THE JOURNAL OF EXPERIMENTAL EDUCATION, *00*(00), 1–23, 2013

ISSN: 0022-0973 print/1940-0683 online
DOI: 10.1080/00220973.2013.813358

MOTIVATION AND SOCIAL PROCESSES

Effects of Perceived Teacher Practices on Latino High School Students' Interest, Self-Efficacy, and Achievement in Mathematics

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The author examined the effects of teacher caring, teacher content explanations, and teacher interest promotion on Latino students' interest, self-efficacy, and achievement in mathematics. Participants in the year-long study were 326 Latino 9th- and 10th-grade students attending a large urban high school in southern California. Teacher variables made unique contributions to students' interest, self-efficacy, and achievement after controlling for demographics and initial levels of interest and self-efficacy. In addition, the author found the 2 instructional practices—content explanations and interest promotion—to mediate the relation between teacher caring and interest, self-efficacy, and achievement. The author did not detect any moderating effects with respect to gender, grade level, English language proficiency, or initial motivation. Implications for research and practice are discussed.

Keywords *instructional practices, interest, mathematics, self-efficacy, teacher caring*

THE QUEST TO UNDERSTAND WHY some students achieve whereas others flounder is at the heart of countless investigations into cognitive and motivational processes. Although the study of individual differences in students' motivation is rightly valued for its ability to explain achievement outcomes, scholars also emphasize motivation as a valuable educational outcome in its own right (Maehr, 1976). It is arguable that it is particularly vital to discover the reasons for academic outcomes when low levels of achievement and motivation are cause for concern. Data suggest that Latino students, whose average high school completion rates, college attendance rates, and achievement levels are consistently lower than those of their Caucasian and Asian peers, are particularly at-risk academically (e.g., Shernoff & Schmidt, 2008; Wilkins & Kuperminc, 2010).

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However, there is a dearth of research exploring how individual and contextual factors contribute to achievement and motivation outcomes in this population.

Research has shown that student motivation and achievement are related to several contextual factors, including school size (Howley & Howley, 2004), school climate (e.g., Goodenow, 1993; Goodenow & Grady, 1993), and curriculum quality (e.g., J. Ainley, Foreman, & Sheret, 1991). Recently, teacher-related contextual variables have received heightened attention in light of proposals to base teacher salary and promotion on measures of teacher quality (e.g., Loeb, Rouse, & Shorris, 2007; Kyriakides, 2005). Research suggests that the role a teacher plays is particularly critical when students are at risk as a result of poverty or prior academic failure (e.g., Croninger & Lee, 2001). Nevertheless, relatively few studies have examined the effects of student perceptions of their teachers among minority students or in urban contexts, where poverty is concentrated and dropout rates are highest (National Research Council and the Institute of Medicine, 2004). Consequently, little is known about the extent to which teacher-related contextual factors are related to academic outcomes among minority students, especially the ones raised in poor communities (Davis, 2003; Murray, 2009).

The present study addressed these gaps in the literature by examining whether individual differences and perceptions of teacher-related contextual factors are predictive of motivation and achievement in a sample of Latino students. I examined these effects in the context of a large urban high school in which three out of four students were socioeconomically disadvantaged.

Student Motivation

Across the many definitions of motivation in the literature, two common considerations are *expectancy* and *value* (Wigfield & Eccles, 2000). *Expectancy* refers to an individual's confidence in his or her ability to successfully complete a task; *value* refers to the individual's belief about the importance of that success. In the present study, I examined the expectancy aspect of motivation through the construct of self-efficacy (Bandura, 1997), and I defined value through the lens of interest (Hidi & Renninger, 2006).

Self-Efficacy

Defined as one's confidence in one's ability to exercise control over the events in one's life, self-efficacy has consistently be shown to powerfully predict student choice, effort, and persistence in academic tasks (e.g., Bandura, 1977; Schunk & Pajares, 2005; Usher & Pajares, 2006). Despite being broadly investigated, researchers have infrequently examined self-efficacy among minority adolescents. One exception is a recent study of urban Latino youth involved in a community center. Among these students, self-efficacy was a significant predictor of self-regulation (Vick & Packard, 2008). Studies of the sources of efficacy have demonstrated the potential effect that teachers can have on students' self-efficacy through practices such as modeling, offering students opportunities to experience academic success, and engaging in social persuasion strategies (Martin & Dowson, 2009; Usher & Pajares, 2006).

Individual Interest

The interest perspective highlights the importance per se of students' enduring predisposition to engage with certain objects or topics (M. Ainley, Hidi, & Berndorff, 2002; Schiefele, 1991). Research in the past decade evidences a resurgence of investigations into interest (M. Ainley et al., 2002; Harackiewicz, Barron, Tauer, & Elliot, 2002). Positive educational correlates of interest include focused attention, use of cognitive strategies, and achievement (Krapp, Hidi, & Renninger, 1992; Mitchell, 1993; Schiefele, Krapp, & Winteler, 1992).

Research has validated a distinction between individual interest, which is trait-like, and situational interest, which is interest sustained by the context (Hidi & Renniner, 2006). The question regarding how individual interest develops remains an open one, though current theory suggests that situational interest precedes individual interest. It is therefore appropriate to ask whether the situational interest induced in the classroom contributes to the longer term interest that an individual develops in a particular subject area. In the present study, therefore, I examined *situational interest*—the extent to which students reported finding their math class interesting and looking forward to going to class—as a predictor of individual interest.

Although it is reasonable to suspect that teacher practices may help students develop a long-term relation with particular subject matter, little research has explored this possibility (Bergin, 1999). Prior work on interest development and the instructional context has focused on aspects of the materials (e.g., text structure) or features of instructional activities (e.g., hands-on activities, use of computers) that promote interest (M. Ainley et al., 2002; Hidi, 1990; Mitchell, 1993). For example, in research on interest in reading, Hidi (1990) found that both formal structural characteristics (e.g., novelty, intensity, ambiguity) and content features of the text (e.g., life themes, human activity) contribute to situational interest.

Identifying factors that foster interest is vital in light of the high incidence of dropout among urban minority students. Although the interrelations of dropout rates to cognitive, affective, and achievement factors are complex, it is likely that the more proximal reason for student dropout is an affective one (Dotterer, McHall, & Crouter, 2009). For example, in a recent study, one in two high school dropouts reported that a major reason they left school was boredom and lack of interest (Bridgeland, DiIulio, & Morison, 2006).

Teacher-Related Contextual Variables

Many researchers have explored the ways in which school and teacher factors influence students' academic outcomes (Bolyard & Moyer-Packenham, 2008; Hill, Rowan, & Ball, 2005; Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008). Studies have homed in on a variety of factors, such as identifying key features of effective schools, examining content-specific teacher–student interactions, and focusing on the ways that learners' resources interact with teacher and school resources (e.g., Brophy & Good, 1986; Bryk, Lee, & Holland, 1993; Cohen, Raudenbush, & Ball, 2003; Cooley & Leinhardt, 1980; Valli, Croninger, & Walters, 2007). Although these efforts yielded promising insights regarding how teachers might make a difference in students' academic success, they relied on indicators of teacher quality that did not include student perceptions.

In addition to indicators of teacher quality such as teachers' years of experience or students' test scores, another way that teachers influence student outcomes is through student perceptions. Several studies have examined outcomes related to students' perceptions of their teachers as caring

(Davis, 2003; Pianta & Stuhlman, 2004; Pianta, 2006; Wentzel, 1993, 1997). Other studies focus on students' perceptions of their teachers' instructional practices (e.g., Brophy & Good, 1986; Nie & Lau, 2010). However, rarely have student perceptions of teacher caring and instructional practices been examined in tandem.

Teacher Caring

Several studies have reported that students' perceptions of the teacher–student interpersonal relationship are positively related to motivation and achievement (den Brok, van Tartwijk, Wubbels, & Veldman, 2010; Goodenow, 1993; for a review, see Martin & Dowson, 2009). Studies with mainstream middle school populations document the importance of the teacher–student relationship for students' perceptions of the classroom environment, achievement, and perceptions of the meaningfulness of academic tasks (Davis, 2001, 2003).

The present study focused on teacher caring. Evidence suggests that students' beliefs about how much adults at school care about them is associated with higher levels of positive health and academic outcomes (Teven & McCroskey, 1997; Wentzel, 1997; Whitlock, 2006). According to Perez (2000), caring teachers encourage students' identification with school and engagement in learning. For example, Davidson and Phelan (1999) found that urban students who believed their teacher cared about them were more willing to work toward academic goals. In a study of Latino high school students, teacher caring and support negatively predicted students' problem behaviors and positively predicted perceived meaningfulness of school (Brewster & Bowen, 2004). Studies with Latino middle school students have reported positive effects of the teacher–student relationship and caring on engagement (Garcia-Reid, Reid, & Peterson, 2005; Murray, 2009). R. M. Ryan, Stiller, and Lynch (1994) reported similar findings among mainstream suburban middle school students. It has been suggested that teacher caring is particularly important for at-risk students (Jennings, 2003). For example, Muller (2001) revealed an interaction between teacher caring and students' at-risk status. Among students considered at risk, teacher caring was a strong predictor of high school students' growth in math achievement. The same study found that teacher-reported student effort was positively associated with students' perceptions of teacher caring.

Teacher Instructional Practices

Investigations into students' cognitive processes demonstrate the importance of teacher instructional practices that emphasize problem-solving and conceptual understanding (e.g., Rivet & Krajcik, 2004), align assessment with learning objectives (e.g., Resnick & Resnick, 1992), prioritize learning over grades (e.g., Greene & Miller, 1996; Greene, Miller, Crownson, Duke, & Akey, 2005; Stipek et al., 1998), and foster mastery goals (e.g., Ames, 1992; Kaplan & Maehr, 2007; Urdan & Schoenfelder, 2006). Nie and Lau (2010) examined ninth-grade students' perceptions of teaching practices associated with a constructivist versus didactic approach in Hong Kong. Practices reflective of a constructivist pedagogy positively predicted students' deep processing strategies, self-efficacy, task value, and English achievement. In contrast, to the extent that students perceived their teachers as engaging in didactic instruction, students reported greater use of surface processing strategies and lower English achievement.

There is reason to expect that teacher practices that support student understanding will contribute not only to higher achievement but also to greater motivation in students (Conley & Karabenick, 2006). An early study with undergraduates found that student interest was generated by the perception that they understood the content (Iran-Nejad, 1987). In a more recent case study, Turner and Patrick (2004) highlighted how student participation depended in part on teacher instructional practices that support content understanding. In a recent review, Martin and Dowson (2009) described a model of instruction that emphasizes support for student understanding within what they label the "instructional connectiveness" dimension (p. 343).

Teachers could be expected to foster motivation also by showing students how interesting and meaningful the subject matter can be. Research from a variety of motivation frameworks has documented the benefits for well-being and achievement that accrue when students recognize the intrinsic value of the academic content. For example, in research with middle school students, Mitchell (1993) found that the more students perceived a task as meaningful, the more they were engaged. Although this research has generated many recommendations for practice, little research has tested whether students' perceptions of their teachers' ability to make the content interesting affects students' own interest in the subject matter.

Grade-Level Differences in Perceptions of Teacher-Related Factors

Few studies have examined perceptions of teacher caring among high school students; however, related research suggests that perceptions of teacher interpersonal relationships turn less favorable over time, even as they become more powerful as predictors of students' engagement and achievement. Among predominantly middle class Caucasian students, Barber and Olsen (2004) found that perceptions of teacher support fell significantly across the transition from eighth grade to ninth grade. Similarly, Furrer and Skinner (2003) found that students' sense of relatedness to their teachers declined over the transition from fifth grade to sixth grade; however, relatedness was a stronger predictor of engagement among sixth-grade students. Midgley, Feldlaufer, and Eccles (1989) focused on students' perceptions of teacher supportiveness across the transition to junior high school. Students' intrinsic value for mathematics increased when they perceived their junior high teachers to be relatively more supportive than were their elementary school teachers; however when the opposite pattern was perceived—less support from junior high teachers than from elementary teachers—students posted dramatic declines in their intrinsic value, perceived utility, and importance of mathematics. Lower-achieving students were more affected by a perceived decrease in teacher supportiveness over the transition to junior high school.

Individual Differences

Gender and grade level are among the individual differences that are well documented to predict motivation and achievement. For example, girls are often found to report lower self-efficacy in mathematics than boys do, despite equivalent performance (Denissen, Zarrett, & Eccles, 2007; Fredricks, Blumenfeld, Friedel, & Paris, 2005). Various measures of motivation have also been shown to decline with age, particularly across the transition into middle school (Anderman & Maehr, 1994; Wigfield & Eccles, 2002). For example, Gottfried and colleagues (2001) found downward trends in early adolescents' intrinsic motivation, and a study by Meece and Miller (2001) revealed lower levels of mastery goals as children grew older.

Another individual difference salient to the present study is English language proficiency. Students who have yet to gain fluency in the language of school instruction face additional challenges to achievement that are likely to impact their motivation as well. The research on English language learners' motivation in content areas such as mathematics, science, and history is scant. There is substantial evidence, however, that English language learners (ELLs) perform far behind native English speakers in mathematics, and that this gap grows at higher grades. For example, in the United States, where I conducted the present study, 7 in 10 eighth-grade ELL students score below basic levels of proficiency in mathematics (Fry, 2007).

In addition, a substantial body of research has shown that cognitive strategy use consistently predicts achievement (e.g., Greene & Miller, 1996; Pintrich & DeGroot, 1990). In an early study, Padron and Waxman (1988) concluded that one explanation for the lower reading achievement levels of Hispanic students is less effective use of cognitive strategies. The documented mismatch between many Latino students' home and school settings represents another reason to consider cognitive strategy use (LaRoche & Shriberg, 2004).

The Present Study

In this study, I aimed to examine the effects of perceived teacher caring, subject-matter explanations and interest promotion on students' interest, self-efficacy, and achievement in mathematics. Given that individual differences of gender, grade level, English language proficiency, and use of study strategies have been shown to affect the outcomes being investigated in the present study, these factors were included as controls for the effect of teacher-related variables. In addition to the aforementioned rationale, this study was designed to make a significant contribution to the literature in two ways. First, the bulk of research on teacher caring has centered on elementary and middle school students, with few studies examining this variable among high school students. The participants in the present study were 9th- and 10th-grade students. Second, there is a relative lack of studies implemented with a multiwave design. In the study reported here, data were collected in multiple waves over an academic year to enable more rigorous examination of the research questions.

Mathematics was selected as the target domain for several reasons. First, mathematics is a domain in which students are required to take courses for the majority of their high school curriculum. Therefore, this domain offered an opportunity to draw the largest possible sample of 9th- and 10th-grade students. In addition, mathematics is an area of particular concern for Latino students, given their low performance relative to other ethnic groups (Aud & Hannes, 2010). Last, mathematics is known to be a gatekeeper for college and career access (U.S. Department of Education, 1997). Thus, gaining insights into ways that teacher practices might foster improvements in Latino students' motivation and achievement in mathematics was particularly compelling.

Three research questions were posed. The first question asked whether students' perceptions of teacher caring, content explanations, and interest promotion would positively explain end-of-year interest, self-efficacy, and achievement after controlling for baselines and individual difference variables. Given that relatively more prior research has documented the effects of teacher caring, the study tested whether teachers' content explanations and interest promotion make unique positive contributions to the dependent variables above and beyond the effects of teacher caring.

The second question examined mediation effects. In a recent review of student-teacher relationships, Davis (2003) highlighted the importance of revealing how teachers demonstrate caring.

It is clear that perceptions of teacher caring per se would not be likely to change a student's sense of confidence or interest in a subject, much less one's achievement. Rather, it is possible that students perceive caring through specific instructional actions that teachers take. This possibility is supported by research on the role of perceived pedagogical caring (Wentzel, 1997), promotion of respect in the classroom (A. M. Ryan & Patrick, 2001), and perceived commitment (Murdock, Hale, & Weber, 2001). To explore this possibility, the second research question asked whether perceived instructional teacher practices act as positive mediating processes between teacher caring and student's interest, efficacy, and achievement.

It is also possible that teacher practices interact with gender, grade level, or initial levels of student motivation to produce unique patterns in academic outcomes. Therefore, the third research question examined whether students' perceptions of teacher caring, interest promotion, and content explanations are moderated by gender, grade level, or prior motivation levels.

METHOD

Participants

The study presented here was part of a larger research project for which all 9th- and 10th-grade students enrolled at the study site—a large urban high school in California—were invited to participate. Latino students constituted 85% of the complete sample, and are the only participants included in the study reported here. All 326 participants in the present study gave their assent and also had their parents' consent to participate in the study. About half (55%) were ninth-grade students, and the study included slightly more girls (57%) than boys (43%). Participating students represented a broad range of mathematics classrooms (more than 60) in the school and, in all, were instructed by 23 teachers. There were insufficient participating students from each class to conduct classroom-level analyses. A two-level model in which students are nested within teachers was not conducted for two main reasons. First, a two-level model would need to assume that teachers perform and interact identically with different groups of students, an assumption which is questionable, particularly in tracked classes. Research has shown that teacher practices may differ depending on expectations for student success (e.g., Jussim & Harber, 2005). More important, the purpose of the study was to examine the effect of students' perceptions of their teachers and did not seek to assess actual levels of teacher qualities.

The school enrolls a large proportion of students whose primary language is other than English. On the basis of the California English Language Development Test, these students are classified either as limited English proficient (LEP) or fluent English Proficient (FEP). LEP students are still learning English, whereas FEP students have met the district criteria for proficiency in English (California Department of Education, 2011). The remaining students were classified as native English speakers. In the present study, parents of 3% of the sample declined access to their child's English language status. Among participants for whom data were accessible, 14.5% were LEPs, 49.2% were FEPs, and 36.3% were native English speakers. This distribution closely matches that of the school, which enrolls 15% LEPs, 47% FEPs, and 38% native English speakers.

Procedures

Before I collected data, I obtained informed consent from parents and assent from students. Survey data were collected at the start (T1), midpoint (T2), and end (T3) of the school year. The schedule

TABLE 1
Survey Administration Schedule

	T1 (early fall)	*T2 (late fall)*	*T3 (spring)*
Math interest	×		×
Math self-efficacy	×		×
Math class interest		×	
Math strategies		×	
Teacher practices			×

of survey administration appears in Table 1. At T1, students completed measures of mathematics interest and self-efficacy. Midway through the academic year (T2), students completed surveys on their strategy use and math class interest. At T3, surveys were administered for perceived teacher practices, as well as mathematics interest and self-efficacy. My research team and I conducted each of the three survey administrations. Participants completed paper-and-pencil surveys in small groups during the school day. No teachers were present when students completed surveys. I obtained data on grade level, gender, English language status, and mathematics achievement from school records at the end of the academic year for participants whose parents had granted specific consent for the research team to access this information.

Measures

Motivation Measures

I measured *math interest* with four items that are based on Hidi and Renninger's (2006) study and Riconscente's (2010) study. All items were assessed along a 4-point Likert-style scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Sample items include the following: "I enjoy math" and "I don't find math all that interesting" (reversed). Cronbach's alpha for math interest at T1 and T3 were .86 and .85, respectively. The measure for *math self-efficacy* was adapted from the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1991) and was administered at T1 and T3. It comprised three items on a Likert-style scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), such as "I'm certain I can understand the ideas taught in math class." Cronbach's alpha was .84 and .78 at T1 and T3, respectively. Last, *math class interest* was measured at T2 on a Likert-style scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), such as "I look forward to going to math class." This measure was based on Mitchell (1993) and Riconscente (2010). For this measure, Cronbach's alpha was .85.

Study Strategies

I assessed study strategies in mathematics using the Motivated Strategies for Learning Questionnaire subscales for effort regulation, metacognitive self-regulation, elaboration, organization, time and study location, rehearsal, help seeking, and peer learning (Pintrich et al., 1991). Students responded to all items using a 7-point Likert-style scale ranging from 1 (*not at all true of me*) to 7 (*very true of me*). For the present study, I computed an overall strategy use variable by averaging students' scores on the eight subscales. Cronbach's alpha was .91 for overall strategy use.

Perceptions of Teacher Practices

I assessed students' perceptions of their mathematics teachers' practices with three subscales I created in the context of a larger study that included interviews with students and teachers. The measure was piloted between T2 and T3 with participants in the present study, analyzed using factor analysis, and modified for administration at T3 in the present study. The first measured *teacher caring* and comprised five items. Sample items are "My math teacher does NOT care about students" (reverse-coded) and "My math teacher treats students with respect." Cronbach's alpha for this subscale was .77. I assessed students' perceptions of how well their teachers help them become interested in mathematics, labeled *interest promotion*, with five items, including "My math teacher makes me want to learn more about math" (Cronbach's alpha = .87). I measured students' perceptions of their teachers' *content explanations* with four items, including "My math teacher is good at explaining math" (Cronbach's alpha = .81).

Achievement

Math achievement was operationalized as the student's mathematics grade for the academic year. At the study site, grades were assigned on an A to F scale, and plusses or minuses were not used. For analysis purposes, the letter grades were quantified with a score of 0 for F, 1 for D and so on, with a score of 4 assigned for an A. Data were obtained from school records.

RESULTS

Preliminary Analyses

I conducted preliminary analyses to check for differences as a function of gender, grade level, and English language proficiency category for all study variables, and for change scores (T3-T1) for interest and self-efficacy. To examine gender and grade-level effects, I conducted 2 × 2 analyses of variance. Between-group differences in relation to English language proficiency were tested with one-way analyses of variance. Neither main effects nor interactions were detected for mathematics achievement by gender or grade level, and mathematics achievement did not vary as a function of English language proficiency.

Group Comparisons for Mathematics Interest and Math Class Interest

Gender and grade level group differences in mathematics interest were tested with a 2 × 2 analysis of variance. I found no main effects or interaction effects in relation to gender; however, 10th-grade students had lower initial interest than did 9th-grade students at T1, $F(1, 296) = 5.378$, $p = .021$. By T3, neither main effects nor interactions were significant for interest. With respect to changes in students' interest from T1 to T3, a main effect was found indicating significant overall declines in students' mathematics interest, $t(281) = -3.208$, $p = .001$. However, neither main effects nor interactions were detected in relation to gender or grade level. For T2 math class interest, grade but neither gender effects nor interaction effects were significant. In addition, 9th-grade students reported higher math class interest than did 10th-grade students, $t(280) = 2.841$, $p = .005$.

With respect to English language proficiency, a one-way analysis of variance test revealed significant between-group differences for interest at T1, $F(2, 287) = 10.270$, $p < .001$; interest at T3, $F(2, 294) = 5.932$, $p = .003$; and math class interest at T2, $F(2, 273) = 6.645$, $p = .002$. Post-hoc analyses using *least significant difference* with Bonferroni correction revealed that native English speakers had significantly lower interest than did fluent English proficient and limited English proficient students at T1 and T3, and lower math class interest at T2. However between-group changes in students' interest from T1 to T3 were nonsignificant.

Group Comparisons for Self-Efficacy

Main effects were significant for grade level at T1 and for gender at T3; however, no interaction effects were detected at either time point. The self-efficacy of 10th-grade students was significantly lower than that of 9th-grade students at T1, $F(1, 295) = 15.040$, $p < .001$. Boys reported slightly higher efficacy for math than did girls at T3, $F(1, 302) = 4.601$, $p = .033$. Students' self-efficacy did not change significantly from T1 to T3, and neither main effects nor interactions were detected in relation to gender or grade level.

English language proficiency groups differed significantly on self-efficacy at T1, $F(2, 287) = 6.660$, $p = 0.001$. *Least significant difference* post-hoc analyses with Bonferroni correction showed that native English speakers reported lower math self-efficacy at T1 than did fluent English proficient students. No differences were found by English language proficiency for mathematics self-efficacy at T3. Although changes in students' self-efficacy from T1 to T3 were significantly different as a function of English language proficiency at the omnibus level, $F(2, 274) = 3.095$, $p = .047$, none of the post-hoc analyses were significant after Bonferroni corrections were introduced.

Group Comparisons for Study Strategies

Main effects were found for grade level but not gender with respect to study strategies, and the interaction term was nonsignificant. Relative to 9th-grade students, 10th-grade students reported less frequent use of study strategies, $F(1, 281) = 7.069$, $p = .008$. An analysis of variance revealed omnibus differences between English-language proficiency groups on overall study strategies, $F(2, 273) = 5.513$, $p = .004$. *least significant difference* post-hoc comparisons with Bonferroni adjustments indicated that native English speakers had significantly lower study strategy scores than did fluent English proficient students.

Group Comparisons for Perceptions of Teacher Practices

Student perceptions of teacher practices did not differ significantly by gender. The only main effect related to grade level was for content explanations, $F(1, 302) = 4.853$, $p = .028$. The average ratings of 9th-grade students' of their teachers on this variable were more favorable than those of 10th-grade students. No significant grade level by gender interactions were detected for any of the

TABLE 2
Means, Standard Deviations, Zero-Order Correlations, and Reliabilities ($N = 283$)

	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender												
2. Grade level	.02											
3. T1: Interest	–.04	–.12*										
4. T1: Self-efficacy	–.10	–.22***	.47***									
5. T2: Class interest	–.01	–.17**	.58***	.40***								
6. T2: Strategy use	.02	–.15*	.47***	.30***	.59***							
7. T3: Teacher caring	.03	–.01	.24***	.32***	.33***	.29***						
8. T3: Teacher interests	.01	–.07	.34***	.32***	.48***	.39***	.64***					
9. T3: Teacher explains	.01	–.12*	.23***	.26***	.42***	.27***	.66***	.67***				
10. T3: Interest	–.07	–.06	.60***	.33***	.66***	.48***	.40***	.59***	.49***			
11. T3: Self-efficacy	–.12*	–.09	.35***	.43***	.39***	.34***	.45***	.39***	.48***	.56***		
12. Achievement	.07	–.11	.16**	.27***	.29***	.18**	.38***	.37***	.38***	.37***	.37***	
M	.57	9.45	2.62	3.00	2.53	4.16	3.05	2.53	3.04	2.49	3.07	1.47
SD	.50	.50	.72	.63	.73	1.10	.61	.74	.70	.77	.60	1.27
α	—	—	.86	.84	.85	.91	.77	.87	.81	.85	.78	—

Note. Analyses conducted with listwise deletion. All self-report measures were reported on 4-point scales, with the exception of strategy use, which used a 7-point scale.

$^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$.

teacher variables. With respect to English language proficiency, significant differences were found for teacher caring, $F(2, 294) = 3.279$, $p = 0.039$, and for teacher interest promotion, $F(2, 294) = 5.898$, $p = 0.003$. *Least significant difference* post-hoc analyses with Bonferroni corrections indicated that native English speakers perceived their teachers as less caring relative to perceptions of fluent English proficient students, and less interest-promoting relative to perceptions of their fluent English proficient and limited English proficient peers.

Correlations

For ease of reading, the three variables related to students' perceptions of their teachers are referred to in the remainder of the results section without the "perceived" qualifier. Table 2 presents zero-order correlations for all study variables. I found a significant and positive medium effect of teacher content explanations in relation to math class interest at T2 and for interest, self-efficacy and achievement at T3. Similar patterns were detected for teacher interest promotion, with significant and positive medium effects in relation to interest at T1, to math class interest and strategy use at T2, and to self-efficacy and achievement at T3. Teacher interest promotion had large positive and significant relations to teacher explanations and interest at T3.

Regression Analyses

I conducted preliminary regression analyses to analyze missing data patterns. Variables were recoded into a separate variable indicating missing status which was then used to predict all study variables. Because missing status was not a significant predictor of any of the study variables, missing data were replaced with means (Graham & Hofer, 2000). The sample size in the present study offered sufficient statistical power to detect an effect size (f^2) of 0.06.

To respond to the first research question, three hierarchical linear regression analyses were conducted examining whether student perceptions of teacher caring, teacher interest promotion and teacher explanations significantly predicted mathematics interest, self-efficacy, and achievement. Demographics were entered in step 1, followed by T1 interest and self-efficacy. The English language development variable was coded using two dummy variables for fluent English proficient and limited English proficient, with native English speakers serving as the comparison group. Math class interest was entered at Step 3, and Step 4 introduced study strategies. Teacher caring was entered at Step 5, and in the final step teacher interest promotion and teacher content explanations were entered. According to Pedhazur (1997), multicollinearity is not a concern if variance inflation factors are between 0.1 and 10.0. In the present study, variance inflation factor values were acceptable, ranging from 1.01 to 2.371.

Mathematics Interest

Table 3 presents the hierarchical linear regression results for predicting mathematics interest at T3. The final step of the regression significantly increased the R^2: $F(2, 244) = 18.462$, $p < .001$. Teacher interest promotion, $\beta = .282$, $t(244) = 4.608$, $p < .001$, made positive unique contributions to end-of-year mathematics interest, and a marginally significant contribution was made by teacher content explanations, $\beta = .112$, $t(244) = 1.841$, $p = .067$. In the final model, the only other significant predictors were interest at T1, $\beta = .323$, $t(244) = 6.038$, $p < .001$, and math class interest at T2, $\beta = .305$, $t(244) = 5.200$, $p < .001$. In other words, teacher interest promotion, and to some extent teacher content explanations, made significant contributions to students'

TABLE 3
Standardized Beta Coefficients for Predicting T3 Mathematics Interest

Step	*Predictor*	*Step 1*	*Step 2*	*Step 3*	*Step 4*	*Step 5*	*Step 6*
1	Gender	–.067	–.018	–.037	–.040	–.051	–.032
	Grade	–.073	–.023	.009	.013	.001	.031
	Fluent English speaker	.147*	–.029	–.040	–.046	–.051	.031
	English language learner	.108	.003	–.042	–.041	–.046	–.016
2	T1 Interest		.579***	.347***	.333***	.334***	.323***
	T1 Self-efficacy		.066	–.008	–.010	–.051	–.051
3	T2 Class interest			.468***	.428***	.397***	.305***
4	T2 Strategy use				.089	.066	.049
5	T3 Caring					.189***	–.025
6	T3 Interest promotion						.282***
	T3 content explanations						.112†
	R^2 change	.035†	.338***	.137***	.005	.030***	.060***
	Total R^2	.035	.373	.510	.515	.545	.605
	Total R^2 effect size (f^2)	.03	.46	.75	.76	.87	1.16

Note. Gender was coded 0 = male, 1 = female. Grade-level reference group was ninth-grade students. Comparison group for the two English language development dummy variables is English speaker.
***$p < .001$. **$p < .01$. *$p < .05$. †$p < .10$.

TABLE 4
Standardized Beta Coefficients for Predicting T3 Mathematics Self-Efficacy

Step	*Predictor*	*Step 1*	*Step 2*	*Step 3*	*Step 4*	*Step 5*	*Step 6*
1	Gender	–.122†	–.071	–.080	–.057	–.103	–.096
	Grade	–.091	–.017	–.003	–.020	–.015	–.017
	Fluent English speaker	.040	–.075	–.080	.003	–.097	–.052
	English language learner	.021	–.035	–.056	–.007	–.062	–.046
2	T1 Interest		.221**	.114	.050	.093	.105
	T1 Self-Efficacy		.299***	.265***	.267***	.195**	.196**
3	T2 Class Interest			.215**	.130*	.103	.054
4	T2 Strategy Use				.143**	.099	.119†
5	T3 caring					.311***	.204**
6	T3 interest promotion						–.103
	T3 content explanations						.276***
	R^2 change	.026	.176***	.029**	.012*	.082***	.034**
	Total R^2	.026	.202	.231	.243	.325	.359
	Total R^2 effect size (f^2)	.03	.20	.25	.27	.46	.56

Note. Gender was coded 0 = male, 1 = female. Grade-level reference group was ninth-grade students. Comparison group for the two English language development dummy variables is English speaker.
***$p < .001$. **$p < .01$. *$p < .05$. †$p < .10$.

interest in mathematics even after controlling for demographics, prior levels of motivation, study strategies, and teacher caring. The change in magnitude and significance of the teacher caring predictor from Step 5 to Step 6, together with the contributions of interest promotion and content explanations, speaks to the shared variance among these predictors rather than to the irrelevance of perceived teacher caring to mathematics interest.

Mathematics Self-Efficacy

In Table 4, results are presented for predicting mathematics self-efficacy at T3. The final step of the regression significantly boosted the R^2 [$F(2, 244) = 6.378$, $p = .002$]. Teacher content explanations, $\beta = .276$, $t(244) = 3.571$, $p < .001$ significantly and positively contributed to the explained variance in mathematics self-efficacy. In the final model, significant unique contributions were also made by mathematics self-efficacy at T1, $\beta = 0.196$, $t(244) = 3.215$, $p = 0.001$ and teacher caring, $\beta = .204$, $t(244) = 2.784$, $p = .006$.

Mathematics Achievement

Results for predicting mathematics achievement are shown in Table 5. The introduction of teacher interest promotion and teacher content explanations in the final step of the regression marginally significantly increased the R^2: $F(2, 224) = 2.994$, $p = .052$. Self-efficacy at T1 was a marginally significant predictor, $\beta = 0.169$, $t(224) = 3.413$, $p = 0.001$. Teacher caring was the only fully significant predictor of mathematics achievement, $\beta = 0.194$, $t(224) = 2.314$, $p = 0.022$. However, the reduction in magnitude of the beta coefficient for teacher caring when interest promotion and content explanations were added to the model, together with the marginally

TABLE 5
Standardized Beta Coefficients for Predicting End-of-Year Mathematics Achievement

Step	*Predictor*	*Step 1*	*Step 2*	*Step 3*	*Step 4*	*Step 5*	*Step 6*
1	Gender	.072	.094	.084	.083	.067	.073
	Grade	–.133*	–.070	–.055	–.054	–.083	–.068
	Fluent English speaker	.003	–.076	–.086	–.087	–.093	–.081
	English language learner	–.056	–.084	–.111	–.111	–.111†	–.112†
2	T1 Interest		.095	–.014	–.016	–.009	–.014
	T1 Self-efficacy		.238**	.200**	.200**	.131†	.133†
3	T2 Class interest			.227**	.222*	.157†	.101
4	T2 Strategy use				–.011	–.023	–.026
5	T3 caring					.326***	.194*
6	T3 interest promotion						.137
	T3 content explanations						.099
R^2 change		.024	.075***	.032**	.000	.090***	.020†
Total R^2		.024	.099	.131	.131	.221	.241
Total R^2 effect size (f^2)		.02	.09	.12	.12	.18	.22

Note. Grade-level reference group was ninth-grade students. Comparison group for the two English language development dummy variables is English speaker.
***$p < .001$. **$p < .01$. *$p < .05$. †$p < .10$.

significant boost in the overall R^2 at Step 6, suggest that these two variables do have relevance to mathematics achievement beyond the contributions made by the control variables.

Mediating Effects

The second research question asked whether teacher instructional practices mediate the relation between teacher caring and students' end-of-year motivation and achievement. The present study tested this hypothesis using a multiple mediator model (Preacher & Hayes, 2008). Until recently, the steps advocated by Baron and Kenny (1986), sometimes in combination with Sobel's (1982) product-of-coefficients approach, have been used to test for mediation. These approaches assume multivariate normality of the sampling distribution of total and specific indirect effects. However, in small samples, these assumptions are problematic (Preacher & Hayes, 2008).

Preacher and Hayes (2008) introduced an alternative approach that does not require these assumptions to be met. Their bootstrapping method increases power and keeps Type I error in check. In bootstrapping, an approximation of the sampling distribution is generated using a nonparametric sampling technique. To test multiple mediation models, many sampling distributions of total and indirect effects are generated using a subsample of the data, with replacement, and effects are determined on the basis of the average effects observed in the empirically generated subsamples. The process yields confidence intervals for indirect and total effects. As recommended by Preacher and Hayes (2008), in the present study the bootstrap confidence intervals using bias-correction and acceleration were used.

For each model, controls were included to take into consideration T1 interest, T1 self-efficacy, T2 math class interest, and T2 study strategies. Table 6 presents the bootstrap confidence intervals

TABLE 6
Magnitude and Confidence Intervals of the Multiple Mediation Effects of the Teacher–Student Relationship With Teacher Practices as the Mediators for Students' Achievement and Changes in Interest and Self-Efficacy

	Bootstrap for mediation effects		
		95% bias-corrected and accelerated confidence intervals	
	Bootstrap mediation effect (SE)	Lower	Upper
T3 Interest			
Mediators			
Total mediated effect	**.2747(.0591)**	**.1575**	**.3916**
Interest promotion	**.1910(.0526)**	**.0818**	**.2868**
Content explanations	**.0837(.0424)**	**.0101**	**.1819**
Contrast			
Interest promotion vs. contrast explanations	.1087(.0770)	–.0515	.2488
T3 Self-efficacy			
Mediators			
Total mediated effect	.1162(.0661)	–.0196	.2362
Interest Promotion	–.0550(.0456)	–.1585	.0300
Content Explanations	**.1712(.0570)**	**.0624**	**.2765**
Contrast			
Interest promotion vs. contrast explanations	**–.2263(.0793)**	**–.3953**	**–.0671**
Achievement			
Mediators			
Total mediated effect	**.2932(.1205)**	**.0637**	**.5307**
Interest promotion	.1312(.0961)	–.0621	.3257
Content explanations	**.1621(.0920)**	**.0028**	**.3578**
Contrast			
Interest promotion vs. contrast explanations	–.0309(.1445)	–.3225	.2681

Note. Values shown are results when controls were included for T1 interest, T1 self-efficacy, T2 math class interest, and T2 study strategies. Significant mediation effects are shown in boldface. Confidence intervals containing 0 are interpreted as being not significant.

for the three multiple mediator models tested. Each is based on 1,000 bootstrap samples. Results for the path coefficients for the multiple mediator models are displayed in Figures 1a–1c.

I hypothesized that teacher content explanations and teacher interest promotion would mediate the relation between teacher caring and mathematics interest, self-efficacy, and achievement. For each test of mediation, all T1 and T2 variables were included as controls. The results of the multiple mediators tests (Preacher & Hayes, 2008) are presented in Figure 1, and significance tests of the mediation effects can be found in Table 6. With respect to mathematics interest, the relation to teacher caring was completely mediated by interest promotion and content explanations. The combined mediation effect of both predictors was significant, as were the contributions of both mediators. Teacher interest promotion and teacher content explanations did not differ significantly in their role as mediators. The combined mediation effect was nonsignificant for self-efficacy. Last, results regarding mathematics achievement revealed a significant combined

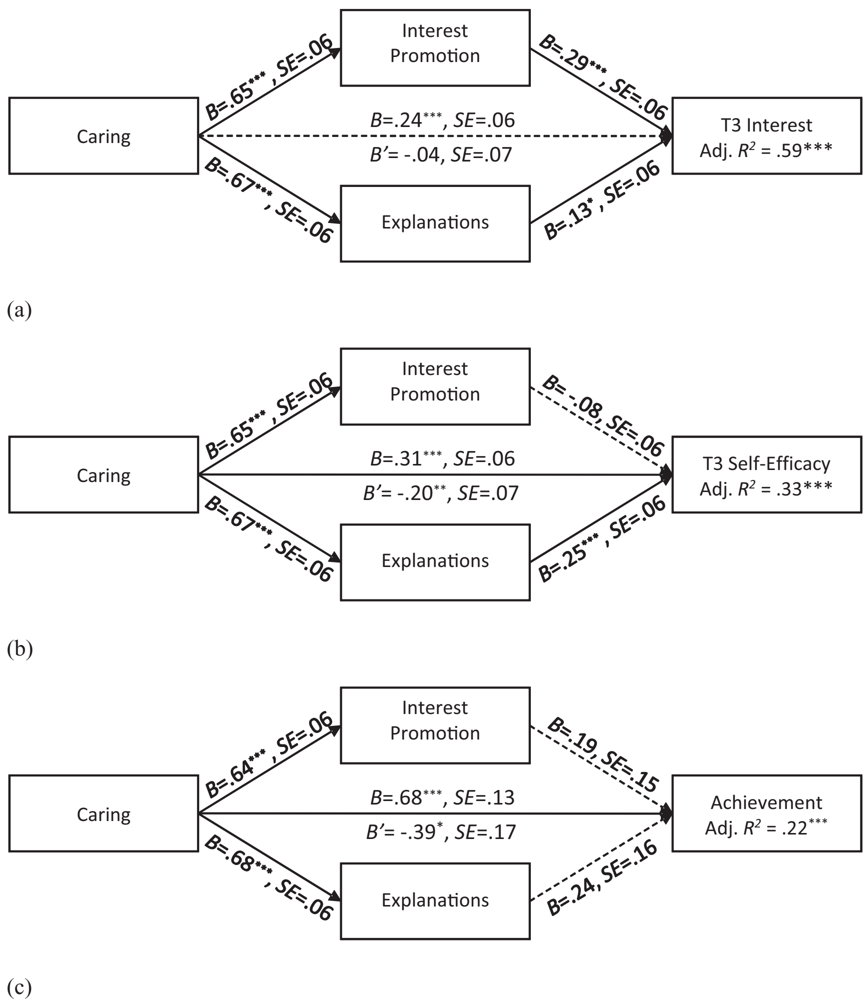

FIGURE 1 Multiple mediation tests of the relations between teacher–student relationship and students' interest, self-efficacy, and achievement. All path coefficients are unstandardized regression coefficients while controlling for T1 interest, T1 self-efficacy, T2 classroom interest, and T2 strategy use. Significant relations are illustrated with solid lines; dashed lines indicate nonsignificant relations. $^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$.

mediation effect. However, content explanations but not interest promotion was responsible for the effect.

Moderating Effects

The third research question asked whether self-efficacy and interest interacted with perceptions of teacher practices to produce differential changes in student outcomes. Six interaction terms were calculated using standardized values: T1 interest by each of the three teacher variables, and T1 efficacy by each teacher variable. These variables were entered as a final step into the regression models presented for Question 1. The addition of the interaction terms did not significantly increase the variance explained in the outcomes. Moreover, multicollinearity posed issues for the efficacy interaction terms. In sum, data in the present study did not offer evidence that teacher practices interacted with students' initial motivation levels in regard to T3 interest or self-efficacy.

DISCUSSION

The primary purpose of this study was to examine the effects of teacher caring, teacher content explanations, and teacher interest promotion on mathematics self-efficacy, interest, and achievement among Latino high school students. Student perceptions of teacher caring remained a significant predictor of self-efficacy even after perceived teacher content explanations and perceived teacher interest promotion were taken into consideration. Although teacher caring did not persist as a significant contributor to either interest or achievement after the addition of perceived teacher instructional practices to the model, the patterns among the coefficients in the last steps of the model, together with the shared variance among these variables suggests their collective relation to the outcomes. This finding confirms and extends prior research. Consistent with prior research in nonminority populations, in this study perceived teacher caring was positively related to Latino students' achievement. The finding regarding the unique contribution of teacher caring to self-efficacy, even after the introduction of the instructional practice variables, suggests that the perceived interpersonal relationship plays a critical role among Latino students.

This study also revealed new insights into the power of perceived instructional practices for fostering Latino students' interest in school subjects, and highlights the close relationship between understanding and interest. Students' perceptions of their teachers' ability to explain mathematics well was positively related to student's achievement and to changes in interest and self-efficacy in mathematics. The fact that students' perceptions of their teachers' ability to explain the subject matter was a unique contributor to their achievement, which was a non–self-report variable, suggests that this aspect of teacher practice may be a key dimension in Latino students' assessments of teacher quality. Moreover, the extent to which students felt their teacher promoted interest explained changes in their interest, but not in self-efficacy or year-end achievement. This result is important and encouraging because students' prior interest and math class interest were controls in the model. In other words, even after taking into account the individual interest that students brought to the classroom context, teacher practices still contributed to students' mathematics interest at the end of the year. This finding strengthens the conclusion that what teachers do in the classroom can positively contribute to Latino students' interest in subject matter.

The study also shed light onto the combined effects of perceived interpersonal and instructional factors on students' academic outcomes by examining whether teachers express their caring through efforts to get students interested in the subject and to explain the subject well. Analyses showed that the relation between caring and interest, and between caring and achievement, was indeed mediated by the instructional factors. This finding is helpful for discovering the criteria Latino students attend to for detecting caring in their teachers.

As a backdrop to the central research questions, preliminary analyses of the data offered additional insights regarding the extent to which the results here are consistent with patterns reported in the literature with respect to gender, grade level, strategies, and English language proficiency. Although no gender-related differences were found on study variables, the results of this study revealed lower levels of motivation, study strategies, perceived teacher interest promotion, and achievement for 10th-grade students relative to their 9th-grade peers. These data are consistent with research, particularly with younger students, indicating downward trajectories of motivation over time (e.g., Wigfield & Eccles, 2002). Although the design of the present study did not enable causal inferences, the findings reported here suggest that the negative trends associated with grade level may be mitigated by teacher practices to promote interest and explain content well. These results are consistent with the studies by Miller (2001) and Garcia-Reid and colleagues (2005) cited earlier. At the same time, given the cross-sectional nature of the 9th–10th grade comparisons, an alternative explanation for the grade-level differences is the range of effectiveness of the teachers in those classrooms. It is possible that teachers of the ninth-grade students in the study were more effective at promoting interest and explaining content. Other classroom-level variables may also be responsible for these outcomes, such as peer relations. Future research should examine these outcomes taking into consideration how students are nested within classrooms.

The finding that native English speakers reported lower levels of interest and self-efficacy, and less favorable perceptions of teacher practices relative to their peers, is intriguing and raises more questions than it answers. For example, English language proficiency may be acting as a proxy for time elapsed since immigration. It is possible that students closer to immigration adopt a more positive outlook on the opportunities they anticipate accessing in their new country. Another possibility is that English language proficiency for immigrant students reflects the level of education a student received prior to entering school in the second country. Additional research is needed to understand the reasons underlying the associations and patterns detected in the present study, and to tease apart the interrelations of language comprehension, immigrant status, and culture.

Of interest was the finding that study strategies did not emerge as a significant predictor of achievement. This raises a point of concern as to whether students in this study were aware of the kinds of strategies they might employ to improve their academic performance. It is possible that high school teachers assume their students are already equipped with the study strategies needed to succeed academically. Additional research is in order to ascertain whether students are aware of and able to effectively apply strategies necessary for deep and flexible content understanding, and whether this knowledge differs across ethnic groups.

Several limitations should be weighed in drawing inferences from the results presented herein. First, the grade-level comparisons were cross-sectional. It is possible that the differences observed are the result of a factor or combination of factors other than age or time in school. Second, the study made use of student reports for the motivation and strategy constructs. It is important to note that student's perceptions are affected by teachers' actions and attitudes. From a sociocognitive perspective these perceptions may also be shaped in part by the interplay between environmental and intrapersonal factors. Consequently, because the present study relied entirely on student perceptions and did not gather data on teachers that were independent of student perceptions, an additional limitation in the study is the inability to tease apart the extent to which students' perceptions are based on teachers' actions and on students' individual differences. Although in this study I opted to test a one-level model, it is possible that students' perceptions of their teachers are indeed reliable across students and that a multilevel model would have yielded different results. Future research with larger samples could explore this possibility. Moreover, teacher variables were only measured at the end of the school year, with the assumption that these variables remained relatively constant over the course of the year. Future research should examine the stability of students' perceptions of teacher caring and instructional practices. More work is also in order to establish the specific behaviors by which students read their teachers' caring, content explanations, and interest promotion.

Further research is in order to replicate and extend these findings. Among the aims of future studies are longitudinal nested models, richer operationalizations of teacher caring and instructional practices, and the use of a variety of methodological approaches, such as observation and teacher-report, to triangulate conclusions. More nuanced investigations of student interest represent another avenue for continued research. Pursuing this work requires the development of measures and the use of innovative data analysis techniques, such as latent class analysis, to individuate students' interest development levels (Riconscente, 2010).

In sum, this study makes a number of significant contributions to the theoretical literature. Although causal claims cannot be made because of the nature of the study design, the findings highlight the powerful role that teacher practices can play in contributing to students' motivation and achievement.

ACKNOWLEDGEMENTS

The author thanks the principal, teachers, and students at the study site for their dedication to this research project. This study would not have been possible without the generous assistance of Ann Nemerouf, who contributed to the data collection efforts and provided valuable feedback on an earlier draft of this article. The author is grateful to Stuart Karabenick and Kathryn Wentzel, who provided valuable feedback on earlier versions of this article.

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REFERENCES

Ainley, J., Foreman, J., & Sheret, M. (1991). High school factors that influence students to remain in school. *Journal of Educational Research*, *85*, 69–80.

Ainley, M., Hidi, S., & Berndorff, D. (2002). Interest, learning, and the psychological processes that mediate their relationship. *Journal of Educational Psychology*, *94*, 545–561.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology*, *84*, 261–271.

Anderman, E. M., & Maehr, M. L. (1994). Motivation and schooling in the middle grades. *Review of Educational Research*, *64*, 287–309.

Aud, S., & Hannes, G. (Eds.). (2010). *The Condition of Education 2010 in Brief (*NCES 2010-029). Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191–215.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Barber, B. K., & Olsen, J. A. (2004). Assessing the transitions to middle and high school. *Journal of Adolescent Research*, *19*, 3–30.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.

Bergin, D. A. (1999). Influences on classroom interest. *Educational Psychologist*, *34*, 87–98.

Bolyard, J. J., & Moyer-Packenham, P. S. (2008). A review of the literature on mathematics and science teacher quality. *Peabody Journal of Education*, *83*, 509–535.

Brewster, A. B., & Bowen, G. L. (2004). Teacher support and the school engagement of Latino middle and high school students at risk of school failure. *Child and Adolescent Social Work Journal*, *21*, 47–67.

Bridgeland, J. M., DiIulio, J. J., & Morison, K. B. (2006). *The silent epidemic: Perspectives of high school dropouts*. Washington, DC: Civic Enterprises.

Brophy, J., & Good, T. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 328–375). New York, NY: MacMillan.

Bryk, A., Lee V., & Holland, P. (1993). *Catholic schools and the common good*. Cambridge, MA: Harvard University Press.

California Department of Education, Educational Demographics Office. (2011). *Instructions for the Spring Language Census*. Sacramento, CA: California Department of Education.

Cohen, D. K., Raudenbush, S. W., & Ball, D. L. (2003). Resources, instruction, and research. *Educational Evaluation and Policy Analysis*, *25*, 119–142.

Conley, A. M. M., & Karabenick, S. A. (2006, March). *Construct validity issues in the measurement of motivation to learn*. *Paper presented at the biennial meeting of the Society for Research on Adolescence*, San Diego, CA.

Cooley, W. W., & Leinhardt, G. (1980). The instructional dimensions study. *Educational Evaluation and Policy Analysis*, *2*, 7–25.

Croninger, R. G., & Lee, V. E. (2001). Social capital and dropping out of high school: Benefits to at-risk students of teachers' support and guidance. *Teachers College Record*, *103*, 548–581.

Davidson, A. L., & Phelan, P. (1999). Students' multiple worlds: An anthropological approach to understanding students' engagement with school. In T. C. Urdan (Vol. Ed.), *Advances in motivation and achievement: Role of context* (pp. 233–283). Stamford, CT: JAI Press.

Davis, H. A. (2001). The quality and impact of relationships between elementary school students and teachers. *Contemporary Educational Psychology*, *26*, 431–453.

Davis, H. A. (2003). Conceptualizing the role and influence of student–teacher relationships on children's social and cognitive development. *Educational Psychologist*, *38*, 207–234.

den Brok, P., van Tartwijk, J., Wubbels, T., & Veldman, I. (2010). The differential effect of the teacher–student interpersonal relationship on student outcomes for students with different ethnic backgrounds. *British Journal of Educational Psychology*, *80*, 199–221.

Denissen, J. J. A., Zarrett, N. R., & Eccles, J. S. (2007). I like to do it, I'm able and I know I am: Longitudinal couplings between domain-specific ability/achievement, self-concept, and interests. *Child Development*, *78*, 430–447.

Dotterer, A. M., McHale, S. M., & Crouter, A. C. (2009). The development and correlates of academic interests from childhood through adolescence. *Journal of Educational Psychology*, *101*, 509–519.

Fredricks, J. A., Blumenfeld, P., Friedel, J., & Paris, A. (2005). School engagement. In K. A. Moore & L.H. Lippman (Eds.), *What do children need to flourish? Conceptualizing and measuring indicators of positive development* (pp. 305–321). New York, NY: Springer.

Fry, R. (2007). *How far behind in math and reading are English language learners?* Washington, DC: Pew Hispanic Center.

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, *95*, 148–162.

Garcia-Reid, P., Reid, R. J., & Peterson, N. A. (2005). School engagement among Latino youth in an urban middle school context. *Education and Urban Society*, *37*, 257–275.

Goodenow, C. (1993). Classroom belonging among early adolescent students: Relationships to motivation and achievement. *Journal of Early Adolescence*, *13*, 21–43.

Goodenow, C., & Grady, K. E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *Journal of Experimental Education*, *62*, 60–71.

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation from childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology*, *93*, 3–13.

Graham, J. W., & Hofer, S. M. (2000). Multiple imputation in multivariate research. In T. D. Little, K. U. Schnabel, & J. Baumert (Eds.), *Modeling longitudinal and multilevel data: Practical issues, applied approaches, and specific examples* (pp. 201–218). Mahwah, NJ: Erlbaum.

Greene, B. A., & Miller, R. B. (1996). Influences on achievement: Goals, perceived ability, and cognitive engagement. *Contemporary Educational Psychology*, *21*, 181–192.

Greene, B. A., Miller, R. B., Crowson, H. M., Duke, B. L., & Akey, K. L. (2005). Predicting high school students' cognitive engagement and achievement: Contributions of classroom perceptions and motivation. *Contemporary Educational Psychology*, *29*, 462–482.

Harackiewicz, J. M., Barron, K. E., Tauer, J. M., & Elliot, A. J. (2002). Predicting success in college: A longitudinal study of achievement goals and ability measures as predictors of interest and performance from freshman year through graduation. *Journal of Educational Psychology*, *94*, 562–575.

Hidi, S. (1990). Interest and its contribution as a mental resource for learning. *Review of Educational Research*, *60*, 549–571.

Hidi, S., & Renninger, K. A. (2006). The Four-Phase Model of Interest Development. *Educational Psychologist*, *41*, 111–127.

Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, *42*, 371–406.

Howley, C. B., & Howley, A. A. (2004). School size and the influence of socioeconomic status on student achievement: Confronting the threat of size bias in national data sets. *Education Policy Analysis Archives*, *12*(1), 25–32.

Iran-Nejad, A. (1987). Cognitive and affective causes of interest and liking. *Journal of Educational Psychology*, *79*, 120–130.

Jennings, G. (2003). An exploration of meaningful participation and caring relationships as contexts for school engagement. *The California School Psychologist*, *8*, 43–51.

Kaplan, A., & Maehr, M. L. (2007). The contributions and prospects of goal orientation theory. *Educational Psychology Review*, *19*, 141–184.

Krapp, A., Hidi, S., & Renninger, K. A. (1992). Interest, learning, and development. In K. A. Renninger, S. Hidi & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 3–25). Hillsdale, NJ: Erlbaum.

Kyriakides, L. (2005). Drawing from teacher effectiveness research into teacher interpersonal behaviour to establish a teacher evaluation system: A study on the use of student ratings to evaluate teacher behaviour. *Journal of Classroom Interaction*, *40*, 44–66.

LaRoche, M. J., & Shriberg, D. (2004). High stakes exams and Latino students: Toward a culturally sensitive education for Latino children in the United States. *Journal of Educational and Psychological Consultation*, *15*, 205–233.

Loeb, S., Rouse, C., & Shorris, A. (2007). *Introducing the issue: Excellence in the classroom*. *The Future of Children*, *17*, 3–14.

Maehr, M. L. (1976). Continuing motivation: An analysis or a seldom considered educational outcome. *Journal of Educational Research*, *46*(3), 443–462.

Martin, A., & Dowson, M. (2009). Interpersonal relationships, motivation, engagement, and achievement: Yields for theory, current issues, and educational practice. *Review of Educational Research*, *79*, 327–365.

Meece, J. L., & Miller, S. D. (2001). A longitudinal analysis of elementary school students' achievement goals in literacy activities. *Contemporary Educational Psychology*, *26*, 454–480.

Midgley, C., Feldlaufer, H., & Eccles, J. S. (1989). Student/teacher relations and attitudes toward mathematics before and after the transition to junior high school. *Child Development*, *60*, 981–992.

Mitchell, M. (1993). Situational interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology*, *85*, 424–436.

Muller, C. (2001). The role of caring in the teacher–student relationship for at-risk students. *Sociological Inquiry*, *71*, 241–255.

Murdock, T. B., Hale, N. M., & Weber, M. J. (2001). Predictors of cheating among early adolescents: Academic and social motivations. *Contemporary Educational Psychology*, *26*, 96–115.

Murray, C. (2009). Parent and teacher relationships as predictors of school engagement and functioning among low-income urban youth. *Journal of Early Adolescence*, *29*, 376–404.

National Research Council and the Institute of Medicine. (2004). *Engaging schools: Fostering high school students' motivation to learn*. Committee on Increasing High School Students' Engagement and Motivation to Learn. Board on Children, Youth, and Families, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academies Press.

Nie, Y., & Lau, S. (2010). Differential relations of constructivist and didactic instruction to students' cognition, motivation, and achievement. *Learning and Instruction*, *20*, 411–423.

Padron, Y. N., & Waxman, H. C. (1988). The reading strategies of bilingual and monolingual students. *Journal of Social Psychology*, *128*, 697–698.

Pedhazur, E. J. (1997). *Multiple regression in behavioral research* (3rd ed.). Orlando, FL: Harcourt Brace.

Perez, S. A. (2000). An ethic of caring in teaching culturally diverse students. *Education*, *12*, 102–105.

Pianta, R. C. (2006). Classroom management and relationships between children and teachers: Implications for research and practice. In C. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 145–171). Aldershot, UK: Ashgate.

Pianta, R. C., Belsky, J., Vandergrift, N., Houts, R., Morrison, F. J. (2008). Classroom effects on children's achievement trajectories in elementary school. *American Educational Research Journal*, *45*, 365–397.

Pianta, R. C., & Stuhlman, M. W. (2004). Teacher-child relationships and children's success in the first years of school. *School Psychology Review*, *33*, 444–458.

Pintrich, P. R., & DeGroot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, *82*, 33–40.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A Manual for the Use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor, MI: The Regents of the University of Michigan.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*, 879–891.

Resnick, L. B., & Resnick, D. P. (1992). Assessing the thinking curriculum: New tools for educational reform. In B. R. Gifford & M. C. O'Connor (Eds.), *Changing assessments: Alternative views of aptitude, achievement, and instruction* (pp. 37–75). Boston, MA: Kluwer.

Riconscente, M. M. (2010, September). Using latent profile analysis to evaluate the 4-Phase Model of Interest Development. In M. Ainley (Chair), *The next decade of interest research: Processes and measures*. Symposium presented at the biannual International Conference on Motivation, Porto, Portugal.

Rivet, A., & Krajcik, J. S. (2004). Achieving standards in urban systemic reform: An example of a sixth-grade project-based science curriculum. *Journal of Research in Science Teaching*, *41*, 669–692.

Ryan, A. M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal*, *38*, 437–460.

Ryan, R. M., Stiller, J., & Lynch, J. H. (1994). Representations of relationships to teachers, parents, and friends as predictors of academic motivation and self-esteem. *Journal of Early Adolescence*, *14*, 226–249.

Schiefele, U. (1991). Interest, learning, and motivation. *Educational Psychologist*, *26*, 299–323.

Schiefele, U., Krapp, A., & Winteler, A. (1992). Interest as a predictor of academic achievement: A meta-analysis of research. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 183–212). Hillsdale, NJ: Erlbaum.

Schunk, D. H., & Pajares, F. (2005). Competence beliefs and academic functioning. In A. J. Elliott & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 85–104). New York, NY: Guilford Press.

Shernoff, D., & Schmidt, J. A. (2008). Further evidence of an engagement–achievement paradox among U.S. high school students. *Journal of Youth and Adolescence*, *37*, 564–580.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological methodology* (pp. 290–312). Washington, DC: American Sociological Association.

Stipek, D. J., Salmon, J. M., Givvin, K. B., Kazemi, E., Saxe, G., & MacGyvers, V. L. (1998). The value (and convergence) of practices suggested by motivation research and promoted by mathematics education reformers. *Journal for Research in Mathematics Education*, *29*, 465–488.

Teven, J. J., & McCroskey, J. C. (1997). The relationship of perceived teacher caring with student learning and teacher evaluation. *Communication Education*, *46*, 1–9.

Turner, J. C., & Patrick, H. (2004). Motivational influences on student participation in classroom learning activities. *Teachers College Record*, *106*, 1759–1785.

Urdan, T., & Schoenfelder, E. (2006). Classroom effects on student motivation: Goal structures, social relationships, and competence beliefs. *Journal of School Psychology*, *44*, 331–349.
U.S. Department of Education. (1997). *Mathematics equals opportunity. White Paper prepared for U.S. Secretary of Education Richard W. Riley*. Washington, DC: Author.
Usher, E. L., & Pajares, F. (2006). Sources of academic and self-regulatory efficacy beliefs of entering middle school students. *Contemporary Educational Psychology*, *31*, 125–141.
Valli, L., Croninger, R. G., & Walters, K. (2007). Who (else) is the teacher? Cautionary notes on teacher accountability systems. *American Journal of Education*, *113*, 635–662.
Vick, R. M., & Packard, B. W. (2008). Academic success strategy use among community-active Hispanic adolescents. *Hispanic Journal of Behavioral Sciences*, *30*, 463–480.
Wentzel, K. R. (1993). Does being good make the grade? Social behavior and academic competence in middle school. *Journal of Educational Psychology*, *85*, 357–364.
Wentzel, K. R. (1997). Student motivation in middle school: The role of perceived pedagogical caring. *Journal of Educational Psychology*, *89*, 411–419.
Whitlock, J. L. (2006). Youth perceptions of life at school: Contextual correlates of school connectedness in adolescence. *Applied Developmental Science*, *10*, 13–29.
Wigfield, A., & Eccles, J. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, *25*, 68–81.
Wigfield, A., & Eccles, J. (2002). Students' motivation during the middle school years. In J. Aronson (Ed.), *Improving academic achievement: Contributions of social psychology* (pp. 159–184). San Diego, CA: Academic Press.
Wilkins, N. J., & Kuperminc, G. P. (2010). Why try? Achievement motivation and perceive academic climate among Latino youth. *Journal of Early Adolescence*, *30*, 246–276.