80	1.79	Simpson teacher diversity in school	-.52	1.36	Simpson teacher diversity in school	-1.52	2.32
Student diversity in classroom	-.20	1.18	Student diversity in classroom	1.40	1.54	Student diversity in classroom	6.01	1.92**
Model 4								
Initial score in kindergarten	34.49	1.37***	Growth in first grade	22.92	1.59***	Growth in third grade	59.00	2.77***
Black	-5.61	1.39***	Black	-2.99	1.63^	Black	-7.27	2.79*
Hispanic	-2.00	1.27	Hispanic	-.06	1.51	Hispanic	.85	2.61
Same-race teacher	1.11	.91	Same-race teacher	.50	1.30	Same-race teacher	2.65	2.52
Simpson teacher diversity in school	.90	2.64	Simpson teacher diversity in school	1.90	2.08	Simpson teacher diversity in school	2.13	3.84
Student diversity in classroom	-.29	1.18	Student diversity in classroom	.95	1.47	Student diversity in classroom	5.08	2.23*
Same-race teacher* Black	-.17	1.39	Same-race teacher* Black	-.43	1.77	Same-race teacher* Black	-7.74	2.62**
Same-race teacher* Hispanic	-1.89	1.36	Same-race teacher* Hispanic	1.73	2.01	Same-race teacher* Hispanic	-4.09	3.35
Simpson teacher diversity* Black	.85	3.74	Simpson teacher diversity* Black	-4.80	3.83	Simpson teacher diversity* Black	-2.71	5.94
Simpson teacher diversity* Hispanic	-1.06	3.45	Simpson teacher diversity* Hispanic	-4.80	3.25	Simpson teacher diversity* Hispanic	-4.58	5.20
Model 5								
Initial score in kindergarten	36.38	1.68***	Growth in first grade	18.50	2.17***	Growth in third grade	55.16	2.81***
Black	-7.29	1.70***	Black	.85	2.14	Black	-2.87	3.08
Hispanic	-4.25	1.59**	Hispanic	4.27	2.02*	Hispanic	4.53	2.79
Same-race teacher	-.86	1.33	Same-race teacher	4.99	1.85**	Same-race teacher	6.61	2.60*
Simpson teacher diversity in school	-7.40	4.96	Simpson teacher diversity in school	21.70	7.53**	Simpson teacher diversity in school	19.43	8.45*

Table 7 (continued)								
Student diversity in classroom	-.57	1.21	Student diversity in classroom	1.39	1.49	Student diversity in classroom	5.40	2.26
Same-race teacher* Black	1.07	2.98	Same-race teacher* Black	-3.60	3.25	Same-race teacher* Black	-13.68	4.01***
Same-race teacher* Hispanic	2.98	2.32	Same-race teacher* Hispanic	-2.68	3.11	Same-race teacher* Hispanic	-6.43	6.05
Simpson teacher diversity* Black	8.90	5.72	Simpson teacher diversity* Black	-23.33	8.52**	Simpson teacher diversity* Black	-23.19	9.91*
Simpson teacher diversity* Hispanic	9.05	5.55	Simpson teacher diversity* Hispanic	-25.09	8.17**	Simpson teacher diversity* Hispanic	-21.99	10.37*
Simpson teacher diversity* same-race teacher	9.97	4.75*	Simpson teacher diversity* same-race teacher	-23.04	8.36**	Simpson teacher diversity* same-race teacher	-20.41	10.20^
Simpson teacher diversity* same-race teacher* Black	-8.17	8.64	Simpson teacher diversity* same-race teacher* Black	19.03	12.40	Simpson teacher diversity* same-race teacher* Black	29.16	12.91*
Simpson teacher diversity* same-race teacher* Hispanic	-18.27	6.84**	Simpson teacher diversity* same-race teacher* Hispanic	23.85	10.19*	Simpson teacher diversity* same-race teacher* Hispanic	17.72	16.18
Model 6								
Initial score in kindergarten	35.06	1.83***	Growth in first grade	26.18	3.54***	Growth in third grade	55.32	4.04***
Black	-3.99	2.20^	Black	-4.30	3.73	Black	-4.77	4.23
Hispanic	-1.84	2.11	Hispanic	-1.41	3.70	Hispanic	2.93	4.90
Same-race teacher	1.92	1.83	same-race teacher	-.81	3.55	Same-race teacher	5.20	4.23
Kanter teacher diversity in school	1.20	.70	Kanter teacher diversity in school	-.79	1.50	Kanter teacher diversity in school	1.53	1.61
Student diversity in classroom	1.16	1.29	Student diversity in classroom	.69	1.10	Student diversity in classroom	5.36	1.31***
Same-race teacher* Black	1.35	3.26	Same-race teacher* Black	1.09	5.29	Same-race teacher* Black	-8.46	6.98
Same-race teacher* Hispanic	-2.14	3.62	Same-race teacher* Hispanic	-1.03	5.00	Same-race teacher* Hispanic	11.90	7.97
Kanter teacher diversity* Black	-.79	.88	Kanter teacher diversity* Black	.13	1.61	Kanter teacher diversity* Black	-1.65	1.82

Table 7 (continued)								
Kanter teacher diversity* Hispanic	-.30	.81	Kanter teacher diversity* Hispanic	.13	1.55	Kanter teacher diversity* Hispanic	-1.96	1.85
Kanter teacher diversity* same-race teacher	-.57	.72	Kanter teacher diversity* same-race teacher	.63	1.50	Kanter teacher diversity* same-race teacher	-1.72	1.65
Kanter teacher diversity* same-race teacher* Black	-.43	1.24	Kanter teacher diversity* same-race teacher* Black	-.60	1.98	Kanter teacher diversity* same-race teacher* Black	1.01	2.63
Kanter teacher diversity* same-race teacher* Hispanic	.09	1.42	Kanter teacher diversity* same-race teacher* Hispanic	.80	1.94	Kanter teacher diversity* same-race teacher* Hispanic	-5.23	2.77^
Notes: *** p<.001, ** p<.01, * p<.05 ^ p<.10; All control variables are applied in each model								

Table 8: Slopes and standard errors from cross-classified growth model predicting reading achievement growth in kindergarten, first, and third grades								
	Estimate	SE		Estimate	SE		Estimate	SE
Model 1								
Initial score in kindergarten	43.44	1.33***	Growth in first grade	31.01	1.58***	Growth in third grade	86.83	2.23***
Same-race teacher	1.24	.66	Same-race teacher	-.77	.82	Same-race teacher	-2.58	1.53
Simpson teacher diversity in school	4.38	2.96	Simpson teacher diversity in school	-4.61	1.98*	Simpson teacher diversity in school	-8.87	2.28***
Model 2								
Initial score in kindergarten	44.86	1.46***	Growth in first grade	29.98	1.60***	Growth in third grade	84.56	2.53***
Same-race teacher	.76	.72	Same-race teacher	-.75	1.03	Same-race teacher	-3.01	1.71
Student diversity in classroom	.88	1.46	Student diversity in classroom	.41	1.28	Student diversity in classroom	1.16	1.42
Model 3								
Initial score in kindergarten	44.35	1.48***	Growth in first grade	30.43	1.70***	Growth in third grade	86.46	2.85***
Same-race teacher	.80	.76	Same-race teacher	-.83	1.04	Same-race teacher	-2.86	2.36
Simpson teacher diversity in school	4.24	2.76	Simpson teacher diversity in school	-5.19	2.14*	Simpson teacher diversity in school	-11.09	2.80***
Student diversity in classroom	-.68	1.32	Student diversity in classroom	.97	1.46	Student diversity in classroom	2.49	1.88

Table 8 (continued)								
Model 4								
Initial score in kindergarten	45.48	1.69***	Growth in first grade	28.60	2.31***	Growth in third grade	78.95	3.61***
Black	-5.54	1.68**	Black	-1.36	2.33	Black	-5.57	3.98
Hispanic	-2.17	1.51	Hispanic	1.66	2.27	Hispanic	4.55	3.62
Same-race teacher	-.24	1.20	Same-race teacher	1.53	1.97	Same-race teacher	5.51	3.78
Simpson teacher diversity in school	5.75	3.65	Simpson teacher diversity in school	-4.19	3.53	Simpson teacher diversity in school	-5.74	5.76
Student diversity in classroom	-.90	1.31	Student diversity in classroom	.66	1.52	Student diversity in classroom	.96	2.05
Same-race teacher* Black	2.48	1.83	Same-race teacher* Black	-3.21	2.77	Same-race teacher* Black	-13.62	3.56***
Same-race teacher* Hispanic	.91	1.78	Same-race teacher* Hispanic	-4.56	3.24	Same-race teacher* Hispanic	-12.81	3.93**
Simpson teacher diversity* Black	-1.94	4.43	Simpson teacher diversity* Black	.87	4.98	Simpson teacher diversity* Black	-2.58	9.15
Simpson teacher diversity* Hispanic	-5.30	3.77	Simpson teacher diversity* Hispanic	-.47	5.49	Simpson teacher diversity* Hispanic	-3.61	8.51
Model 5								
Initial score in kindergarten	45.92	2.04***	Growth in first grade	23.17	2.96***	Growth in third grade	76.52	4.26***
Black	-6.51	2.08***	Black	4.74	3.27	Black	-1.16	5.27
Hispanic	-3.23	2.04**	Hispanic	7.54	2.88*	Hispanic	7.44	4.13
Same-race teacher	-.72	1.80	Same-race teacher	7.10	2.94*	Same-race teacher	8.07	4.61
Simpson teacher diversity in school	4.03	5.76	Simpson teacher diversity in school	20.19	10.64^	Simpson teacher diversity in school	4.95	12.02
Student diversity in classroom	-1.05	1.31	Student diversity in classroom	1.15	1.52	Student diversity in classroom	1.05	2.02
Same-race teacher* Black	5.80	3.53	Same-race teacher* Black	-12.60	4.53**	Same-race teacher* Black	-23.34	6.65**
Same-race teacher* Hispanic	4.79	3.02	Same-race teacher* Hispanic	-12.62	5.10*	Same-race teacher* Hispanic	-17.53	8.31*
Simpson teacher diversity* Black	1.97	6.77	Simpson teacher diversity* Black	-27.14	11.18*	Simpson teacher diversity* Black	-21.82	16.24
Simpson teacher diversity* Hispanic	-.85	6.71	Simpson teacher diversity* Hispanic	-27.56	9.79**	Simpson teacher diversity* Hispanic	-16.53	12.96

Table 8 (continued)								
Simpson teacher diversity* same-race teacher	2.40	6.73	Simpson teacher diversity* same-race teacher	-28.46	12.37	Simpson teacher diversity* same-race teacher	-12.86	12.54
Simpson teacher diversity* same-race teacher* Black	-10.94	10.18	Simpson teacher diversity* same-race teacher* Black	41.34	17.74*	Simpson teacher diversity* same-race teacher* Black	39.25	23.48
Simpson teacher diversity* same-race teacher* Hispanic	-12.33	10.05	Simpson teacher diversity* same-race teacher* Hispanic	36.90	13.98*	Simpson teacher diversity* same-race teacher* Hispanic	20.12	20.56
Model 6								
Initial score in kindergarten	47.12	2.63***	Growth in first grade	32.20	3.13***	Growth in third grade	80.51	5.33***
Black	-4.52	2.94	Black	-.73	3.62	Black	-.92	5.35
Hispanic	-3.35	3.15	Hispanic	.10	3.75	Hispanic	-.32	6.37
Same-race teacher	.02	2.64	Same-race teacher	.27	3.19	Same-race teacher	3.98	5.77
Kanter teacher diversity in school	.88	1.04	Kanter teacher diversity in school	-.81	1.32	Kanter teacher diversity in school	-.13	2.23
Student diversity in classroom	.94	1.51	Student diversity in classroom	.01	1.42	Student diversity in classroom	.90	1.54
Same-race teacher* Black	1.87	4.83	Same-race teacher* Black	-2.63	6.55	Same-race teacher* Black	-25.86	12.03*
Same-race teacher* Hispanic	1.30	4.32	Same-race teacher* Hispanic	-4.23	6.58	Same-race teacher* Hispanic	18.31	9.43^
Kanter teacher diversity* Black	-.34	1.24	Kanter teacher diversity* Black	-.42	1.52	Kanter teacher diversity* Black	-3.13	2.24
Kanter teacher diversity* Hispanic	.29	1.28	Kanter teacher diversity* Hispanic	.51	1.50	Kanter teacher diversity* Hispanic	.68	2.66
Kanter teacher diversity* same-race teacher	-.21	1.11	Kanter teacher diversity* same-race teacher	.93	1.35	Kanter teacher diversity* same-race teacher	.38	2.39
Kanter teacher diversity* same-race teacher* Black	.25	1.95	Kanter teacher diversity* same-race teacher* Black	-.66	2.42	Kanter teacher diversity* same-race teacher* Black	5.49	4.25

Table 8 (continued)								
Kanter teacher diversity* same-race teacher* Hispanic	-.42	1.76	Kanter teacher diversity* same-race teacher* Hispanic	-.66	2.60	Kanter teacher diversity* same-race teacher* Hispanic	-11.94	3.53***
Notes: *** p<.001, ** p<.01, * p<.05 ^ p<.10; All control variables are applied in each model								

Table 9: Summary statistics of the variables in the hierarchical linear models for explaining student placement in ability groups

Variables	Kindergarten		First		Third	
	Mean	SD	Mean	SD	Mean	SD
Dependent variable						
Reading ability group placement z-score	0	.62	0	1.0	0	.97
Student variables						
Black	.17	.38	.17	.42	.17	.45
Hispanic	.20	.40	.20	.44	.20	.48
White (reference category)	.62	.49	.62	.54	.59	.58
Gender (1=Male)	.51	.50	.51	.55	.52	.61
Socioeconomic status	-.04	.79	-.06	.92	-.11	.92
Age (in months)	65.56	4.38	86.96	4.92	111.23	5.84
Reading achievement z score during fall of kindergarten	0	1				
Math achievement z score during fall of kindergarten	0	1				
Reading achievement z score during spring of kindergarten			0	1		
Math achievement z score during spring of kindergarten			0	1		
Reading achievement z score during spring of first grade					0	1
Math achievement z score during spring of first grade					0	1
Learning behavior z score during fall of kindergarten	0	1				
Learning behavior z score during spring of kindergarten			0	1		
Learning behavior z score during spring of first grade					0	1
Classroom level variables						
Same-race teacher	.68	.52	.69	.61	.61	.85
Average age (in months) of students in class	65.88	2.70	87.04	3.54	111.22	4.68
Male students (percentage)	.51	.30	.50	.35	.52	.46
Black students (percentage)	.19	.39	.18	.37	.13	.30
Hispanic students (percentage)	.17	.37	.16	.33	.12	.30

Table 9 (continued)						
Average ses in class	-.04	.56	-.06	.78	-.10	1.01
Average reading score in class	-.03	.61	-.02	.67	-.04	.90
Average math score in class	-.02	.62	-.03	.70	-.03	.90
Average learning behavior score in class	-.01	.63	-.01	.69	-.05	.95
Note: kindergarten (total students: 11,260; total classrooms: 2,180); first grade (total students: 12,400; total classrooms: 3,730); third grade (total students: 11,860; total classrooms: 5,570)						

Table 10: Reading[1] ability grouping by grade, race and socioeconomic status				
Overall levels of ability grouping practices		Kindergarten (%)	First (%)	Third (%)
Percentage of students placed in ability groups		38	71	51
Ability grouping by race/ethnicity				
Black	non-grouped	53	28	41
	high ability group	20	28	21
	low ability group	27	44	38
Hispanic	non-grouped	57	23	43
	high ability group	18	31	23
	low ability group	25	46	34
White	non-grouped	66	31	53
	high ability group	16	32	24
	low ability group	18	37	23
Ability grouping by socioeconomic status				
Low SES	non-grouped	61	26	44
	high ability group	15	27	19
	low ability group	23	47	37
Middle SES	non-grouped	63	30	50
	high ability group	17	31	24
	low ability group	20	33	26
High SES	non-grouped	63	30	53
	high ability group	19	36	27
	low ability group	18	33	20
Note: [1]In kindergarten, reading refers to "pre-reading" skills as most kindergartners are not able to read.				

Table 11: Slopes and standard errors from HLM analyses of kindergarten ability group placement

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Intercept	.76	.19***	.73	.19***	.44	0.19*	.34	.19	.40	.20*	.35	.20
Key independent variables												
Black	-.12	.02***	-.10	.02***	-.04	.02	-.03	.02	-.03	.03	-.01	.04
Hispanic	-.10	.02***	-.10	.02**	.00	.02	.00	.02	-.02	.03	.00	.04
Same-race teacher	-	-	-	-	-	-	-	-	-.01	.02	.02	.03
Same-race teacher*Black	-	-	-	-	-	-	-	-	-	-	-.03	.05
Same-race teacher*Hispanic	-	-	-	-	-	-	-	-	-	-	-.05	.05
Additional student level variables												
Gender	-.05	.01***	-.05	.01***	-.04	.01***	-.01	.01*	-.01	.01*	-.01	.01^
Age (in months)	.07	.01***	.07	.01***	.02	.01***	.01	.01	.01	.01	.01	.01
Socioeconomic status	-	-	.10	.01***	.03	.01***	.02	.01*	.02	.01**	.02	.01**
Reading achievement scale score (fall of kindergarten)	-	-	-	-	.12	.01***	.10	.01***	.11	.01***	.10	.01***
Math achievement scale score (fall of kindergarten)	-	-	-	-	.16	.01***	.11	.01***	.12	.01***	.12	.01***
Learning behavior of students (fall of kindergarten)	-	-	-	-	-	-	.12	.01***	.13	.01***	.13	.01***
Classroom level variables												
Average age of students in class	-.01	.00***	-.01	.00***	-.01	.00*	.00	.00^	-.01	.00	.01	.00
Percentage of male students in class	.00	.03	.00	.03	.01	.03	.00	.03	-.02	.03	-.01	.03
Percentage of Black students in class	.08	.03*	.07	.03*	.04	.03	.04	.03	.05	.03	.05	.04
Percentage of Hispanic students in class	.04	.03	.02	.03	.00	.03	.00	.03	.01	.03	.02	.04
Average SES in class	-	-	-.10	.02***	-.11	.02***	-.10	.02***	-.10	.02***	-.10	.02***
Average reading score in class in fall of kindergarten	-	-	-	-	-.03	.02	-.02	.02	-.02	.02	-.02	.03
Average math score in class in fall of kindergarten	-	-	-	-	-.10	.02**	-.07	.02**	-.08	.02**	-.08	.02**
Average learning behavior score in class in fall of kindergarten	-	-	-	-	-	-	-.03	.01*	-.03	.01*	-.03	.01*

Table 12: Slopes and standard errors from HLM analyses of first grade ability group placement

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Intercept	-.15	.35	-.18	.34	.26	.32	.25	.32	.44	.31	.52	.31	.55	.30
Key independent variables														
Black	-.17	.04***	-.11	.04**	.01	.03	.02	.03	.05	.04	-.04	.06	-.04	.06
Hispanic	-.15	.03***	-.08	.03*	.02	.03	.00	.03	.04	.04	-.06	.06	-.06	.06
Same-race teacher	-	-	-	-	-	-	-	-	.04	.03	-.07	.05	-.06	.05
Ability group placement in kindergarten													.20	.01***
Same-race teacher* Black	-	-	-	-	-	-	-	-	-	-	.14	.08^	.14	.08
Same-race teacher* Hispanic	-	-	-	-	-	-	-	-	-	-	.26	.07***	.24	.07***

Table 12 (continued)

Additional student level variables														
Gender	-.16	.02***	-.17	.02***	-.14	.02***	-.08	.02***	-.09	.02***	-.08	.02***	-.08	.02***
Age (in months)	.01	.00**	.01	.00**	-.01	.00**	-.01	.00***	-.01	.00***	-.01	.00***	-.01	.00***
Socioeconomic status	-	-	.22	.02***	.09	.01***	.08	.01***	.08	.01***	.08	.01***	.07	.01***
Reading achievement scale score (spring of kindergarten)	-	-	-	-	.29	.01***	.26	.01***	.27	.01***	.27	.01***	.24	.01***
Math achievement scale score (spring of kindergarten)	-	-	-	-	.23	.01***	.18	.01***	.19	.01***	.19	.01***	.17	.01***
Learning behavior of students (spring of kindergarten)	-	-	-	-	-	-	.14	.01***	.15	.01***	.15	.01***	.12	.01***
Classroom level variables														
Average age of students in class	.00	.00	.00	.00	.00	.00	.00	.00	-.01	.00	-.01	.00	-.01	.00
Percentage of male students in class	.04	.04	.04	.04	.06	.03	.07	.03*	.06	.03	.06	.03	.05	.03
Percentage of Black students in class	.06	.05	.09	.05	.06	.05	.06	.05	.03	.05	.02	.05	.02	.05
Percentage of Hispanic students in class	.07	.04	.10	.05*	.05	.04	.07	.04	.06	.05	.02	.05	.03	.05
Average SES in class	-	-	-.09	.02***	-.16	.02***	-.16	.02***	-.17	.02***	-.16	.02***	-.15	.01***
Average reading score in class in spring of kindergarten	-	-	-	-	-.08	.03*	-.06	.03*	-.07	.03*	-.07	.03*	-.07	.03*
Average math score in class in spring of kindergarten	-	-	-	-	-.06	.03*	-.03	.03	-.03	.03	-.03	.03	-.02	.03
Average learning behavior score in class in spring of kindergarten	-	-	-	-	-	-	-.03	.02	-.03	.02	-.03	.02	-.02	.02

Table 13: Slopes and standard errors from HLM analyses of third grade ability group placement

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7©	
	Estimate	SE	Estimate	SE	Estim Ate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Intercept	-.51	.43	-.49	.43	.37	.44	.38	.45	.37	.44	.55	.42	.33	1.07
Key independent variables														
Black	-.20	.04***	-.16	.04***	-.06	.03	-.05	.04	-.04	.04	-.07	.04	-	-
Hispanic	-.05	.04	.01	.04	.06	.04	.05	.04	.06	.04	.04	.04	-	-
Same-race teacher	-	-	-	-	-	-	-	-	.01	.02	-.02	.02	.03	.05
Ability group placement in first grade	-	-	-	-	-	-	-	-	-	-	.10	.01***	.10	.02***
Additional student level variables														
Gender	-.06	.02**	-.06	.02***	-.06	.02**	-.02	.02	-.02	.02	-.01	.02	-.05	.04
Age (in months)	.00	.00	.00	.00	.00	.00	.00	.00*	.00	.00*	.00	.00	.00	.01
Socioeconomic status	-	-	.18	.01***	.09	.01***	.08	.01***	.08	.01***	.09	.02***	.04	.04
Reading achievement scale score (spring of first grade)	-	-	-	-	.23	.01***	.19	.01***	.19	.01***	.14	.01***	.15	.04**

Table 13 (continued)														
Math achievement scale score (spring of first grade)	-	-	-	-	.12	.01***	.08	.01***	.08	.01***	.08	.01***	.09	.04*
Learning behavior of students (spring of first grade)	-	-	-	-	-	-	.11	.01***	.11	.01***	.09	.01***	.07	.03*
Classroom level variables														
Average age of students in class	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
Percentage of male students in class	-.05	.03	-.04	.03	.01	.03	.01	.03	.01	.03	-.01	.03	.05	.06
Percentage of Black students in class	.01	.04	.04	.04	.02	.04	.01	.04	.01	.04	.04	.04	.14	.16
Percentage of Hispanic students in class	-.07	.05	-.03	.05	-.04	.04	-.04	.04	-.04	.04	-.02	.04	.04	.07
Average SES in class	-	-	-.05	.02*	-.11	.02***	-.11	.02***	-.11	.02***	-.11	.02***	-.05	.05
Average reading score in class in spring of first grade	-	-	-	-	-.02	.02	.01	.02	.01	.02	.03	.02	.00	.05
Average math score in class in spring of first grade	-	-	-	-	-.05	.02**	-.03	.02	-.03	.02	-.03	.02	.00	.06
Average learning behavior score in class in spring of first grade	-	-	-	-	-	-	-.05	.02**	-.05	.02**	-.04	.02**	-.04	.04

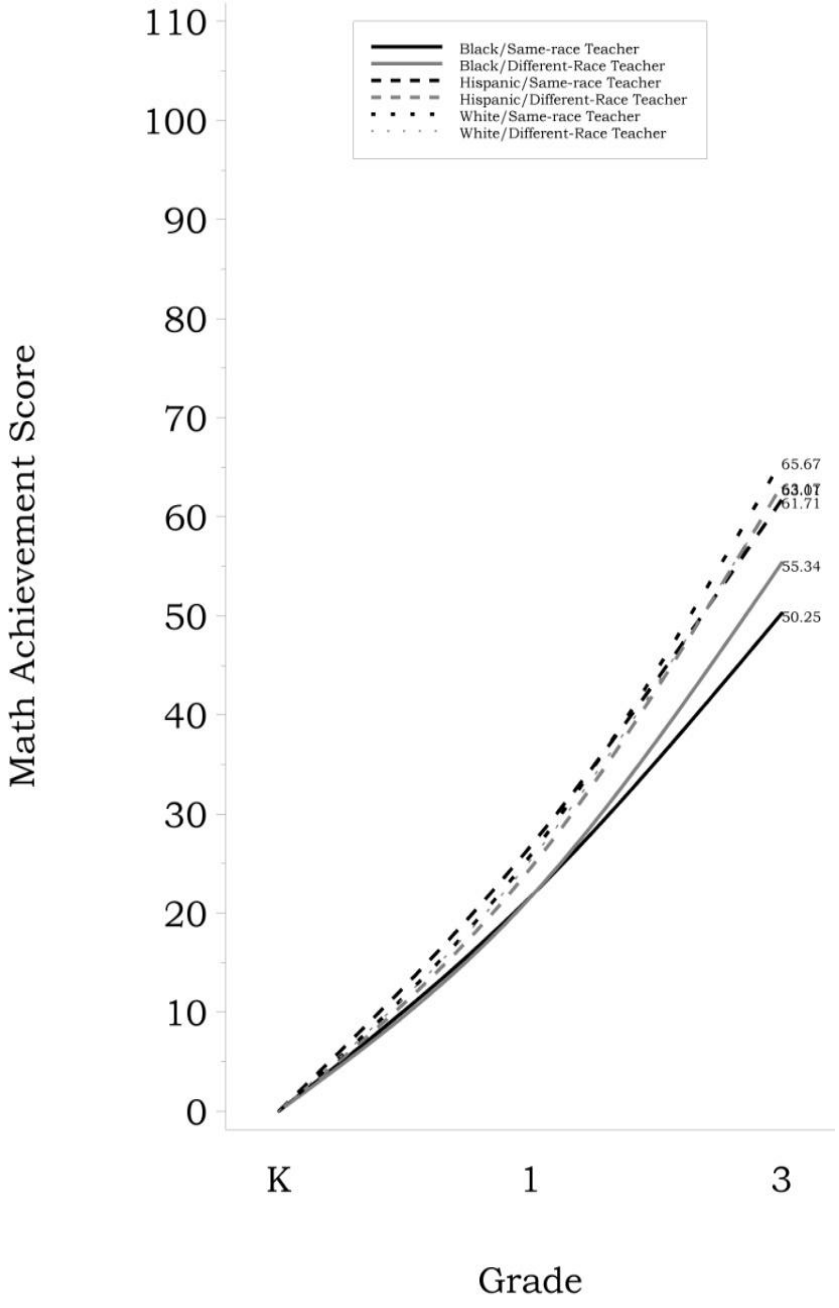

Figure 1: Predicted math achievement growth for students by teacher assignment

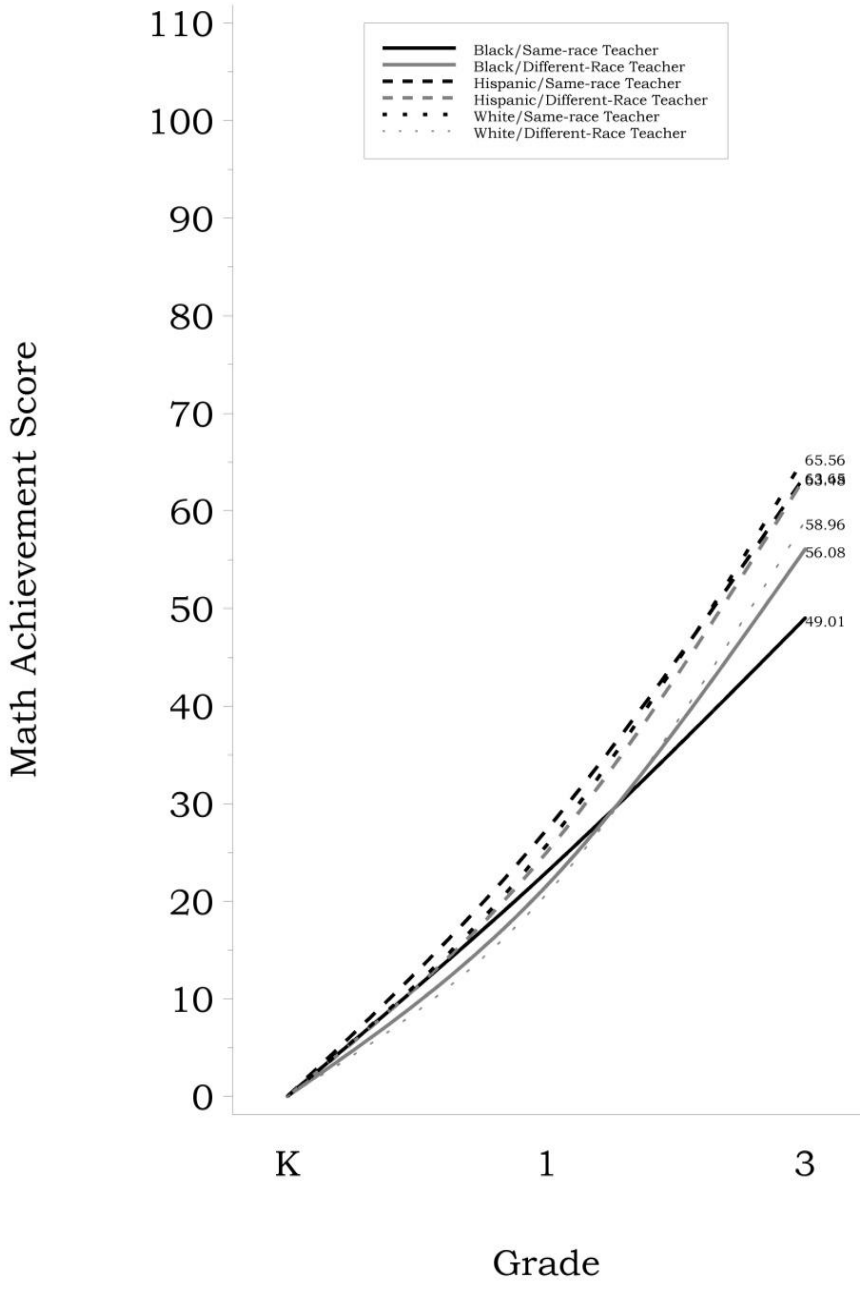

Figure 2: Predicted math achievement growth for students by teacher assignment and in schools with low teacher diversity

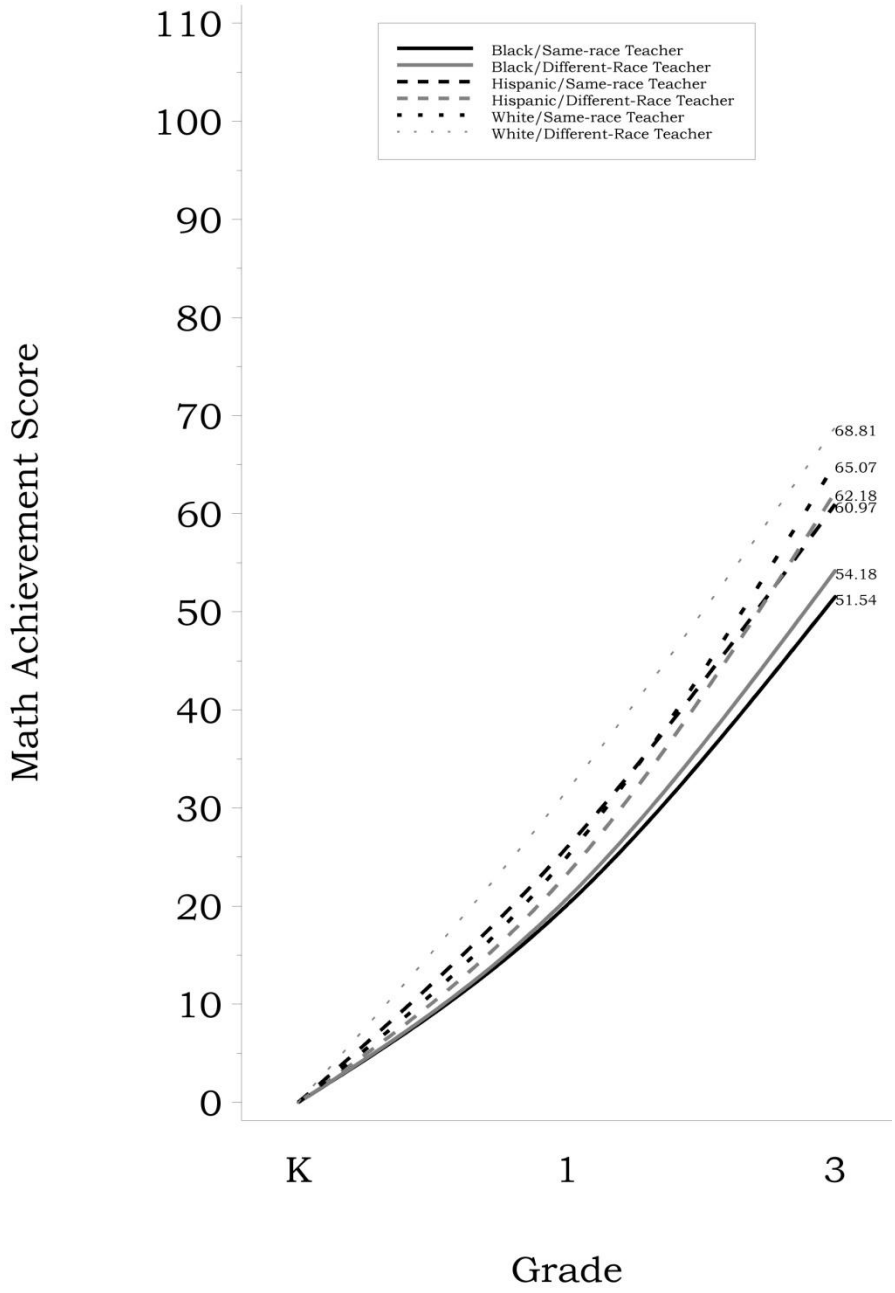

Figure 3: Predicted math achievement growth for students by teacher assignment and in schools with high teacher diversity

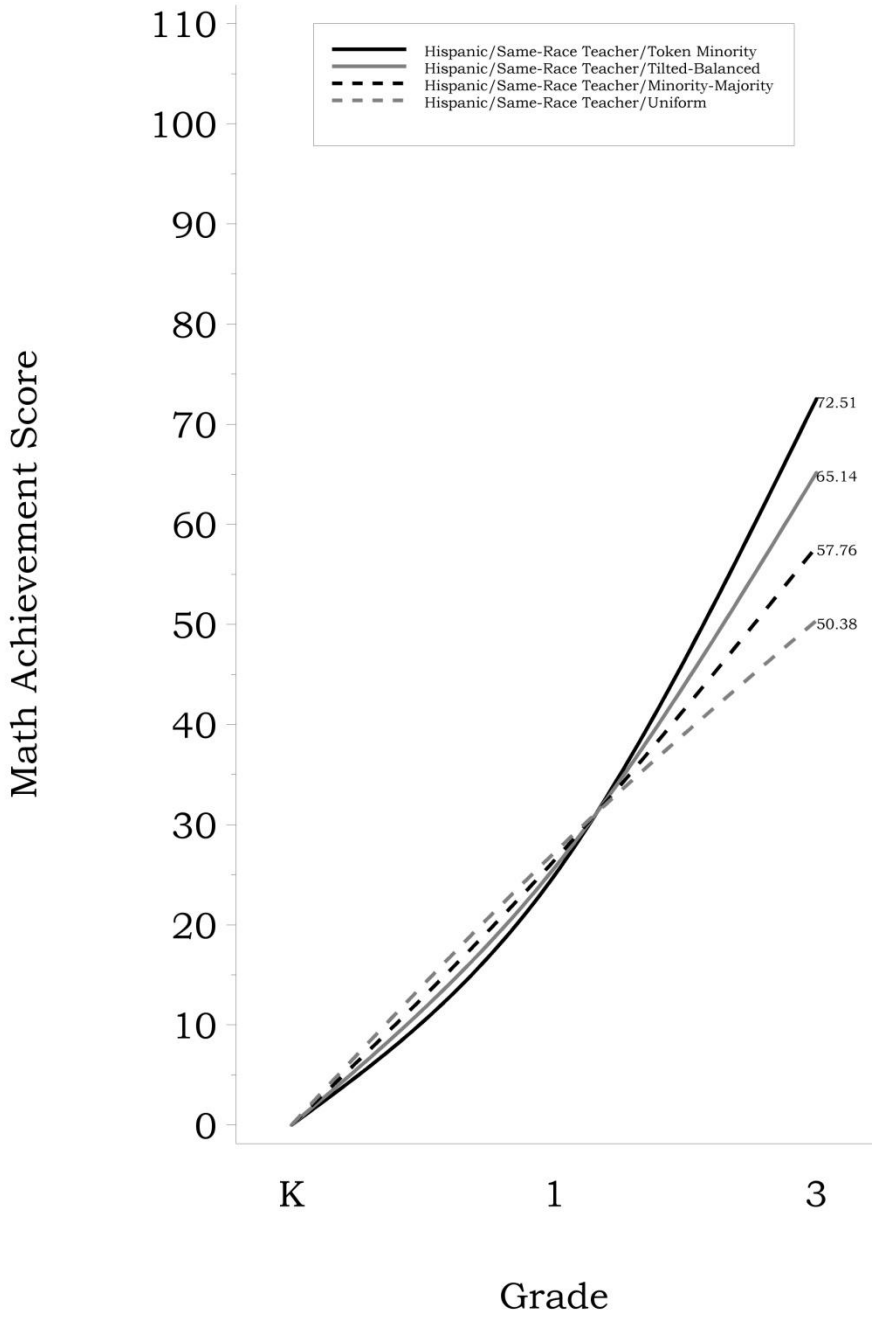

Figure 4: Predicted math achievement growth for Hispanic students by teacher assignment and by racial composition of teachers in schools

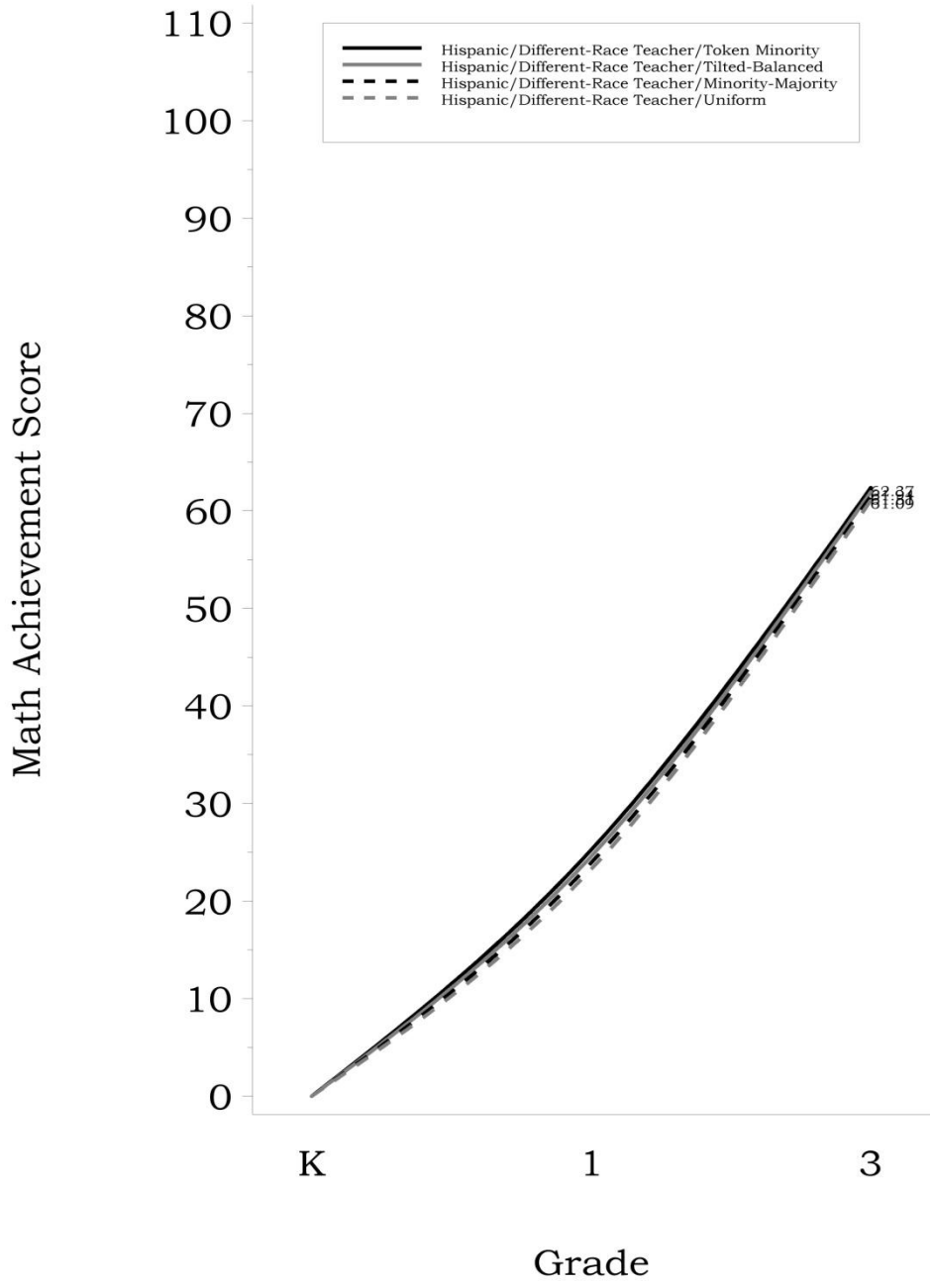

Figure 5: Predicted math achievement growth for Hispanic students by teacher assignment and by racial composition of teachers in schools

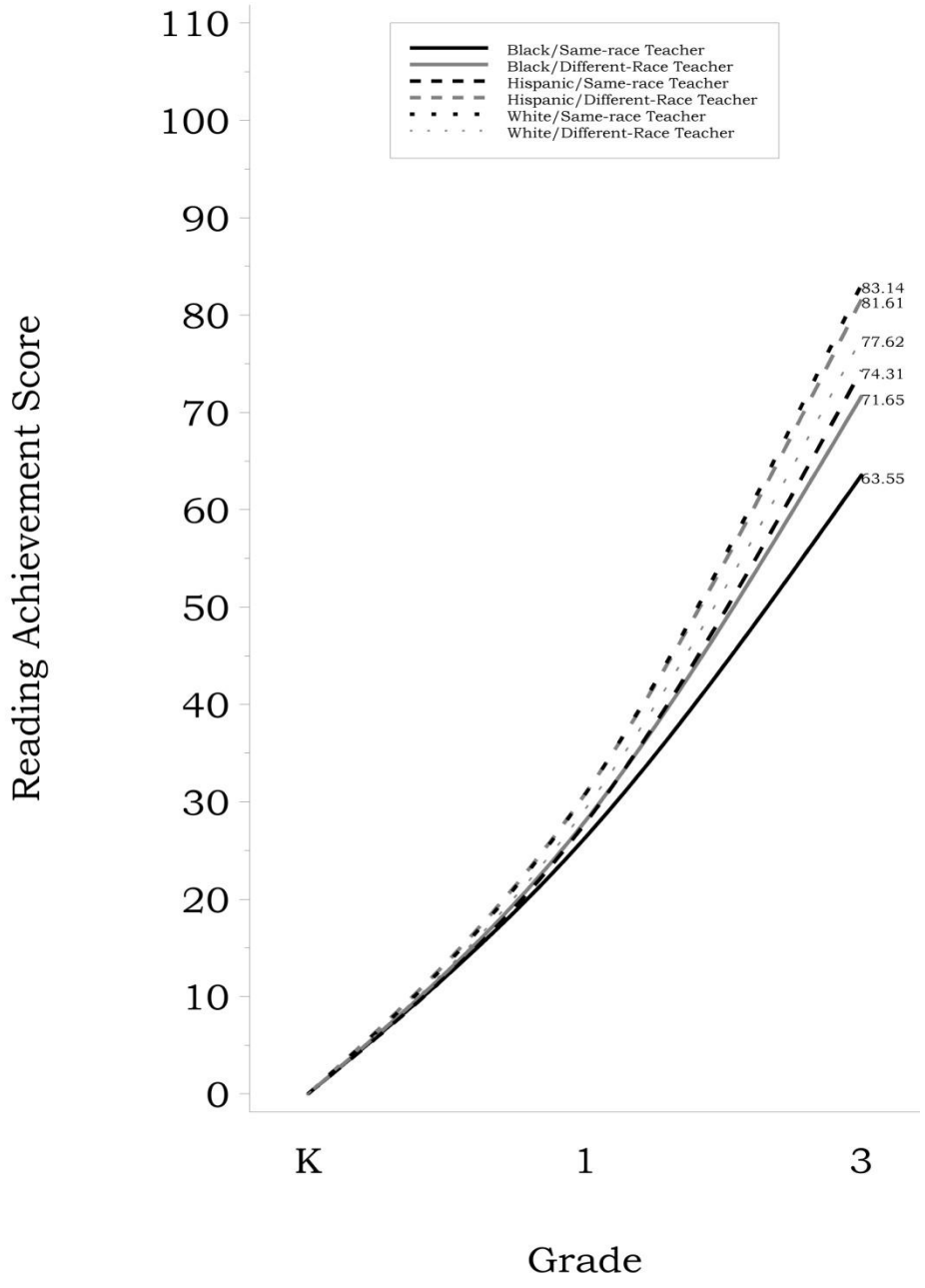

Figure 6: Predicted reading achievement growth for students by teacher assignment

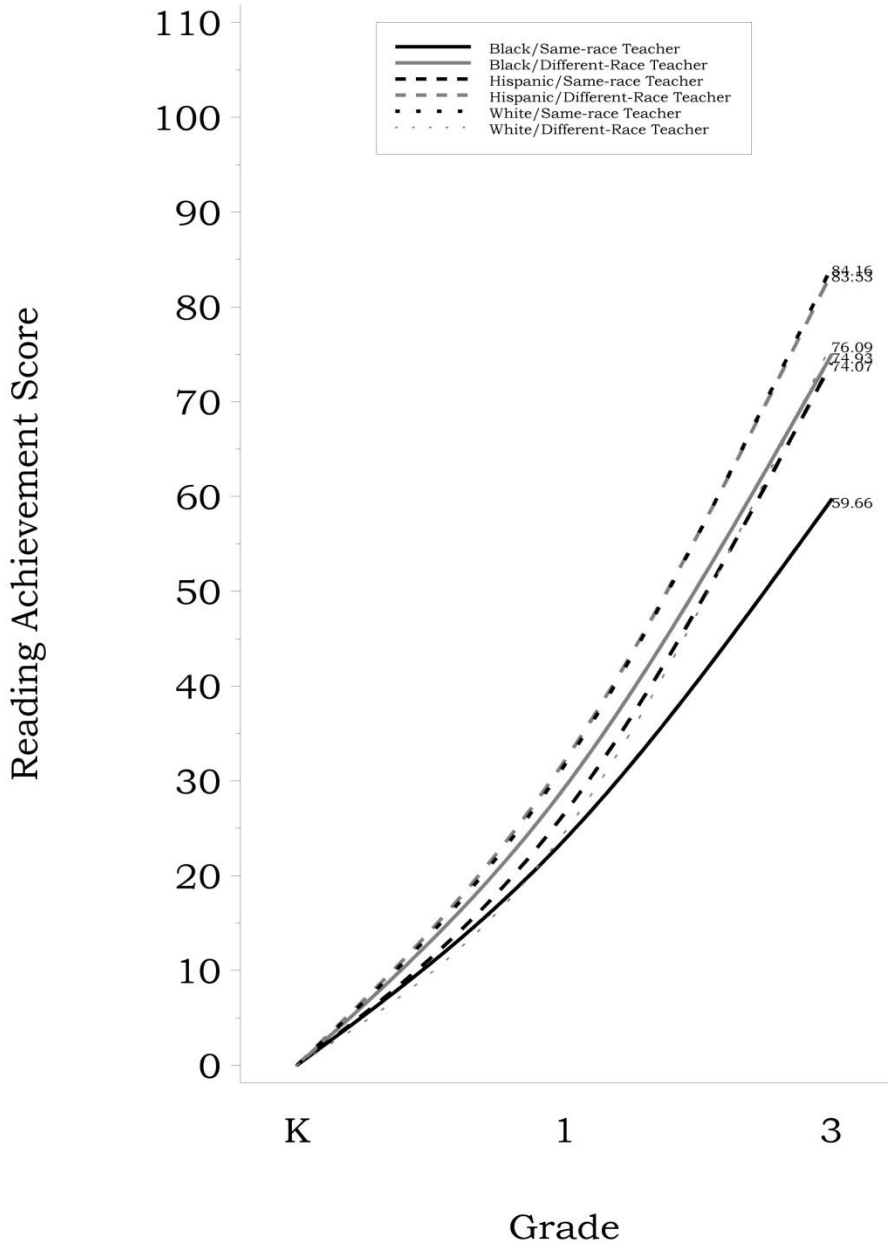

Figure 7: Predicted reading achievement growth for students by teacher assignment and in schools with low teacher diversity

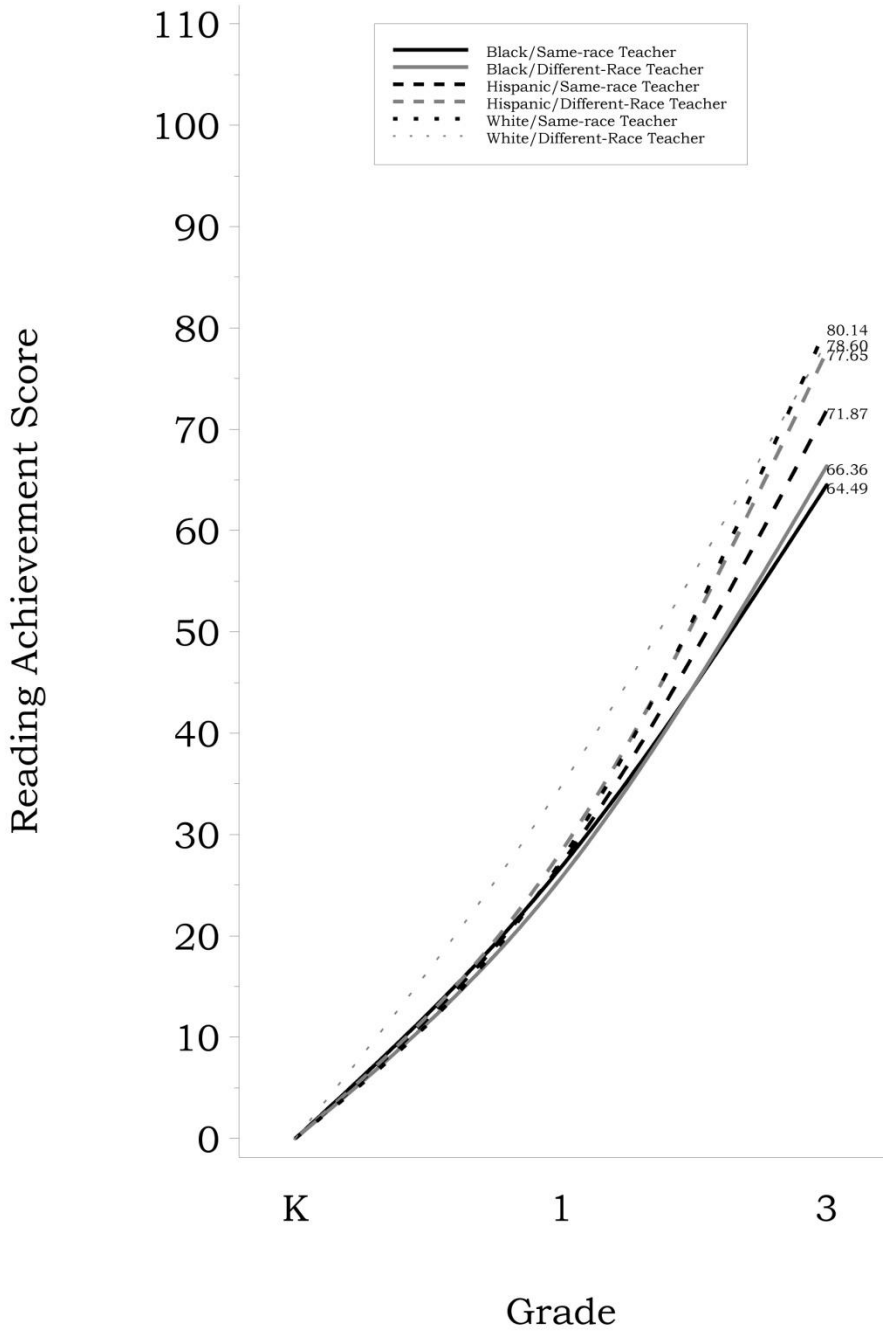

Figure 8: Predicted reading achievement growth for students by teacher assignment and in schools with high teacher diversity

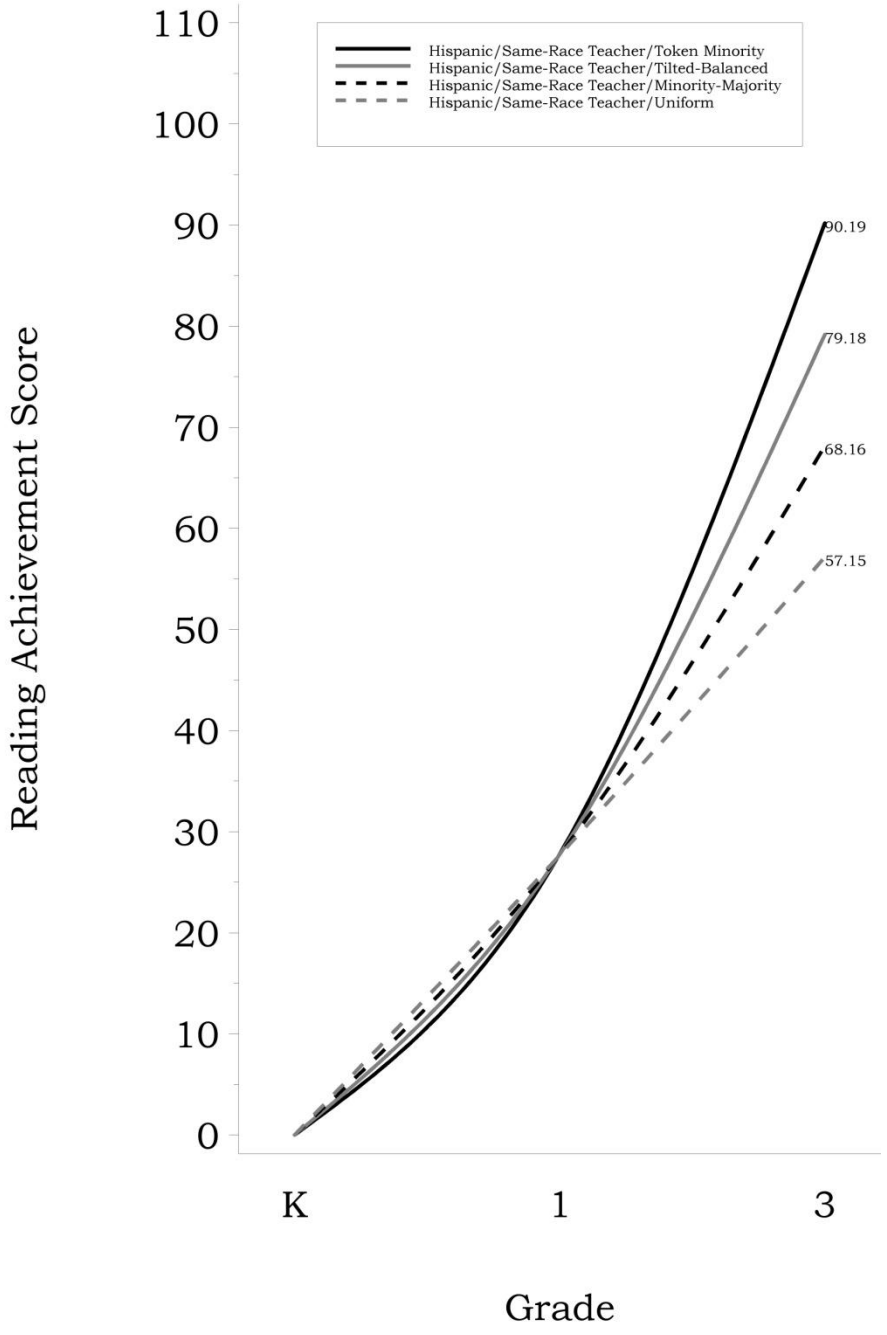

Figure 9: Predicted reading achievement growth for Hispanic students by teacher assignment and by racial composition of teachers in schools

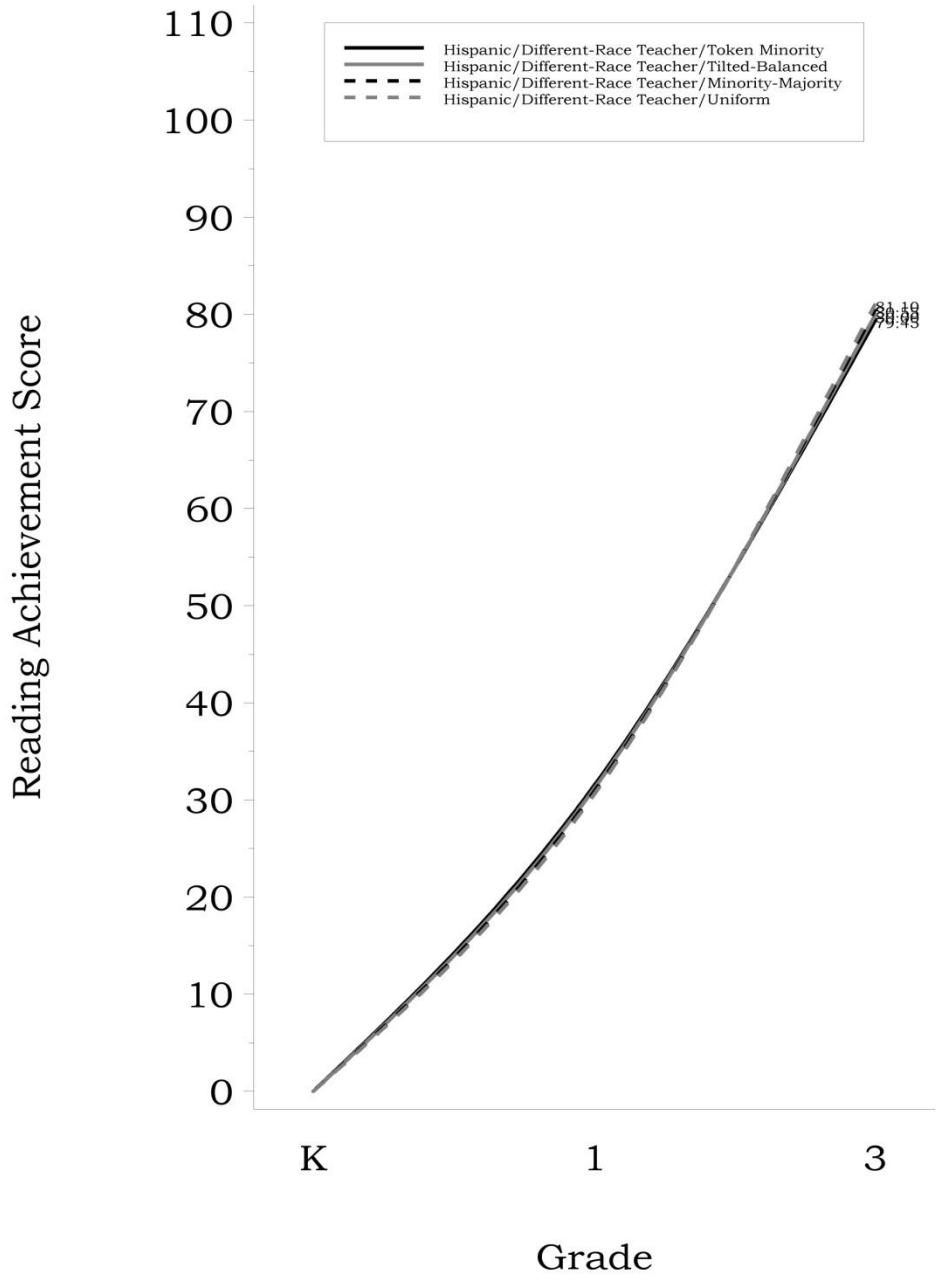

Figure 10: Predicted reading achievement growth for Hispanic students by teacher assignment and by racial composition of teachers in schools