Con Cariño: Teacher Caring, Math Self-Efficacy, and Math Achievement Among Hispanic English Learners

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Background/Context: *How do we account for the persistence of below-average math test score performance among California Hispanics who are fluent in English, as well as Spanish-dominant English learners? Recent studies have attributed the problem to an overly rigid focus on "what works" in curriculum and fluency in English to the veritable neglect of the social components of teaching and learning—particularly caring.*

Purpose/Objective/Research Question/Focus of Study: *We investigated Hispanic elementary student perceptions of teacher caring in relation to their math self-efficacy and math test performance, and we specify the sequence of the relationship: Caring teachers bolster student self-efficacy in math, which in turn bolsters math test scores. Moreover, we sought to examine whether the meditational relationships among the variables were moderated by English language proficiency.*

Research Design: *Our correlational/comparative analyses were based on longitudinal data for 1,456 Hispanic students nested in 84 fifth- or sixth-grade classrooms in the spring of 2007. Students were either fluent English speakers (EFs, n = 799) or English learners (ELs, n = 657). We secured student self-report measures of teacher caring and math self-efficacy*

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using the Student Motivation Questionnaire, and scores from the California Standards Test for Mathematics served as the primary dependent variable. While controlling for background variables, prior math achievement, and prior math self-efficacy where appropriate, we employed a well-known framework and a series of multilevel regression models to examine our hypothesis of moderated mediation.

Conclusions/Recommendations: *For all study participants, caring teachers bolstered can-do attitudes in math, which in turn positively impacted math test scores. We identified two principal differences, however, in support of our hypothesis of moderated mediation that indicate that the total effect of teacher caring is larger among ELs. First, the magnitude of the direct link between teacher caring and math self-efficacy was more pronounced among ELs. Second, teacher caring was only partially mediated by math self-efficacy for ELs, whereas for EFs, the positive influence of teacher caring on math scores was completely mediated by math self-efficacy. Several issues come to light when the literature on how communication across cultural and language barriers impacts perceptions of caring is examined concurrently with our findings. Among them is the deemphasis of bilingual ability in California's recent mandate for more authorizations to teach ELs, which may create a barrier to fostering caring teacher–student and teacher–parent relations for Hispanic EFs and especially Hispanic ELs, whose math achievement would otherwise stand to gain.*

The success of educational reform efforts depends increasingly on the ability to elevate the achievement of U.S. Hispanics,[1] whose numbers are growing much more rapidly than the population as a whole (Fry & Gonzales, 2008). Hispanics who are fluent in English continue to score well below national achievement norms, as do Spanish-dominant English learners (ELs),[2] whose achievement profiles tend to be even lower (National Research Council, 2006; Rumberger & Gándara, 2004; Ruiz-de-Velasco & Fix, 2000). These patterns are seen not only in reading but also in mathematics, where culture and language differences between the home and the school might otherwise be considered less of a barrier to test score performance (Batalova, Fix, & Murray, 2007; Fry, 2007; Sleeter & Grant, 1988).[3] Insofar as English proficiency is a necessary but insufficient condition for remedying Hispanic underachievement, pressure has been building for the identification of other factors that may interact with language skill and subsequently influence educational mobility among Hispanic youth (August & Hakuta, 1997; Valencia 2002). One of these factors, the social dynamics of learning, is listed prominently as an important yet often overlooked competency for teachers of Hispanic students (Gándara & Rumberger, 2009; Genesee, Lindholm-Leary, Saunders, & Christian, 2005).

Delivering the curriculum in ways that students grasp always embodies the quality of relations between students and teachers and the back-and-forth signaling of one's place in the social order (Page, 1991; Snow, 1994).

One especially important measure of relationship quality is *caring*—that is, the ability to listen to, empathize with, and be moved by the plight or feelings of the other person. Thus, this study addresses the educational importance of a particular social dynamic, a teacher's ability to communicate caring to Hispanic youth. We investigate teacher caring because a long line of research demonstrates the educational importance of teachers who forge meaningful connections with their students and of schools that are structured such that students are able to perceive of their teachers as authentically caring about student well-being (Muller, 2001; Murdock & Miller, 2003; Noddings, 1984; Valenzuela, 1999). Moreover, our analyses link teacher caring and student self-efficacy, because in teacher–student relations, recognition of caring is often manifest in the confident pursuit by the cared-for of his or her own endeavors (Bandura, 1993; Noddings, 2007). Indeed, the presence of caring has been shown to trigger can-do psychological dispositions that facilitate student acquisition of content knowledge and student achievement (Bandura, 1997; Murdock & Miller), even in mathematics (Fast et al., 2010; Wolters, 2004). Thus, we consider teacher caring to be a critical form of social capital (Bourdieu, 1986; Coleman, 1988)[4] that underlies the process of educational mobility via its impact on Hispanic students' confidence in their ability to do math.

Whether such processes in sociocognition differ by students' language proficiency is often overlooked in the literature on caring. This is surprising inasmuch as recognition of difference, in students and situations, is central to the literature on caring in education (Noddings, 1992; Valenzuela, 1999). A growing literature targets the critical intersection between race/ethnicity and caring in schools (Delgado Bernal, 2002; Rolón-Dow, 2005) by pushing back against a color-blind construction of what counts as caring (Beauboeuf-Lafontant, 2002; Solórzano & Yosso, 2002). Yet language facility is often muted in race-centered considerations of critical care praxis. By centering our analyses of caring on sociolinguistic variation among Hispanic children, we call attention to student English language proficiency as a potential moderator in caring teacher–student relations.

What is it about student language proficiency that might affect the hypothesized dialectic linking teacher caring and Hispanic students' self-efficacy in mathematics? On one hand, by speaking English well, Hispanics who are fluent in English would seem already advantaged in overcoming teacher-student misunderstandings about what it means to care. After all, dialogue is fundamental to caring inasmuch as we have to engage in dialogue to facilitate mutual understanding and to learn what the other is going through (Noddings, 2007). On the other hand,

behavioral adaptations in the classroom can help immigrant ELs overcome challenges in language proficiency. Especially when the oppressive experiences of their immediate past overshadow concerns regarding U.S. cultural hegemony, immigrants and the children of immigrants may benefit from both a "dual frame of reference" (M. Suarez-Orozco, 1987) and optimistic help-seeking behaviors that make ELs less threatening and more attractive to mainstream teachers despite obvious communication barriers (Stanton-Salazar & Dornbusch, 1995).[5] Therefore, when it comes to the interpersonal dynamics of Hispanic success and failure in school, sociocultural dynamics, racialized perspectives, *and* language facility are interrelated in ways that are not entirely well understood and may run contrary to expectations (Portes & Rumbaut, 2001; Rolón-Dow, 2005; C. Suarez-Orozco, Pimentel, & Martin, 2009; Valenzuela, 1999).

THE CURRENT STUDY

We use longitudinal survey and achievement data to investigate Hispanic elementary student perceptions of teacher caring in relation to student math confidence and test score performance. And we specify the sequence of the relationship: Caring teachers bolster student self-efficacy in math, which in turn leads to improved math test scores. Student reports of their perceptions may consist of projections of their own values onto others—a bias that has been targeted as a weakness of research on social dynamics (Kandel, 1996). From a different perspective, however, tracking Hispanic student perceptions of teacher caring is justified because people often act based on their perceptions. Indeed, meaning is causal for human action (Ames, 1992; Erickson, 1986; Ryan, 2000).

Our sample includes Hispanic fifth and sixth graders in California elementary schools, given that Hispanics constitute the majority (51%) of California's K–6 student population in a state that educates more ELs than any other in the Nation (California Department of Education, 2009; Kindler, 2002). Again, we are chiefly interested in whether performance in math may be influenced by potentially causal social and psychological factors that work together rather than as discrete inputs. Thus, our research is designed to examine two hypotheses: (1) Teacher caring impacts Hispanic elementary student performance in mathematics via its impact on student self-efficacy in math, and (2) The sociocognitive processes entailed in Hypothesis 1 differ between Hispanic fluent English speakers versus Spanish-dominant ELs. The following research questions are derived from these hypotheses:

- Do student perceptions of teacher caring impact math self-efficacy and math achievement in ways that vary between Hispanic English speakers and Hispanic English learners?
- Does math self-efficacy mediate the impact of teacher caring on math achievement, and are the mediational relationships among these variables moderated by group membership as defined by proficiency in English?

In what follows, we begin with a brief review of the many educational challenges faced by Hispanic youth and the particular role of nonfamily relations in helping to meet such challenges. Then we address the literature on caring within educational contexts, as well as the educational importance of self-efficacy. We follow with a description of our research design. We then turn to the central focus of the article: the analysis of links among caring, self-efficacy, and math test score performance among Hispanic English-fluent students and their Spanish-dominant counterparts. We conclude with a discussion of the implications of our findings for research, as well as policy and practice in elementary school mathematics.

LITERATURE REVIEW

On average, Hispanic youth face extraordinary educational challenges that appear prior to their entry into formal schooling and persist throughout the primary grades and beyond (National Research Council, 2006). Economic inequality and subsequent limitations on opportunities to acquire English literacy skills are highly correlated with low achievement patterns among Hispanic students (DeNavas-Walt, Proctor, & Mills, 2004). The rate of U.S. Hispanic children living in poverty (27%) is more than twice the rate of poverty for non-Latina/Latino Whites (U.S. Department of Education, 2009). Moreover, the incidence of poverty is much higher among immigrant Hispanics who are learning English (Lichter, Qian, & Crowley, 2005). Eighty-five percent of California's 1.5 million ELs speak Spanish and are eligible for free or reduced lunch, which is how government agencies identify low-income students (Rumberger, 2007). Thus, language barriers and socioeconomic stress are most frequently cited in association with Hispanic achievement, with the result that since the 1970s, most of the federal and state activity aimed at increasing the educational performance of Hispanic youth focused on English language acquisition and development (Gándara, 1994; Gibson, Gándara, & Koyama, 2004).

There is widespread agreement that ELs must learn English well enough to meet rigorous standards. How best to educate ELs has long been contentious, however.[6] By the late 1990s, antibilingual education sentiment reached a tipping point with the 1998 passage of a California ballot initiative, Proposition 227, designed to severely limit public schools from using native language instruction to teach (García & Wiese, 2002; Guerrero, 2002). Today, most instruction for ELs focuses narrowly on the rapid transition to English via English immersion programs (Haas & Huang, 2010). Yet English-fluent Hispanics continue to score well below state and national test score norms. In mathematics, Hispanic performance profiles are especially low (Batalova et al., 2007; Fry, 2007; Ruiz-de-Velasco & Fix, 2000).

Not only are Hispanics more likely to have parents who are poor and do not speak English, but they are also more likely to attend highly segregated urban schools (Rumberger & Gándara, 2004; Van Hook & Fix 2000) with large enrollments of other impoverished children and high class sizes (Fry, 2008). Hispanics are also overrepresented in special education (Brown, 2004; Burnette, 1998). So although most of the variation in achievement between racial/ethnic groups is attributable to factors outside of school, including poverty and linguistic minority status (Coleman et al., 1966; Rothstein, 2004), between- and within-school factors worsen educational inequality from inside schools (McLaughlin, Shepard, & O'Day, 1995). To the degree that family poverty and concentrated school poverty, and language minority status affect academic achievement, Hispanics are twice disadvantaged (Rumberger, 2007; Trueba, 1999; Valencia, 2002).

Exacerbating between-school segregation and tracking within schools, the teachers of Hispanic English speakers and learners often lack familiar background experiences and formal training directed at their needs (Maxwell, Lim, & Early, 2006). In fact, Hispanic children who are learning English as a second language are increasingly isolated in schools and classrooms where teachers are underprepared (Gándara & Rumberger, 2006; Kindler, 2002). Moreover, cultural disjuncture or mismatch theories (Delgado-Gaitan, 2004; Sleeter & Grant, 1988) emphasize that Hispanic youth often attend schools where teachers have limited knowledge of their cultural backgrounds (Gibson et al., 2004). In recent years, California has taken important steps to reduce these problems. All teachers in California are required to obtain a Crosscultural, Language, and Academic Development (CLAD) credential or a California Teachers of English Learners (CTEL) certificate. However, the vast majority of teachers who instruct English learners do not possess the more comprehensive credentials that certify cross-cultural competence *and* require bilingual

ability, such as the Bilingual, Crosscultural, Language and Academic Development (BCLAD) certification (EdSource, 2007; Gándara & Rumberger, 2003). The ability of teachers who hold the BCLAD or BCLAD-like specialist credentials to communicate with ELs and their parents in a second language and to appraise EL students informally, and their specialized skills in the instruction of EL students make them highly sought after in many schools.[7] Yet although the growing attention of educators, researchers, and policy makers to this issue has led to a decrease in the number of California classrooms with underprepared teachers, as defined by their credential status (Maxwell-Jolly, Gándara, & Shields, 2009), between- and within-school disparities that limit Hispanic access to high-quality teachers and biliterate instructors remain large (Gándara, Rumberger, Maxwell-Jolly, & Callahan, 2003). These inequities have contributed to widespread Hispanic student alienation and disengagement from school (Darling-Hammond, 2007; Rumberger & Rodriguez, 2002; Trueba, 1988), and in some cases, they may be growing worse (Darling-Hammond, 2007; Orfield & Lee, 2007).

Adding to the list of challenges, scholastic success among Latina/Latino children from immigrant households is much more dependent, relative to many other student groups, on resource-full relationships with nonkin adults outside the home and in formal educational settings (Ream & Stanton-Salazar, 2007; Romo & Falbo, 1996). This may seem surprising inasmuch as Hispanic schoolchildren—the vast majority of whom are immigrants or the children of immigrants—are known to rely heavily on their parents and other family members for emotional and psychological support (Becerra, 1988; Valenzuela & Dornbusch, 1994). But the educational resourcefulness of these relationships may be compromised insofar as immigrant parents' investments in their children's education are limited by the losses parents sustain through immigration as a result of serious economic pressures and time constraints, and by the language barriers that can alienate them from the schools their children attend (Buriel, 1984; Delgado-Gaitan, 1991; Ream, 2005).[8] In effect, both structural circumstances (such as limited job opportunities) and cultural conditions (such as differences between home and school languages) create a situation in which teachers and school counselors often wield unusually heavy influence over the educational experiences of Hispanic schoolchildren (Gibson et al., 2004; Stanton-Salazar, 2001; Trejo, 1996).

This is not to suggest an oversimplified understanding of student achievement whereby teachers themselves should claim all the credit for Hispanic success in school, nor should teachers shoulder all the blame when Hispanic youth fall short of their academic potential. Children are enveloped within families, and they navigate social life with peers. They

reside in neighborhoods and communities where schools are charged with their formal education, which takes place largely within individual classrooms. Each of these overlapping networks and domains conditions students' educational performance in ways that are not mutually exclusive. Children lead nested lives (Ream, Espinoza, & Ryan, 2009). Yet according to the collective research of scholars of teaching, competent teachers matter (Darling-Hammond, 1999; Ferguson, 1998; Goldhaber, 2002), and the quality of interpersonal teacher–student relations also counts (Midgley, Feldlaufer, & Eccles, 1989; Noddings, 1998). Both factors are crucial to understanding Hispanic patterns of student performance (Gándara, Maxwell-Jolly, & Driscoll, 2005; C. Suarez-Orozco et al., 2009; Valenzuela, 1999).

CARING MATTERS

How teachers and students are oriented toward one another is central to Noddings (1984) well-known framework on the educational importance of caring. Teachers who foster caring relationships promote prosocial and responsible behavior that helps students adapt to the school environment and school demands. This positively impacts academic effort and achievement among children in the early grades and beyond (Ladd, Birch, & Buhs, 1999; Pianta, Nimitz, & Bennett, 1997; Wentzel, 1997). Students receive fewer disciplinary referrals, have higher educational goals, and have increased levels of adaptive motivation and internalized interest in school when they perceive that their teachers and other school personnel care about them (Murdock, 1999; Murdock & Miller, 2003). Moreover, the positive impact of caring teacher–student relations on educational outcomes is robust even to the inclusion of other relationship variables such as student connections with parents or peers (Ladd et al.; Pianta et al.). In short, one educationally important teacher quality is the degree to which teachers are able to convey that they authentically care about their students.

This does not typically happen in a vacuum. Schools that manage to develop a caring ethos also help to create a vital sense of community and belonging for students who are from groups that have historically underachieved (Alder, 2002; Howard, 2002; Swaminathan, 2004). Even within school communities that are deficient in care, however, individual teachers who are empathetic listeners and trustworthy advisors can facilitate student resilience and success (Rolón-Dow, 2005; Valenzuela, 1999). Succinctly, caring teachers mitigate the negative effects of an "at-risk" designation for students (Bondy, Ross, Gallingane, Hambacher, & Elyse, 2007). The impact of caring teachers on mathematics achievement—the

outcome of concern in this investigation—mainly benefits students who are at risk (Muller, 2001). Indeed, affective variables play a larger role, and are robust to the inclusion of potential mediators, when student ability is low (Rouxel, 1999). Thus, caring teacher–student relations may be especially important for Hispanics and Hispanic ELs, who are among the most at risk of academic failure (Gándara & Rumberger, 2009). Yet even well-intentioned teachers and motivated Hispanic students sometimes harbor misaligned perceptions of what it means to care for one another. Insofar as the very definition of education for Hispanics is deeply rooted in notions of authentic caring, Latinas/Latinos may implicitly ask to be cared for before they can optimally care about school (Valenzuela, 1999).[9] Among mainstream educators for whom teaching is caring, students are first expected to demonstrate that they value schooling. When Hispanic students and their teachers harbor misaligned perceptions of what it means to care, this misreading can taint classroom relations and impede the education of Hispanic youth (Noddings, 1984; Rolón-Dow, 2005).

LINKING CARING, SELF-EFFICACY, AND ACHIEVEMENT

Studies across disciplines have shown how social dynamics and psychological dispositions are linked in other areas of human performance, thus offering clues as to why caring processes might also matter in the classroom. Rees and Freeman (2009) reported, for example, that the impact of social support on sports-related task performance is mediated by participants' self-efficacy. Moreover, social support has a greater positive impact on both self-efficacy and task performance for individuals under high levels of stress as compared with those under less pressure. The reason is straightforward: Athletes who have a social support system in place feel more capable of executing the courses of action required to compete under particularly stressful circumstances. Social support bolsters self-efficacy, and self-perception of ability plays a vital role in determining the action/inaction a person takes when confronted with a challenging task (Bandura, 1997; Stipek, 2001).

Similar studies can be found in education. Murdock and Miller (2003) reported that student perceptions of teacher caring matter because caring teachers bolster students' academic self-efficacy. The more caring the student perceives the teacher to be, the more efficacious the student's conception of self. This is important, because self-perception of high ability is known to bolster academic achievement, whereas self-perception of low ability can produce severely debilitating consequences for students (Graham & Weiner, 1996). Moreover, self-efficacy appears to mediate the

impact of teacher behaviors on academic performance, persistence, effort, and other areas of cognitive and affective functioning (Bong, 2008; Greene, Miller, Crowson, Duke, & Akey, 2004; Wolters, 2004). In a related study, we report that self-efficacy mediates the impact of teacher caring on math test score performance among fluent English speakers of varying ethnicities (Fast et al., 2010). In the present study, we focus on Hispanics—and whether group-level differences in the dialectic between caring and self-efficacy distinguish Hispanic fluent English speakers from Hispanic English learners. We designed the study around sociolinguistic variation first because the impact of teacher caring on math performance is especially pronounced for at-risk students (Muller, 2001). Second, the impact of self-efficacy on academic performance is known to be larger among low-achieving students (Multon, Brown, & Lent, 1991). Thus, low-performing linguistic minorities who are confronting high levels of school-related stress (Freeman, Freeman, & Mercuri, 2002; Tabors, 1997) seem positioned to gain even more from caring teachers than their English-fluent Hispanic counterparts. Our study tests this proposition.

METHODS

PARTICIPANTS

Our study used longitudinal data collected as part of a larger investigation on math pedagogy and teacher professional development, which included over 3,000 elementary school students and more than 120 teachers from a single inland Southern California school district. The participating district served students living primarily in low- to middle-income neighborhoods. Participants in the current study were Latina/Latino and in fifth or sixth grade in the spring of 2007. Data regarding student grade level, gender, ethnicity, English language proficiency, and free lunch status were made available in masked files from the district database. Students were included in the study database if they met both of the following criteria: All participants had California Standards Test (CST) for Mathematics scores available for 2006 and 2007, and all participants had scores from the Student Motivation Questionnaire, which was administered in all elementary schools in fourth through sixth grades in 2006 and 2007. Students with formally diagnosed cognitive disabilities were excluded from the study. Approximately 90% ($n = 721$) of our English-fluent participants appeared in a study described elsewhere (Fast et al., 2010) that examined whether math self-efficacy mediates the impact of several classroom environment variables on math achievement among English-fluent students of varying ethnicities. In the current

study, we turn our attention particularly to Hispanic students and to whether the mediated effect of teacher caring is moderated by English language proficiency.[10]

Inclusion criteria resulted in a final sample of 1,456 students. Participants were fifth (n = 687, 47.18%) or sixth graders (n = 769, 52.82%) nested in 84 classrooms in 2007.[11] Cluster sizes ranged from 3 to 27 students per classroom (M = 17.33). We investigated teacher caring in elementary school classrooms rather than in middle or high schools partly because multiple-subject teachers have so much more contact with their students than teachers at the secondary level, who routinely see 150 or more students per day. Latina/Latino fluent English speakers (EFs) constituted 54.88% (n = 799), and Latina/o English learners (ELs) constituted the remaining 45.12% (n = 657). Female students constituted a little more than half of the sample (53.30%, n = 776), and the vast majority of participants (n = 1,174, 80.63%) received free or reduced lunch.

ENGLISH LANGUAGE PROFICIENCY

To conduct comparative analyses among U.S. Hispanics, we divided our sample of Hispanic students between fluent English speakers and Spanish-dominant English learners, as indicated in the data provided by the school district. Upon enrollment in the school district, parents report the primary language spoken at home. If the only language spoken at home is English, the student is declared an English native speaker. Students in homes where English is not the primary language are administered the California English Language Development Test (CELDT). Students who are declared English learners are reassessed with the CELDT annually each fall. The CELDT scores, in addition to other factors, including CST scores, classwork, and teacher input, are used to determine English proficiency status. These district procedures for examining English proficiency place each student in one of four classification categories, which indicate whether a student is (1) an English native speaker, (2) initially fluent English proficient, (3) redesignated fluent English proficient, or (4) an English learner. In our study, we obtained this information for each Hispanic student in 2007 and designated each student accordingly, as either an English language learner (for all students placed in Category 4 by the district) or English fluent (for all students placed in any category except Category 4 by the district).[12]

DEPENDENT VARIABLE

We used student scores from the California Standards Test for

Mathematics (CST-M) to assess student math achievement. CST-M items are multiple-choice format and are based on California content standards, which define the mathematical knowledge, skills, and reasoning abilities that students should acquire at each grade level. CST-M items for Grades 4–6 contain questions covering four content areas: (1) algebra and functions, (2) measurement and geometry, (3) number sense, and (4) statistics, data analysis, and probability. Each student completed the 65-item grade-level-appropriate test in the late spring of 2006 and 2007. Scores used in our analyses were the number of items that students completed correctly at each annual administration.

CONTROL VARIABLES

We included control variables in our analyses to reduce residual variance and to preclude the possibility that any observed effects of our explanatory variables of interest (teacher caring and math self-efficacy) were attributable to variables with which they were expected to be correlated. In each analysis, we controlled for student gender (0 = male, 1 = female), free lunch status (0 = no free lunch, 1 = free lunch), and grade level (0 = fifth grade, 1 = sixth grade). In cases where 2007 math achievement was examined as the outcome, we controlled for 2006 student math achievement. Where 2007 student math self-efficacy was the outcome variable, we controlled for 2006 math self-efficacy and 2006 math achievement.

MEASURING TEACHER CARING AND MATH SELF-EFFICACY

Rather than conducting analyses that take caring and self-efficacy as intuited, we have to describe and make clear what we mean by both. We used the Student Motivation Questionnaire (SMQ) to measure student perceptions of teacher caring in the early spring of 2007, and math self-efficacy in the early spring of 2006 and 2007 (Karabenik & Maehr, 2004, 2007). The SMQ was developed by researchers on the Math and Science Partnership-Motivation Assessment Program (MSP-MAP), funded by the National Science Foundation. The SMQ was created as part of an effort to provide math-science partnerships with reliable and valid self-report instruments for assessing a variety of student motivation and classroom environment variables. Teacher caring and math self-efficacy items were adapted from existing definitions and scales (Johnson, Johnson, Buckman, & Richards, 1985; Midgley et al., 2000; Pajares & Miller, 1995; Wentzel, 1997) to be relevant to mathematics. All items were 5-point Likert type (1 = *not at all true*, 5 = *very true*).

Our latent measure of caring is based on the notion that students feel

cared for when teachers take a personal interest in them as individuals, are empathic toward students' feelings, and are intent on listening and responding to student concerns (Noddings, 2007). Specifically, we used three items to assess student perceptions of teacher caring (= .81): (1) "Our math teacher takes a personal interest in students," (2) "Our math teacher cares about how we feel," and (3) "Our math teacher listens to what I have to say." Four items were used to assess math self-efficacy (= .84): (1) "I'm sure I can learn everything taught in math," (2) "I'm sure I can do even the hardest work in my math class," (3) "Even if a new topic in math is hard, I'm sure I can learn it," and (4) "I'm sure I can figure out the answers to problems my teacher gives me in math class." Additional questions on the 32-item survey were linked to factors such as academic press, teacher emphasis of mastery goals, and students' intrinsic interest in mathematics.

Students completed the SMQ questionnaires in their classrooms each spring several days or weeks prior to the administration of the CST-M. Teachers were instructed to trade rooms with a colleague so that the teacher was not in the room when students were completing the questionnaires. Three practice questions were given to the students to introduce them to the Likert scale response choices. All questions were read aloud to the students by the supervising adult, and the questionnaire took approximately 20–30 minutes to complete.

Measurement invariance. Before comparing the relationships among study variables across groups, we examined measurement invariance for both SMQ constructs. Whether the nature of each construct is similar across Latino subgroups matters because valid group comparisons and related inferences rely on the assumption that items tap the same underlying construct for each group. In addition, we are unaware of the extent to which our measures of both teacher caring and math self-efficacy were administered in English or Spanish to our ELs, nor do we know the precise methods by which bilingual classroom aides may have assisted ELs in understanding SMQ items in different classrooms. Our examination of measurement invariance provides a basis for determining whether our language groups understood and interpreted items similarly (Vandenberg & Lance, 2000).

We used multiple group confirmatory factor analysis to examine measurement invariance in order to obtain factor scores for our SMQ constructs (Lawley & Maxwell, 1971; Muthén, 1998–2004) and to handle missing data for individual SMQ items that were skipped by respondents.[13] Measurement invariance was examined for teacher caring and math self-efficacy in 2007 only. Parameters were estimated using the EM algorithm and a robust full information maximum likelihood estimator

with adjustment for clustered observations (Asparouhov & Muthén, 2005; Yuan & Bentler, 2000). Model identification was achieved by constraining the variance of each latent construct to 1.0, such that each loading could be freely estimated.

Models were estimated for each group (EF, EL) simultaneously, and parameter constraints were imposed and relaxed to examine fit differences in competing cases. Formal comparisons were conducted using χ^2 difference testing with correction for the robust maximum likelihood estimator (Satorra, 2000; Satorra & Bentler, 1999). We examined the tenability of equal factor loadings, equal item residuals, and equal correlation among the two constructs. Overall, the results of the competing models supported the tenability of measurement invariance for both teacher caring and math self-efficacy across groups. As we discuss in more detail in the appendix, models in which both loadings, residuals, and the correlation between factors were constrained to equality across groups fit equally as well as models in which they were free to vary across groups in various ways ($p > .10$ in all cases). Our examination suggests that item functioning was similar across groups and that overall, ELs understood and interpreted the SMQ items no differently than did English fluent students. Factor scores were produced from a single group confirmatory factor analysis in which math self-efficacy and teacher caring were correlated.

STATISTICAL ANALYSES

We used multilevel modeling (two-level) with maximum likelihood estimation to examine our hypotheses. We included no classroom-level predictors but used multilevel modeling to separate random variability attributable to students from random variability attributable to classrooms in which students were nested, such that standard errors associated with student-level explanatory variables were unbiased (Raudenbush & Bryk, 2002). Factor scores for teacher caring and math self-efficacy were standardized, and variables were coded such that model intercepts represent predicted outcome variable scores for a fifth-grade male student who does not receive free lunch, is in a sample average classroom, and has sample average scores on all numeric variables in the model, including the prior year's (2006) score on the outcome. Coefficients for English proficiency and each dichotomous categorical control variable represent the change in model intercepts associated with a change in category membership. Similarly, coefficients associated with explanatory variables represent the change in the model intercept associated with a positive one-standard-deviation increase in the explanatory variable.

Tests for mediation. We examined our hypothesis that math self-efficacy mediates the impact of teacher caring on achievement in mathematics using the 4-step process described by Baron and Kenny (1986) and others (e.g., Kenny, Kashy, & Bolger, 1998; MacKinnon & Fairchild, 2009; MacKinnon, Fairchild, & Fritz, 2007; MacKinnon, Krull, & Lockwood, 2000; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). According to this framework, mediation requires that at least two of four criteria (the second and third criteria) be met.[14] First, the initial variable (teacher caring) should significantly impact the dependent variable (math achievement). Second, the initial variable should significantly impact the mediator (math self-efficacy). Third, the mediator should significantly impact the dependent variable. Finally, complete and consistent mediation require that the impact of the initial variable on the dependent variable be clearly zero when the mediator (its impact on the dependent variable) is included in the model.

At each of the four steps, we estimated between one and three models. First we examined a full model containing all control variables, the explanatory variable(s) of interest (i.e., teacher caring and/or math self-efficacy), and the English language proficiency × explanatory variable interaction. Inclusion of the interaction allowed us to determine whether the relationship between the explanatory variable and the dependent variable was moderated by English language proficiency, and ultimately whether our data support our hypothesis of moderated mediation. If necessary, we continued by examining a second model in which we retained all the control variables, but discarded effects of primary interest that did not exert a considerable impact ($p > .15$) in the full model. In cases in which a marginal effect ($p \leq .15$) remained for a variable or term of primary interest, we estimated a third model from which the marginal effect was removed. We then compared the second and third models using three fit statistics: -2 log likelihood, Akaike's information criteria (AIC), and Bayesian information criteria (BIC). We made our decision concerning the optimal set of predictors using the consensus from the three measures of model fit.

RESULTS

The results are presented in three sections. First, we describe the focal variables—teacher caring, math self-efficacy, and achievement in mathematics—across Hispanic students who are English fluent and Spanish-dominant English learners. Second, we model links among the focal variables via the four-step process used to study whether self-efficacy mediates the impact of teacher caring on mathematics achievement.

Third, we evaluate the total and mediated effect of student perceptions of teacher caring on math achievement to determine whether proficiency in English moderates sociocognitive processes among Hispanic youth.

DESCRIPTIVE FINDINGS

We display unadjusted language group means for items tapping student perceptions of teacher caring (TC) and math self-efficacy (ME), as well as unadjusted means on 2006 and 2007 math achievement (MA) in Table 1. Bivariate correlations between all study variables can be examined in Table A1 in the appendix.

Table 1. Descriptive Statistics on Items and Primary Study Measures Across Language Groups

		Descriptive Statistics			
		Hispanic English Fluent		Hispanic English Learner	
Domain	Items/Measure	*M*	*SD*	*M*	*SD*
Math Self-Efficacy					
	I'm sure that I can learn everything taught in math.	3.88	1.10	3.84	1.10
	I'm sure that I can do even the hardest work in my math class.	3.43	1.23	3.36	1.24
	Even if a new topic in math is hard, I'm sure that I can learn it.	4.16	1.04	4.08	1.04
	I'm sure that I can figure out the answers to problems my teacher gives me in math class.	3.92	0.99	3.82	1.01
Teacher Caring					
	Our math teacher takes a personal interest in students.	3.46	1.26	3.60	1.25
	Our math teacher cares about how we feel.	3.72	1.27	3.90	1.30
	Our math teacher listens to what I have to say.	4.05	1.14	4.21	1.05
Math Achievement					
	CST raw score 2006	45.37	11.96	37.93	12.53
	CST raw score 2007	41.55	11.14	34.08	10.48

Note: $N = 1{,}456$. CST = California Standards Test for Mathematics.

MODERATED MEDIATION

Step 1. We began by regressing 2007 math achievement (MA) scores on TC, the EL × TC interaction, and control variables, including 2006 MA scores, student free lunch status, student 2007 grade level, and gender. This model showed significant effects for control variables, including 2006 MA, being in sixth grade, and being an EL ($p < .001$ in each case). The main effect of TC did not approach significance ($p > .15$), but the EL × TC interaction was significant, $t(1365) = 2.345$, $p < .05$. We proceeded with a second and final model from which we removed only the main effect of TC. This model showed a superior fit according to two of the three3 fit measures (AIC and BIC), a very similar pattern of effects for control variables, and that the EL × TC interaction remained significant, $t(1366) = 3.725$, $p < .001$. The pattern of effects suggests that ELs, on average, have lower MA scores (7.181 points lower). For EF students, TC does not exert a significant direct impact on MA, whereas for EL students it does, such that a 1.0 standard deviation increase in TC is associated with an average increase of 1.043 points on the MA measure. Details for both models, including regression coefficients, random effects, standard errors, *t* values for all variables, and model fit statistics, can be examined in Table 2.

Table 2. Mathematics Achievement 2007 Regressed on Teacher Caring

		Full Model			Final Model		
Fixed Effects							
	Variable	*b*	*SE*	*t*	*b*	*SE*	*t*
	Intercept	43.456	0.714	60.863	43.377	0.712	60.923
	Math achievement 2006	0.678	0.015	45.200	0.679	0.015	45.267
	Female	-0.304	0.340	-0.894	-0.259	0.338	-0.766
	6th grade	2.912	0.743	3.919	2.847	0.742	3.837
	Free lunch	-0.516	0.443	-1.165	-0.508	0.443	-1.147
	English learner (EL)	-7.190	0.362	-19.862	-7.181	0.362	-19.837
	Teacher caring (TC)	0.272	0.244	1.115	—	—	—
	EL × TC	0.815	0.347	2.345	1.043	0.280	3.725
Random Effects							
	Variable	σ^2	*SE*	*t*	σ^2	*SE*	*t*
	Classroom	15.442	2.787	5.541	15.198	2.723	5.581
	Student	39.000	1.492	26.139	38.841	1.483	26.191
Fit Statistics							
	-2 log likelihood	9627.8	9629.0				
	AIC	9647.8	9647.0				
	BIC	9672.1	9668.9				

Note: N = 1,456.

Step 2. We continued by regressing 2007 ME on TC, control variables, and the EL × TC interaction. The full model showed a significant impact for control variables, including 2006 ME ($p < .001$), 2006 MA ($p < .001$), and being an EL ($p < .01$), and a near significant effect for being in sixth grade ($p = .100$). The main effect of TC was significant, $t(1364) = 12.036$, $p < .001$, as was the EL × TC interaction, $t\ (1364) = 2.366$, $p < .05$. Because no primary explanatory effects were nonsignificant at this step, we did not estimate a second model. The pattern of effects suggests that ELs, on average, have lower levels of ME (.125 standard deviation units lower). For EF students, TC exerts a significant impact on ME, such that a 1.0 standard deviation increase in TC is associated with a .337 standard deviation increase in ME. TC also exerts a positive impact on ME for EL students, but the impact is of greater magnitude. For ELs, a 1.0 standard deviation increase in TC is associated with a .434 standard deviation increase in ME. Additional model details can be examined in Table 3.

Table 3. Math Self-Efficacy 2007 Regressed on Teacher Caring

		Full/Final Model		
Fixed Effects				
	Variable	*b*	*SE*	*t*
	Intercept	0.007	0.064	0.109
	Math efficacy 2006	0.424	0.021	20.190
	Math achievement 2006	0.012	0.002	6.000
	Female	-0.040	0.040	-1.000
	6th grade	0.097	0.059	1.644
	Free lunch	0.024	0.052	0.462
	English learner (EL)	-0.125	0.042	-2.976
	Teacher caring (TC)	0.337	0.028	12.036
	EL × TC	0.097	0.041	2.366
Random Effects				
	Variable	σ^2	*SE*	*t*
	Classroom	0.040	0.011	3.636
	Student	0.554	0.021	26.381
Fit Statistics				
	-2 log likelihood	3340.2		
	AIC	3362.2		
	BIC	3388.9		

Note: $N = 1{,}456$.

Step 3. We continued by regressing 2007 MA on 2007 ME, control variables, and the EL × ME interaction. As seen previously, the full model

again showed a significant impact for control variables, including 2006 MA, being in sixth grade, and being an EL ($p < .001$ in each case). The main effect of ME was significant, $t(1365) = 5.922$, $p < .001$, but the EL × ME interaction did not approach significance ($p > .15$). We removed the interaction and examined a better fitting (according to both AIC and BIC) second and final model, which revealed the same pattern of effects for control variables and again a significant main effect for ME, $t(1366) = 7.816$, $p < .001$. Results suggest that, on average, a 1.0 standard deviation increase in 2007 ME is associated with a 1.399 point increase in 2007 MA. The magnitude of the effect for ME was found to be the same for both EL and EF students. Additional details can be examined in Table 4.

Table 4. Math Achievement 2007 Regressed on Math Self-Efficacy

		Full Model			Final Model		
Fixed Effects							
	Variable	*b*	*SE*	*t*	*b*	*SE*	*t*
	Intercept	43.124	0.696	61.956	43.117	0.695	62.039
	Math achievement 2006	0.641	0.016	41.090	0.642	0.016	40.125
	Female	-0.164	0.331	-0.495	-0.155	0.328	-0.473
	6th grade	2.511	0.725	3.463	2.508	0.725	3.459
	Free lunch	-0.548	0.436	-1.257	-0.548	0.436	-1.257
	English learner (EL)	-6.930	0.356	-19.467	-6.932	0.356	-19.472
	Math efficacy (ME)	1.368	0.231	5.922	1.399	0.179	7.816
	EL × ME	0.069	0.339	0.204	—	—	—
Random Effects							
	Variable	σ^2	*SE*	*t*	σ^2	*SE*	*t*
	Classroom	14.390	2.583	5.571	14.380	2.581	5.571
	Student	37.674	1.438	26.200	37.676	1.438	26.200
Fit Statistics							
	-2 log likelihood	9582.8	9582.9				
	AIC	9602.8	9600.9				
	BIC	9627.2	9622.8				

Note: N = 1,456.

Step 4. We concluded our series of two-level models by regressing 2007 MA on control variables, TC, ME, and the EL × TC interaction. The full model again revealed significant effects for control variables, including 2006 MA, being in sixth grade, and being an EL ($p < .001$ in each case). The main effect of ME was significant, $t(1364) = 7.026$, $p < .001$, and the EL × TC interaction was nearly significant, $t(1364) = 1.918$, $p = .055$. The

main of effect of TC, however, did not approach significance ($p > .15$). We removed the main effect of TC and examined a second model. This model showed a similar pattern of effects for control variables and that the main effect of ME remained significant, $t(1365) = 7.055$, $p < .001$. The EL × TC interaction remained marginally significant, $t(1365) = 1.643$, $p = .100$. We removed the marginally significant interaction and examined a third model from which we obtained the following three measures of model fit: -2 log likelihood = 9582.9, AIC = 9600.9, BIC = 9622.8. We compared these fit measures with those from the second model (see Table 5) and found that the second model had a superior fit on two of the three measures. Based on this comparison and the small likelihood (10%) that the null hypothesis for the interaction term was true, we retained the second model (referred to as the final model in Table 5) and concluded that the positive impact of TC was not fully mediated by ME for ELs.

Table 5. Math Achievement 2007 Regressed on Teacher Caring and Math Self-Efficacy

		Full Model			Final Model		
Fixed Effects							
	Variable	*b*	*SE*	*t*	*b*	*SE*	*t*
	Intercept	443.112	0.700	61.589	43.192	0.695	62.147
	Math achievement 2006	0.644	0.016	40.250	0.6448	0.016	40.300
	Female	-0.201	0.335	-0.600	-0.243	0.332	-0.732
	6th grade	2.522	0.729	3.460	2.594	0.725	3.577
	Free lunch	-0.523	0.436	-1.120	-0.530	0.436	-1.216
	English learner (EL)	-6.959	0.357	-19.493	-6.976	0.357	-19.541
	Teacher caring (TC)	-0.250	0.251	-0.996	—	—	—
	Math efficacy (ME)	1.370	0.195	7.026	1.312	0.186	7.055
	EL × ME	0.341	1.918	0.4700	0.286	1.643	
Random Effects							
	Variable	σ^2	*SE*	*t*	σ^2	*SE*	*t*
	Classroom	14.299	2.570	5.564	14.242	2.560	5.563
	Student	37.588	1.434	26.212	37.623	1.436	26.200
Fit Statistics							
	-2 log likelihood	9579.2	9580.2				
	AIC	9601.2	9600.2				
	BIC	9628.0	9624.5				

Note: $N = 1,456$.

Mediated and total effects. Results support that TC exerts a mediated effect on MA for both groups (e.g., Baron & Kenny, 1986; Kenny et al., 1998; MacKinnon & Fairchild, 2009; MacKinnon et al., 2000, 2002, 2007). The nature and magnitude of the mediated effect, however, are moderated by English language proficiency. To clarify, we calculated the total and mediated effect of TC on MA for both groups. The mediated effect is the coefficient obtained by regressing ME on TC, multiplied by the coefficient obtained by regressing MA on ME (in Step 4). We determined whether the mediated effects were significant using the Sobel test (MacKinnon et al., 2002; Sobel, 1982). The magnitude of effects associated with both TC and ME did not vary across classrooms in any case ($p > .15$), so we made no adjustment for the multilevel nature of our analyses when calculating the mediated effect (Kenny, Korchmaros, & Bolger, 2003).[15]

For English-fluent students, the mediated effect of TC on MA was significant ($z = 6.086$, $p < .001$), indicating that a one-standard-deviation increase in TC results in a .442-point increase in MA via its relationship to ME. For ELs, the mediated effect was larger and also significant ($z = 6.153$, $p < .001$), indicating that a one-standard-deviation increase in TC results in a .569-point increase in MA via its relationship to ME. For English-fluent students, the total and mediated effects of TC were equal because TC's impact on MA is completely mediated by ME. For ELs, however, our results indicate that TC is only partially mediated by ME, because its direct impact on MA remains nonzero and positive when ME is included in the model. For this reason, we added the direct effect of TC to its mediated effect and observed that, in total, a one-standard-deviation increase in TC results in a 1.039-point increase in MA.

DISCUSSION

This study builds on research that attributes below-average math test score performance among Hispanic youth to an overly rigid focus on "what works" in curriculum and fluency in English to the neglect of the social components of teaching and learning—particularly caring (Gándara & Rumberger, 2009; Rolón-Dow, 2005; C. Suarez-Orozco et al., 2009). We conceptualize teacher caring, especially as it is recognized by Hispanic students, as a form of social capital in the classroom (Bourdieu, 1986; Valenzuela, 1999). We also identify self-efficacy, as measured by psychologists, for its effects on math test score outcomes (Bandura, 1993; Graham & Weiner, 1996). We link caring and self-efficacy in predictive models to investigate whether students' English proficiency moderates the sociocognitive processes that influence Hispanic achievement on the California Standards Test (CST) for Mathematics.

RECAPPING THE FINDINGS

Two principal findings hold for Hispanic English speakers and Hispanic English learners in our sample. First, our study calls attention to a factor that impacts self-efficacy in mathematics (caring relations bolster math self-efficacy) and notes that self-perception of math skill is importantly influenced by classroom social dynamics. Specifically, perceptions of teacher caring boost student confidence in the ability to learn what is taught in math, complete even the hardest math work, and figure out answers to math problems. Second, math self-efficacy bolsters math test score performance. As Hispanic students gain confidence in their ability to do mathematics, their math scores rise. In short, teacher caring boosts math self-efficacy, which in turn sparks Hispanic achievement in mathematics.

Having centered sociolinguistic variation among the students in our analysis, we identify two principal differences in caring that distinguish Hispanic English speakers and Spanish-dominant English learners, to the advantage of the latter.

First, the magnitude of the direct link between caring and self-efficacy is more pronounced among Hispanics who have yet to demonstrate a thorough command of English. So although caring teachers bolster can-do attitudes for all students in the sample, the impact is greatest among Hispanic ELs, whose overall math performance is lowest. Second, the impact of caring on math achievement for ELs is robust to the inclusion of self-efficacy—that is, the "total effect" goes beyond the fact that caring teachers make ELs feel more capable of doing math. This is not the case for English-fluent Hispanics, however, whose math test scores were positively influenced by teacher caring only via its influence on self-efficacy in math. Thus, ELs stand the most to gain from teachers who are predisposed to and skilled at caring, and the math confidence they engender in Hispanic youth. This finding is novel in research on caring inasmuch as language differences remain on the periphery of how "otherness" gets conceptualized in research on caring in schools.

IMPLICATIONS FOR RESEARCH

Because policy solutions are most wisely undertaken in the context of a cumulative body of findings rather than in response to the results of any single study (McDonnell, 2000), we put forward in this section a set of ideas for future research on caring in the educational experiences of Hispanic youth. First, we address the measure of caring in survey analysis. Then we call for more interpretive studies that can further illuminate

the how and why of caring praxis in schools serving Hispanic children. Last, we assert that future research on caring should employ multiple methods to better account for how teachers and students are nested within larger sociopolitical contexts that Hispanics often perceive as being less than concerned for their well-being.

Is it possible to capture the quality of interpersonal relations using items on a survey? We employed a parsimonious measure of caring that accounts for affective components of Hispanic students' worldview about how knowledge gets transmitted relationally. According to Valenzuela (1999), Hispanic students view teacher caring as more genuine if it precedes and accompanies transmission of information and, further, that a teacher's technical competence is important but not the sole measure of caring classroom instruction (Noddings, 1984; Rolón-Dow, 2005). Admittedly, teachers show concern in ways that we did not measure. The teacher who is appropriately challenging, mastery oriented, and competent in the subject matter, for instance, is likely to be perceived as caring by outside evaluators, if not by students themselves (Fast et al., 2010). Nevertheless, we probed into a set of indicators concerning feelings and intuition that suggest that Hispanic students feel cared for when teachers (1) take a personal interest in students as individuals, (2) are empathetic toward students' feelings, and (3) are intent on listening to what students have to say. Together, these three characteristics are educationally consequential.

Yet in the absence of more information about teacher behaviors, simply knowing that caring matters seems insufficient for improving education for Hispanic youth. How can preservice and in-service training better equip all teachers to demonstrate care in ways that are recognizable and tangibly beneficial for Hispanic English speakers and learners? Our reliance on survey data leaves room for more interpretive kinds of analyses that reveal the actual pedagogical and cognitive strategies that teachers use to make caring familiar in diverse classroom settings (Noddings, 2007; Rolón-Dow, 2005; Valenzuela, 1999). Field research shows, for example, that teachers who are aware of what it means to behave authentically in caring are often knowledgeable about the lived experiences of Hispanic students within and beyond the classroom. These teachers conscientiously position themselves as students in and of the communities where they teach (Noddings, 2007; Valenzuela, 1999). One recent school case study cited a caring teacher who treats her Hispanic students like extended family—"You have to treat that child as if they have your last name" (Rolón-Dow, p. 103).

Last, although survey and field studies are often siloed in separate analyses, a more ecumenical research agenda on caring—one that leverages

the complementary strengths of survey and field research—promises to better inform teacher training (and evaluation) about the variability in how and for whom caring matters. This more integrated methodological approach may also advance knowledge about caring at the institutional versus individual level. Do uncaring school environments dilute the impact of caring teachers? Or are teachers who are skilled at caring even more impactful within "subtractive schools" that divest Hispanic children of the cultures and languages they bring to school from home? In a state such as California, which has been cited both historically and recently for denial of civil rights and the illegal segregation of Hispanic students in its public schools (Gándara & Rumberger, 2009; Oakes, 2004; Ream & Vazquez, 2011), it seems all the more critical to braid together multiple methods of research to address the ongoing dialectic between the determinative power of social structure and the undetermined meaning-making that goes on between teachers and Hispanic youth in classroom settings.

LIMITATIONS

As is the case in virtually all empirical studies, there are limitations in our research. First, as we discuss elsewhere (Fast et al., 2010), the magnitude of our mediated and direct effects are rather modest. The small size of our effects, however, is not surprising in light of two factors that indicate that both the magnitude and practical importance of our effects may be underestimated. First, our mediator, math self-efficacy, was not measured without error, which is known to result in underestimation of mediated effect sizes (Hoyle & Kenny, 1999). We considered, and would have preferred, employing structural equation modeling (SEM) to test our models (thereby removing error from our SMQ constructs) but concluded that doing so would have been ill-advised in light of the cross-classified random effects present in our data—there is currently no available method in the SEM framework to appropriately deal with cross-classified random effects.[16] In other words, the use of two-level SEM or a robust estimator in SEM that accounts for clustered observations would have been incorrect because our participants were nested in more than one classroom over time. We prevented this problem by using multilevel modeling outside of the SEM framework, because such modeling only requires cluster information for the dependent variable. Second, standardized tests, such as the CST-Math, are known to result in the smallest effect sizes for self-efficacy, particularly when compared with studies in which classwork or class grades are the outcome (Multon et al., 1991). Had we examined classwork or class grades as the dependent variable, we likely would

have observed larger effects, which is important in light of researcher assertions that such outcomes may be more significant and practical indicators of student progress and learning compared with standardized tests (Kohn, 2000). Conversely, had our measure of self-efficacy asked students to specifically rate their ability to do well on a standardized test in math, we likely would also have observed larger effects because such a measure would be more proximal to our outcome, which is also known to increase effect sizes for self-efficacy (Pajares, 1996).

POLICY IMPLICATIONS

California continues to struggle to effectively educate the Hispanic majority of its student population. The Hispanic–White math test score gap is widest in the state that educates more Latinos than any other (National Center for Education Statistics, 2009).[17] The stakes continue to rise with the veritable explosion of Hispanic ELs relative to their English-only counterparts (Gándara & Rumberger, 2006).[18] Nevertheless, our findings are encouraging inasmuch as caring teachers boost Hispanic, and especially Hispanic EL, performance on the California Standards Test (CST) for Mathematics.

Although our data (from this study and Fast et al., 2010) point to optimistic math achievement outcomes for students of caring teachers, most notably for Hispanic ELs, our optimism might be tempered by multiple studies that account for how interethnic misunderstandings tend to short-circuit otherwise caring relations between mainstream teachers and Hispanic youth (Gibson et al., 2004; Ream, 2005; Rolón-Dow, 2005; Stanton-Salazar, 2001; Valenzuela, 1999). When we consider our findings alongside the extant literature on teacher caring, and in the context of glaring Hispanic–White test score gaps in California schools, two characteristics of the California teaching force come to mind. First, teacher demographics vary widely from student demographics in the Golden State. This places an enormous burden on teacher professional development to build particular cultural and linguistic skills that may not inhere in the vast majority of California educators. Second, unlike Texas, California has been unable to provide a bilingual teacher—one who can most fully communicate with ELs and their parents—for the great majority of ELs.

Addressing the first concern, the K–12 teacher labor force in California is made up overwhelmingly of non-Hispanic (82%) and mostly White middle-class candidates from suburban or rural backgrounds, whereas the majority of its elementary students are of Hispanic origin (California Department of Education, 2010). It is not our intent to imply that teachers

from non-Hispanic backgrounds cannot effectively educate culturally and linguistically diverse Hispanic youth. They certainly can. But to successfully meet this challenge, teachers from backgrounds of every social class, language, and culture must be expertly trained (if not temperamentally predisposed) to draw on skills and information that may not be readily available in their own communities (Maxwell-Jolly et al., 2009). Importantly, caring miscarries when mainstream teachers lack an empathetic understanding of what counts as caring for Hispanic youth. Caring also goes awry when Hispanic students misperceive or presume that their teachers are uncaring. So although it is plausible that some teachers do not care, and perhaps cannot be made to care, ethnographic accounts suggest that the more invidious problem is teacher–student misunderstandings about how to interact according to mutual appreciation of what it *means* to care (Rolón-Dow, 2005; Stanton-Salazar, 2001; Valenzuela, 1999).[19]

Yet even if matching teachers and students according to ethnicity affects caring and bolsters student outcomes—and the research is not consistent here[20]—attempts at diversifying the California teaching force are substantially constrained. Why? Because an important factor contributing to the underrepresentation of Hispanic college graduates in teaching is the underrepresentation of Hispanic college graduates. Even as their college enrollment and graduation rates are at an all time high, Hispanics are losing ground to their White and Black peers in rates of bachelor's degree and general higher education attainment (Alon, Domina, & Tienda, 2010; Aud et al., 2010; Lewis, Menzies, Najera, & Page, 2009). Meanwhile, over the 8-year period between 2006 and 2014, California is projected to need replacements for more than 100,000 teachers (Esch et al., 2005; Loeb & Miller, 2006). Even if we are to make the assumption, all else being equal, that Hispanic teachers can be particularly effective at teaching the wide range of Hispanic students in California classrooms, the short-term supply of Hispanic teachers simply won't satisfy the demand brought on by the impending California teacher shortage.[21]

Regarding the second concern, in spite of a steep 30-year upward trend in the proportion of students who are learning English as a second language in California schools, relatively few California teachers are *bilingual* certified. The scarcity of bilingual teachers also challenges teacher–parent communication because 38% of California students have parents who do not speak English fluently, which is the highest of any state (EPE Research Center, 2011). Undeniably, California has, in recent years, significantly increased its efforts at training teachers to work with ELs learners and their families.[22] In 2008–2009, for example, 21,725 certificates,

credentials, or permits were granted that authorized teachers to instruct ELs. Yet in the same year, only 391 of the more comprehensive and bilingual BCLAD authorizations were given (CCTC, 2010). Similarly, in 2005–2006, a total of 139,300 California teachers held an authorization to provide instruction to ELs, but only 6,300 (4.5%) of these were *bilingual* authorizations (EdSource, 2007). Today there are 18 different EL authorizations issued or renewable in California, but only seven require bilingual proficiency; three of the seven are BCLAD authorizations. Other research in the past decade has noted that the more comprehensive and rigorous EL authorizations—those requiring substantial depth in cultural competency training *and* bilingual proficiency—are the rarest in California (EdSource; Gándara & Rumberger, 2003; Gándara et al., 2003). Still others level the charge that bilingual ability has been relegated "to compensatory or add-on status" in California's new mandate for EL authorizations (Olivos & Sarmiento, 2006, p. 75). Clearly, the lack of California teachers who are qualified to promote student competency at high academic levels in two languages remains pressing, if not strongly contested (Maxwell-Jolly et al., 2009).

Much has been written about whether instruction is best given in English or in students' native language. We are suspicious of false-choice dichotomies of this nature; competent instruction in English is essential, albeit not entirely sufficient, for educating ELs. Nevertheless, the effectiveness of using students' primary language in formal instruction and the "if, how, and when" of teaching in students' primary language are not the focus of this article. Instead, we simply assert that the deemphasis of bilingual ability in California's recent mandate for more EL authorizations is of concern because of the educational importance of teachers' capacity to communicate authentic caring to students.

We want to make sure it is clear which assertions are being made directly from our data, and which issues come to light when the literature on how communication affects caring is examined concurrently with our findings. Although the data described here demonstrate math achievement effects for Hispanic students irrespective of teacher fluency in Spanish, the research literature does assert that to care is to engage in reciprocal exchange that meaningfully discloses persons, as individuals, to one another. If not its sine qua non, then two-way communication importantly undergirds the educational salience of caring. Succinctly, caring is both a disposition and a skill. Through informed dialogue with students and their parents, teachers learn the expressed needs of the children in their charge and can therefore respond more effectively to students' needs (Noddings, 2007).

There is an alternative. Mainstream teachers can talk to ELs, listen to

ELs and their parents as best they can, and make inferences about what gets lost in translation. But ever since Rosenthal and Jacobsen published *Pygmalion in the Classroom* in 1968, researchers have shown that mainstream teachers make inferences that tend to favor advantaged student groups and penalize, however unwittingly, student groups who have historically underachieved (Bourdieu, 1984; Dusek & Joseph, 1983; Loury, 2002; Ream, 2005; Steele, 1997). Because people so often act based on perceptions of what they think is true, even when it is not (Erickson, 1986; McKown & Weinstein, 2002), cross-cultural and language-based miscues over what it means to care may be especially consequential for Hispanic ELs, whose math test scores otherwise stand to improve from their perception that they are cared for by their teacher.[23]

In conclusion, if more California teachers are skilled at caring across culture and language boundaries in diverse elementary school classrooms, Hispanic, and especially Hispanic EL, performance in math stands to gain. Such improvement may depend in part on whether research can inform how to teach the practice of care with greater precision in teacher professional development. It may also hinge on aligning reforms in teacher training with formative evaluation that accounts for the caring components of classroom management and instruction. And improvement may further depend on California's capacity to recruit, train, and retain a more diverse and culturally informed teaching force in which biliteracy is normative, not exceptional. Hispanic youths are not the only ones who are likely to benefit where caring flourishes. When teachers are unaccustomed to acting in ways that Hispanic students perceive as caring, teacher–student relations get undermined, disaffected students often disengage from school, and teachers burn out and exit the profession prematurely (Flores-González, 2002; Gibson et al., 2004; Noddings, 2007). Indeed, quit and transfer decisions are the largest component of teacher supply problems (Ingersoll, 2001; National Commission on Teaching and America's Future, 2003). In sum, our findings point to the importance, for both teachers and students, of a teacher's ability to care in ways that demonstrate a rich understanding of Hispanic students' lived experiences.

Notes

1. If U.S. Hispanics/Latinos are asked to choose between the panethnic terms, Hispanic is preferred to Latina/Latino by a 3 to 1 margin (National Research Council, 2006). Thus, we tend to employ the term *Hispanic*, although we use both labels interchangeably. Neither adequately acknowledges the diverse ethnic and cultural heritage in the populations that each describes, however.

2. We use English learner to describe students who initially learn a language other

than English in their home, including students who are just beginning to learn English and students who are approaching proficiency in English but may need additional assistance in schooling situations. What has been a more common label for these students, *limited English proficient*, has a negative connotation in spite of its continued use in federal policy contexts (August & Hakuta, 1997).

3. Although English skills matter more obviously for reading comprehension than for mathematics test score performance, research shows that lack of English proficiency also inhibits student performance on standardized math tests (Abedi, Lord, & Hofstetter, 1998; Durán, 1987). Illustratively, Gándara and Rumberger (2009) asserted that being able to distinguish a math expression like *the sum of the numbers* from the phrase *some numbers* may perplex students who are simultaneously learning a second language and developing their skills in mathematics.

4. By social capital, we mean the resources and information embedded in social relationships that may be accessed and then converted, via social exchange, into dispositions and know-how that can improve student achievement. Forms of social capital conjure notions of the strength and diversity of social networks, including relationship caring and levels of commitment; the range of one's social portfolio across socioeconomic, racial and ethnic, and generational borders; and the informal domains (e.g., family, peer) or more formal domains (e.g., school, community) in which useful relationships are made manifest (McNeal, 1999).

5. According to Suarez-Orozco (1987), many Latin American immigrants in U.S. schools maintain an optimistic "dual frame of reference" whereby the advantages in the United States are self-evident, requiring little elaboration. "For them it was very clear: despite ongoing difficulties there were more opportunities to study, more help to do so, better training facilities, and more and better future job opportunities in the United States than back home" (p. 290).

6. The U.S. Congress first passed the Bilingual Education Act in 1968. Eight years later, the California Legislature passed one of the first state-level comprehensive bilingual education bills (Assembly Bill 1329) requiring schools with specific numbers of ELs to be offered bilingual education. Other states, including Texas, followed suit (Crawford, 1989). By the late 1980s, however, bilingual education had become contentious and politicized (García & Wiese, 2002).

7. BCLAD teachers not only speak a second language and possess subject matter expertise but may also adapt differentiated instructional techniques that build on Hispanic students' perceptions about caring (Kindler, 2002; Maxwell et al., 2006). The advantage to EL students of having these expert teachers is supported by findings from a fairly recent study conducted in the Los Angeles Unified School District. In this study of the effect of the best-prepared teachers on EL student learning, researchers found that the students of teachers who spoke the students' language and had specialized training showed greater academic gains than students whose teachers lacked such preparation (Hayes & Salazar, 2001).

8. Hispanic immigrant parents, who commonly see fulfillment of their ambitions not in their own achievement but in that of their offspring (Portes & Rumbaut, 2001), consistently report limitations in their ability to assist with their children's schooling. What's more, the immigrant parent–child bond may be susceptible to the language and cultural differences exacerbating the "generation gap" between immigrant parents and their U.S.-born children (Buriel, 1984; Buriel, Perez, DeMent, Chavez, & Moran, 1998; Suarez-Orozco & Suarez-Orozco, 1995).

9. According to Valenzuela (1999), whereas immigrant and U.S.-born Hispanic youth are committed to an authentic form of caring that emphasizes relations of reciprocity between teachers and students, non-Latino mainstream teachers expect students to demon-

strate caring about schooling with an abstract or aesthetic commitment to ideas or practices that purportedly lead to achievement.

10. All participants in the related study (Fast et al., 2010) were fluent English speakers. The English-fluent Latinos who reappear in this study constituted only a portion of the sample in the related study (62%), and results in Fast et al. were in no way disaggregated by ethnicity. As such, with our efforts in this study, we also examine whether the findings in the related study hold in a sample that contains Latinos only, in addition to having the 657 new participants (all ELs) and examining our primary hypothesis concerning whether English proficiency moderates the meditational relationship among the variables. Procedures for data collection are described in more detail in Fast et al. We redescribe the measures here for convenience.

11. Although we do not have exact numbers, our knowledge and experience with participating classrooms indicate that the vast majority (perhaps all) were those in which primary instruction was given overwhelmingly in English, and a Spanish-speaking bilingual aide was present in the classroom for at least part of the day.

12. We recognize that a two-level conceptualization of English proficiency fails to account for all potential variation in language ability (e.g., bilingualism among English fluent Hispanics). Yet our research is designed, in part, to draw attention to Hispanic ELs, because schools in California continue to assess language skill and designate students as lacking proficiency until a minimum English level is achieved.

13. Missing data for individual SMQ Likert-type items ranged from 0.89% to 2.87%. We did not include potential participants who had missing data for an entire scale in any year. The method used confronts missing data with estimation by full information maximum likelihood (FIML). Unlike many other imputation methods, FIML estimation uses all the information from the observed data, estimating a coefficient for the relationship between variables (missing data are built directly into the estimation method), as opposed to imputing a value for an otherwise observed variable (Arbuckle, 1996).

14. The second and third criteria are the only criteria needed to determine whether mediation is occurring. The first and final steps demonstrate whether mediation is complete and consistent (Kenny et al., 1998). Partial or inconsistent mediation is observed in the case in which the initial variable's impact on the dependent variable changes when the mediator is included in the model. Partial mediation is observed in the case in which it decreases in absolute magnitude but remains nonzero. Inconsistent mediation (suppression) occurs when the initial variable's impact changes in sign (positive to negative or vice-versa) or becomes nonzero, having been zero when the mediator was excluded.

15. We determined that the effects of both teacher caring and math self-efficacy did not vary across classrooms by including them as random effects in our models. We did not retain these effects in our models for two reasons. First, they were nonsignificant and resulted in poorer model fits. Second, and perhaps more important, their coefficients were very near zero, which most often resulted in nonpositive definite solutions or lack of model convergence.

16. There is a growing awareness concerning the need for cross-classified random effects models in the latent variable framework. Recent works have begun to formulate and test models (e.g., Marsh et al., 2009), but the research is generally sparse, and applications remain virtually unavailable to applied researchers at the time of this writing.

17. According to the most recent National Assessment of Educational Progress (NAEP) report card, the Hispanic–White gap among California fourth graders is, at 28 points, the largest in the nation, excepting Washington DC (National Center for Education Statistics, 2009). See: http://nces.ed.gov/nationsreportcard/statecomparisons.

18. Between 1980 and 2005, the California linguistic minority population increased by 187%, whereas the English-only population increased by only 8% (Gándara & Rumberger, 2006, p. 3).

19. Even among teachers and students who share complementary educational goals, concurrent teacher–student misunderstandings about what it means to care tend to unnecessarily weaken classroom relations and take the joy out of learning. When it happens that well-meaning teachers and conscientious students find themselves working at cross-purposes, who should remedy the confusion? In power-equal relations, we expect both parties to regularly switch places in caring. In unequal teacher–student relations, however, it is the teacher who bears the major responsibility. Yet many teachers may not know how to care in ways that Hispanic students recognize and understand as being authentic (Valenzuela, 1999).

20. Although most studies that have examined the relationship between teachers' race/ethnicity and student outcomes have found no effects (Ehrenberg, Goldhaber, & Brewer, 1995; Loeb & Miller, 2006), one recent study using experimental data came to a different conclusion: Math achievement improved by 3–4 percentile points when elementary students had a teacher of the same race for one year (Dee, 2004)

21. The projected shortfall in teacher supply seems counterintuitive in the midst of so many headlines about teachers being laid off from work because of California's yawning budget gap. In fact, California teachers are once again bracing for major cutbacks. Nevertheless, analysts at the California Center for the Future of Teaching and Learning project that tomorrow's headlines are likely to show that California's pipeline for recruiting, training, and inducting teachers is in serious need of repair. Consider three related factors. First, the baby boom generation of teachers is retiring at increasing rates (about one third of the state's teachers are older than 50) just as California witnesses a dramatic drop in the number of novice teachers. Next, the pool of prospective teachers has declined dramatically in recent years. In the past 7 years, the number of enrollees in teacher preparation programs in California has dropped by nearly half, from more than 75,000 to fewer than 45,000. Last, the number of new teaching credentials issued by the state is similarly down (Bland et al., 2010).

22. The need for all teachers to have some level of expertise in EL instruction was mandated in legislation (Ducheny, AB 1059, 1999) that changed the state education code to require the inclusion of these skills. Moreover, standards recently adopted by the California Commission on Teacher Credentialing (CCTC) authorize all teachers who received a single or multiple subject teaching credential after 2002 to teach ELs (Maxwell-Jolly et al., 2009).

23. The scarcity of biliterate teachers in California is problematic for two other reasons. First, research on second language acquisition shows that closing test score gaps is most likely to occur in the context of a biliteracy curriculum (August & Shanahan, 2006; Slavin & Cheung, 2005), wherein, among other things, students' primary language can be used for clarification of material presented in English (Rumberger & Gándara, 2004). Second—and this seems critical in a state that is struggling to surmount huge budget shortfalls—studies in school finance show that it is more cost-effective to train and employ bilingual teachers than to use monolingual teachers and then have to augment classroom instruction by relying on bilingual teacher aides and other support personnel (Carpenter-Huffman & Samulon, 1981; Gándara & Rumberger, 2006; Parrish et al., 2006).

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APPENDIX

Multiple-Group Confirmatory Factor Analysis

We began our investigation of measurement invariance with a model in which all loadings were constrained to equality across the two groups, whereas residuals and the correlation between factors were freed. This model showed a good fit to the data, χ^2 (38) = 73.884, CFI = .988, TLI = .987, RMSEA = .036. Next, we allowed all factor loadings for teacher caring to be freely estimated across groups while constraining loadings for math efficacy to equality. This model also showed a good fit to the data, χ^2 (35) = 69.109, CFI = .989, TLI = .986, RMSEA = .037. The difference test showed no significant difference across models in which the loadings for teacher caring were constrained and free across groups, χ^2 (3) = 4.463, $p > .10$. We continued by constraining the teacher caring loadings but freeing the math efficacy loadings across groups. This model showed a good fit to the data, χ^2 (34) = 72.304, CFI = .987, TLI = .984, RMSEA = .040. The difference test again showed no difference between the model in which all loadings were constrained to equality and this model, χ^2 (4) = 1.226, $p > .10$. Next we examined a model in which loadings for both math self-efficacy and caring were free across groups. This model showed a good fit to the data, χ^2 (31) = 69.543, CFI = .988, TLI = .983, RMSEA = .041, but it did not differ from the model in which all loadings were constrained to equality, $\chi^2\Delta$ (7) = 5.283, $p > .10$. Next, we examined a model in which all item loadings and residuals were constrained to equality across groups. This model also showed a good fit to the data, χ^2 (45) = 90.717, CFI = .985, TLI = .986, RMSEA = .038. The difference test, however, showed that the model in which loadings were constrained to equality but residuals were freed across groups fit equally well, $\chi^2\Delta$ (7) = 11.529, $p > .10$, as did the model in which all loadings and residuals were free, $\chi^2\Delta$ (14) = 17.424, $p > .10$. Finally, we estimated a model in which loadings, residuals, and the correlation between the latent constructs were constrained to equality across groups. This model showed a good fit to the data, χ^2 (45) = 92.886, CFI = .984, TLI = .986, RMSEA = .038. We compared this model with the model in which loadings, residuals, and the correlation between latent constructs were free to vary across groups and found that they did not differ, $\chi^2\Delta$ (15) = 19.070, $p > .10$.

Table A1. Bivariate Correlations Between Study Variables

Variables	1	2	3	4	5	6	7	8	9
1. English learner	1								
2. Female	-.008	1							
3. Free lunch	**.200**	.005	1						
4. 6th grade	**-.108**	.025	.007	1					
5. Math achievement 2006	**-.242**	.044	**-.098**	**-.172**	1				
6. Math achievement 2007	**-.318**	.026	**-.065**	**-.062**	**.680**	1			
7. Math self-efficacy 2006	**-.045**	-.001	-.014	-.037	**.318**	**.272**	1		
8. Math self-efficacy 2007	**-.056**	.051	-.027	**-.070**	**.285**	**.353**	**.399**	1	
9. Teacher caring 2007	**.091**	**.176**	.023	**-.245**	-.029	**.063**	**.075**	**.500**	1

Note: Bolded correlations are signifcant at $p < .5$ or better.

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