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Early Adolescents' Perceptions of the Classroom Social Environment, Motivational Beliefs, and Engagement

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This research examined whether 5th-grade students' (N = 602) perceptions of the classroom social environment (teacher support, promotion of mutual respect, promotion of task-related interaction, student support) were related to their engagement in the classroom (self-regulation and task-related interaction) and whether those relations were mediated by personal motivational beliefs (mastery goals, academic and social efficacy). Teacher support, promotion of interaction, and student support were related to both types of engagement, and those relations were fully or partially mediated by motivational beliefs. Relations with promoting mutual respect were not significant.

Keywords: motivation, achievement goal theory, classroom environment, social environment, teacher support

Success in school depends on the extent to which students engage adaptively in classroom learning tasks. A growing body of research indicates that the classroom context plays a significant role. Students' construals of their classroom experiences are influenced by their personal characteristics and history and are linked to behavior (Ames, 1992; Maehr, 1984). The association between perceived classroom environment and student engagement is assumed by social–cognitive motivation theories to be mediated by students' motivational beliefs (e.g., Ames, 1992; E. M. Anderman & Maehr, 1994; Nicholls, 1984). That is, perceptions of the classroom influence students' beliefs about themselves and their schoolwork, and these beliefs, in turn, influence the nature and extent of their engagement in academic tasks. The few studies that have tested this mediation, however, have considered only academic dimensions of the classroom (Church, Elliot, & Gable, 2001; Nolen & Haladyna, 1990).

Although academic dimensions are important, the classroom social environment, or climate, is also related to students' motivation and engagement (e.g., Fraser & Fisher, 1982; Goodenow, 1993; A. M. Ryan & Patrick, 2001). However, little is known regarding processes for how the classroom social environment influences student engagement and performance. In the present study, we examine the role of the classroom social environment and its association with early adolescents' positive beliefs about themselves and two types of adaptive engagement in math class. In particular, we focus on students' reported use of self-regulation strategies (a type of cognitive engagement) and task-related interaction (a type of behavioral engagement). Consistent with social–cognitive theories, we propose that perceptions of the social environment (teacher and student support, promotion of mutual respect, promotion of task-related interaction) influence students' engagement by enhancing both types of adaptive student engagement. Furthermore, we examine whether those relations are mediated by students' personal motivational beliefs—concern with developing competence (mastery goal orientation), beliefs in their ability to be successful in math (academic efficacy), and confidence that they can relate effectively to others in the classroom (social efficacy). Finally, we examine associations between students' engagement in math class and their achievement. We propose that the use of both self-regulation strategies and task-related interaction is related to achievement. This model is shown in Figure 1.

The Classroom Social Environment and Associations With Engagement

During school, students interact with and work alongside peers and adults, and social perceptions and relationships are related to and predictive of school-related outcomes (e.g., Goodenow, 1992; Hymel, Comfort, Schonert-Reichl, & McDougall, 1996; Ladd, 1990). Students' perceptions of dimensions of their classroom social environment, including affiliation, cohesion, fairness, mutual respect, and support from teachers and students, are associated

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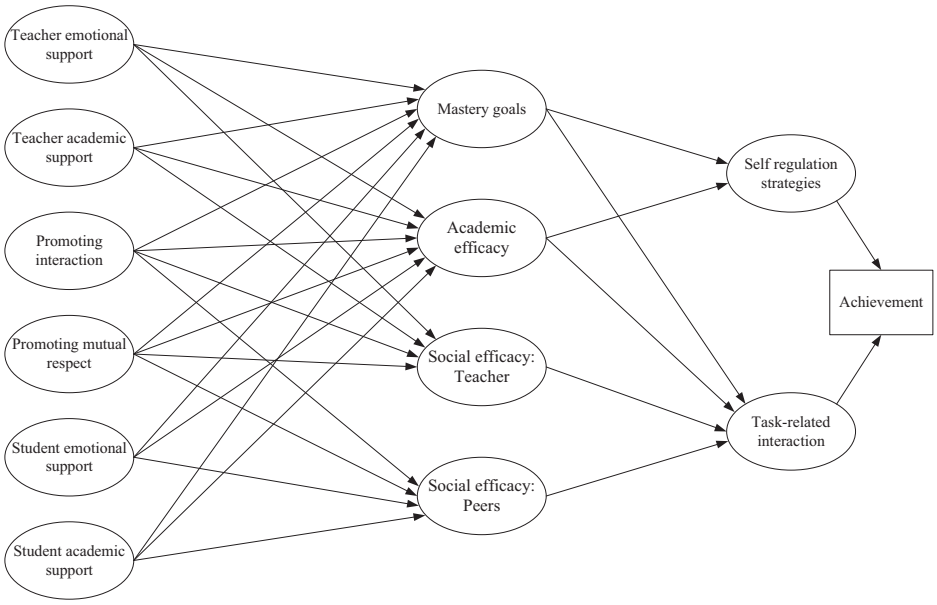

Figure 1. Proposed model with motivational beliefs mediating perceptions of the classroom social environment and engagement.

consistently with adaptive motivational beliefs and achievement behaviors (e.g., Fraser & Fisher, 1982; Goh, Young, & Fraser, 1995; Haertel, Walberg, & Haertel, 1981; McRobbie, Fisher, & Wong, 1998; A. M. Ryan & Patrick, 2001; Trickett & Moos, 1973). The social–cognitive perspective that has been applied to academic dimensions of classrooms is also relevant for examining the classroom social environment. Thus, we use this approach to consider how dimensions of the classroom social context facilitate students' adaptive engagement in mathematics.

Teacher Support

Teacher support refers to students' perceptions that their teacher cares about and will help them (Trickett & Moos, 1973). Measures of teacher support typically refer to emotional or personal support, involving perceptions that the teacher likes and cares about the student as an individual (e.g., Fraser & Fisher, 1982; Trickett & Moos, 1973). When students feel supported emotionally by their teacher, they are likely to engage more fully in their academic work, including expending effort (Goodenow, 1993; Wentzel, 1994), asking for help (Newman & Schwager, 1993), and using self-regulated learning strategies (A. M. Ryan & Patrick, 2001). They are also likely to have higher achievement (Goodenow, 1993; Trickett & Moos, 1974). These associations are likely because feeling cared about by a teacher encourages students' investment in school and desire to comply with the teacher's wishes and lessens school concerns that detract from thinking about tasks and learning. This can be explained by the roles that perceived relatedness and support have with respect to promoting intrinsic motivation (Connell & Wellborn, 1991; R. M. Ryan, 1995) and emphasizing mastery goals (Patrick & Ryan, 2006; Patrick, Ryan, Kaplan, & Maller, 2005).

Researchers sometimes also have investigated perceptions of teachers' academic support; these include beliefs that the teacher cares about students' learning, wants to help them learn, and wants them to do their best. These two types of teacher support are distinct, as indicated by factor analyses (e.g., Johnson, Johnson, & Anderson, 1983) and classroom observational studies (e.g., Patrick, Anderman, Ryan, Edelin, & Midgley, 2001). However, because measures also tend to be correlated highly, they are sometimes summed to form a single measure of teacher support (e.g., Wentzel, 1997). Consistent with the other research, combined emotional and academic teacher support is related to student effort for academics (Wentzel, 1997). Thus, we expect that perceived support will facilitate students' willingness to engage cognitively and behaviorally in academic tasks, so that both teacher emotional support and teacher academic support will be related positively to both students' use of self-regulation strategies and their task-related interaction.

Student Support

Students may also perceive support from their classmates in terms of feeling cared about, both as a person and with respect to their academic learning (Johnson et al., 1983). Student support differs from teacher support because of the greater reciprocity and similar power inherent in peer, compared with adult authority, relationships (Hartup, 1989); however, both are important (Cauce, Felner, & Primavera, 1982; Wentzel, 1994). Although there is little to no direct evidence that perceived student support is related to classroom engagement, emotional and academic support, both separately (Wentzel, 1994) and combined (Wentzel, 2003), are related to students' desire to conform to teacher-established norms about academics. We argue that, in a similar fashion to teacher support, feelings of support, caring, and encouragement from peers facilitate participation in academic tasks by increasing confidence and ameliorating distracting anxieties. Thus, we expect that per-

ceptions of peer support will be associated positively with both self-regulation strategies and task-related interaction.

Promoting Mutual Respect

An environment of mutual respect involves a perception that the teacher expects all students to value one another and their contributions, requires students to be considerate of others' feelings, and prohibits students making fun of each other. Respectful environments are associated with cognitive engagement, including increased use of self-regulated learning strategies (A. M. Ryan & Patrick, 2001). This is likely because the psychological comfort ensuing from respect frees individuals from concern about being ridiculed and thus enables more processing to be about the task (E. Cohen, 1994; De Lisi & Golbeck, 1999; Wood, 1999). Similarly, when students perceive the classroom as respectful, we expect that they will be most likely to suggest and explain their ideas about schoolwork, even when tentative, without feeling constrained by concerns about what others might think or say if they are incorrect. Therefore, we hypothesize that perceptions that the teacher promotes mutual respect will be related positively to self-regulation strategies and task-related interactions.

Promoting Task-Related Interaction

Teachers differ in the extent to which they encourage students to interact and exchange ideas with each other during lessons. Interaction creates affordances for students to justify, evaluate, and refine their ideas; to evaluate other possibilities; and to give and receive help (Good, Mulryan, & McCaslin, 1992; Webb & Palincsar, 1996). Being encouraged to explain their understandings and listen to others explain theirs encourages students to use adaptive self-regulation strategies that involve metacognitive reflection and thoughtfulness (Clark et al., 2003; Guthrie & Wigfield, 2000). Accordingly, we expect that perceptions that the teacher promotes interaction will be related positively to students' self-regulation strategies. We also expect a positive relation between being encouraged to interact about academic tasks and students' reports that they do so.

Motivational Beliefs as Mediators

Consistent with social–cognitive motivational theories (e.g., Ames, 1992; Maehr, 1984), the relations between students' perceptions of the classroom social environment and their engagement in academics are likely to be mediated by students' beliefs about themselves and their schoolwork. Accordingly, we expect that dimensions of the social environment will be associated with students' mastery goals and academic and social efficacy, which, in turn, will be associated with their use of self-regulation strategies and engagement in task-related interaction.

Mastery Goals

An orientation to mastery goals involves a focus on personal improvement and gaining understanding or skill, with learning being seen as an end in itself (Ames, 1992; Maehr, 1984). Conveying support and promoting respect among students will contribute to an environment in which students can focus on understanding content rather than diverting attention to how they are being perceived by others or contributing to anxiety about ridicule if they experience difficulty or uncertainty. Environments characterized by support, respect, and widespread student interaction encourage a focus on mastery goals (Patrick et al., 2001; Patrick, Turner, Meyer, & Midgley, 2003; Stipek et al., 1998; Turner et al., 2002). Students' perceptions of teacher support are related to valuing and enjoying learning and a desire for personal improvement (Fraser & Fisher, 1982; Fry & Coe, 1980; Midgley, Feldlaufer, & Eccles, 1989; Trickett & Moos, 1974)—aspects integral to a mastery goal. The same appears to be true for classrooms in which students are supportive and interact; students in more affiliation-oriented classrooms report greater desire for self-improvement (Fry & Coe, 1980). Accordingly, we expect that dimensions of the classroom social environment will be related positively to students adopting mastery goals in that class.

We expect also that students' mastery goals will be related to their adaptive engagement. That is, when students are focused on trying to increase their own understanding, they will be more likely to be effortful with respect to schoolwork, including being thoughtful, using self-regulatory strategies, and interacting with others about their ideas and understanding. There is considerable evidence that mastery goals are associated with students' use of cognitive and self-regulatory strategies (Pintrich, 2000), and we expect to find the same in the current study. We also hypothesize that when students are focused on enhancing their understanding, they will be more likely to share and explain their thoughts with classmates, as part of developing competence and checking correctness.

Self-Efficacy

Self-efficacy refers to individuals' contextually specific judgments of their capabilities to perform a task successfully (Bandura, 1986; Schunk, 1991). Individuals hold self-efficacy beliefs with respect to different domains, such as for academic subjects, social relationships, and extracurricular activities (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). When students perceive support and respect in their classroom, they tend to also feel confident about their academic skills, although researchers do not always refer specifically to self-efficacy. Teachers' emotional support is related to students' academic self-concept (Felner, Aber, Primavera, & Cauce, 1985) and expectancies for success (Goodenow, 1993)—constructs analogous to academic efficacy. Student support is also related to academic self-concept (Felner et al., 1985). Furthermore, perceptions that the teacher promotes mutual respect are related to increased academic efficacy (A. M. Ryan & Patrick, 2001). These associations are likely because when students believe that the teacher and classmates care about them as individuals and about their learning, that the teacher and classmates want to help them, and that they will not be made fun of, they will feel more efficacious with respect to schoolwork. Accordingly, we hypothesize that students' beliefs that their teacher and classmates are respectful and supportive of them as people and as learners will promote their own confidence in being able to do well academically. We also expect that perceiving encouragement to talk about work with classmates will foster students' feelings of efficacy, because opportunities to ask questions and talk about the task should enable students to feel more confident about being successful, compared with not having these opportunities.

Less research has examined social efficacy, or confidence relating socially with others, compared with academic efficacy. Perceptions of the teacher as emotionally supportive and as promoting interaction are related to efficacy to interact positively with the teacher (A. M. Ryan & Patrick, 2001). Thus, we expect that teacher support will be related to efficacy with the teacher. Similarly, we expect that when students perceive support from classmates, they will feel efficacious interacting with them. Furthermore, we expect that the promotion of both interaction and respect among students will be related to efficacy about communicating with both the teacher and classmates.

We expect that academic and social self-efficacy will also be related to students' adaptive engagement in class. When students feel confident they can learn, they tend to use more self-regulatory strategies (e.g., Pintrich & De Groot, 1990; Zimmerman, 2000b); thus, we expect that academic efficacy will be related to self-regulation strategies. Furthermore, we hypothesize that when students feel confident that they can be successful at academics, they will be more likely to put their ideas out for public scrutiny and discuss their thinking and ideas with classmates. We also expect that students' efficacy for relating socially to both peers and the teacher will be related to their interaction in class.

Student Engagement and Associations With Achievement

Self-Regulation Strategies

Self-regulatory strategies involve planning, monitoring, and regulating cognition, and their use is a central aspect of self-regulated learning (Pintrich & Schrauben, 1992; Zimmerman, 2000a). *Planning* refers to students' attempts to set goals for themselves when they study. *Monitoring* refers to using self-questioning or self-testing strategies to check learning and comprehension and is a crucial part of metacognition. Students who monitor their engagement have information about their understanding of the material, which they can then use to make decisions about regulating their cognition. There is considerable research indicating that the use of self-regulatory strategies improves learning and achievement (Zimmerman, 2000a). In line with this research, therefore, we expect that students' self-regulatory strategy use will be related to their achievement.

Task-Related Interaction

Interaction may encompass students suggesting ideas and approaches during whole-class lessons, explaining their thoughts or reasoning and discussing alternatives with others during small-group activities, and sharing ideas or informally giving help during individual seatwork. Whatever form it takes, however, task-related interaction among students is an important means of promoting conceptual understanding. Interaction, particularly giving and receiving explanations for concepts, is viewed as a significant catalyst for learning and understanding in a number of theories of cognitive development, including Piagetian (De Lisi & Golbeck, 1999) and sociocultural theories (Hogan & Tudge, 1999). Understanding and achievement are facilitated when students explain content to others during lessons and group activities (Bargh & Schul, 1980; Fuchs, Fuchs, Hamlett, & Karns, 1998; Webb, 1983). In line with theory and research, generating interaction among students is a critical component of student-centered instructional approaches and is emphasized in current instructional initiatives for teaching a range of subjects, including mathematics (National Council of Teachers of Mathematics, 2000). Accordingly, we expect that student reports of interacting with others about math will be related to their achievement.

Research Questions

In summary, we extend the research showing that students' motivational beliefs mediate associations between academic dimensions of the classroom, on the one hand, and engagement and performance, on the other, to consider classroom social relational dimensions and social as well as academic motivational beliefs. We investigate how students' perceptions of various aspects of the classroom social environment (teacher academic and emotional support, promotion of mutual respect, promotion of task-related interaction, student academic and emotional support) relate to self-reports of their adaptive engagement in math (use of self-regulation strategies, task-related interaction). We also examine the associations of both types of engagement with a measure of math achievement (grades). Additionally, we investigate whether students' motivational beliefs (mastery goals, academic efficacy, social efficacy) mediate the associations between dimensions of the social environment and engagement. We control for students' previous achievement and gender in all analyses, because these characteristics are often associated with academic outcomes and we want to explain variation beyond that associated with achievement and gender.

Method

Participants

The data were collected as part of the Young Adolescents' Motivation in Math Project. The participants in this study were 602 fifth-grade students (51% female) from 31 classes in six elementary schools in Illinois. Ninety-four percent of the fifth graders attending these schools completed surveys; this included 21 students receiving special education, who were excluded from this study. The sample was almost exclusively European American; during the year of data collection, European Americans made up 95%–98.3% of students in those six schools (see http://iirc.niu.edu/iirc/). The schools were located in three predominantly middle-class districts; the percentage of students in these schools who were eligible to receive free or reduced-cost lunches ranged from 0% to 12%, and the schools' within-year mobility rates ranged from 3.9% to 10.2% (see http://iirc.niu.edu/iirc/). Students in the current study were taught math by their regular class teacher.

Procedure

Students completed surveys in their regular classes in the spring. In five schools, we administered the surveys in pairs with trained research assistants. The students were told the purpose of the survey was to find out what they thought about school and their schoolwork, that it was not a test, and that there were no right or wrong answers. Students were informed that participating in the study was voluntary and that the information would be kept confidential. Students were guided through examples of how to answer Likert-type survey questions and were encouraged to ask questions. One administrator read the items aloud, and the other monitored the students and answered any questions. In the sixth school, students were given a one-page sheet containing the same information about the study

and instructions about the question format, in addition to the survey. On completion, students individually sealed their survey in an envelope for collection by us the following day. To investigate whether there were significant differences in responding for these students, we conducted a multivariate analysis of variance to compare their responses on all measures with those of the students in the other three schools in the same district. The multivariate effect was significant, $F(1, 326) = 1.99$, $p < .01$. However, after we applied the Bonferroni correction to adjust for Type I error, there was no significant difference between students who experienced the standard versus the alternative survey administration.

Measures

The format for all items was a 5-point scale, ranging from 1 (*not at all true*) through 5 (*very true*), except for the measures of support. All items were specific to math class and are shown in the Appendix.

Perceptions of the classroom social environment. Students responded to six scales about the perceived classroom social environment. There were two measures of teacher support and two of student support, adapted slightly from the Classroom Life Measure (Johnson et al., 1983). Each scale had four items, and responses ranged from 1 (*almost never*) through 5 (*often*). The measure of teacher emotional support referred to the belief that the teacher cared about and liked the student as a person, whereas the measure of teacher academic support involved a perception that the teacher cared about how much the student learned and wanted to help him or her learn. The measure of student emotional support referred to the belief that the student's classmates cared about and liked the student as a person, whereas the measure of student academic support involved a perception that classmates cared about how much the student learned and wanted to help him or her learn. These measures have been reliable and valid in prior research (e.g., Johnson et al., 1983; Wentzel, 1994). The four-item promoting mutual respect scale assessed the extent to which the teacher was perceived as encouraging respect among classmates (A. M. Ryan & Patrick, 2001). The three-item promoting task-related interaction scale measured the extent to which the teacher was perceived as encouraging interaction among peers around academic tasks and was a short version of the scale developed by A. M. Ryan and Patrick (2001). These scales have been shown to be both reliable and valid across different samples of adolescents (Patrick & Ryan, 2005).

Students' engagement. We used two measures of engagement in academics. The six-item measure of self-regulation strategies assesses the extent to which students plan, monitor, and regulate their cognition. There are many studies (e.g., Middleton & Midgley, 2002; A. M. Ryan & Patrick, 2001; Turner, Meyer, Midgley, & Patrick, 2003) that provide support for its reliability and validity. The five-item measure of students' task-related interaction assessed the extent to which students answered questions, explained content, and shared ideas about math with classmates and was developed for the current study.

Students' motivation. We used two measures from the Patterns of Adaptive Learning Survey (Midgley et al., 1996) to assess students' academic motivational beliefs. The six-item measure of mastery goals referred to students' desire to develop their understanding and ability for academics. The five-item measure of academic efficacy referred to students' judgments of their capability to complete their math work successfully. Both scales have been shown to be reliable and valid (Midgley et al., 1998). We used two measures to assess students' social motivational beliefs (Patrick, Hicks, & Ryan, 1997). The four-item measure of social efficacy with the teacher involved students' judgments of their ability to relate effectively and satisfactorily with their teacher. Similarly, the four-item measure of social efficacy with peers referred to students' confidence that they could interact well with classmates. These scales have been reliable and valid in previous studies (e.g., Patrick et al., 1997; A. M. Ryan & Patrick, 2001).

Achievement. We collected students' final fourth- and fifth-grade math grades from their records. Letter grades were converted to numerical values (F = 1 through A+ = 13).

Results

Preliminary Analyses of the Classroom Social Environment

Students' perceptions of their environment are a critical link in understanding how the environment influences motivation and engagement. We expected that there would be individual differences in students' perceptions of their environment, and, indeed, in the present study it is this variation at the individual level that we are exploring. However, we expected that these perceptions would converge somewhat among students in the same classroom because there is a common experience. To examine the degree of consensus among students about the social environment of the classroom, we calculated the intraclass correlation (the ratio of the between-classes variance and the total variance). We estimated these correlations by running six unbalanced one-way random-effects analyses of variance, in which class was a random factor with varying numbers of students per class and each of the six dimensions of the social environment were the outcome variables. The one-way analyses of variance indicated that the intraclass correlations for the student reports about their classroom environment were 14%, 11%, 10%, 8%, 13%, and 22% for teacher emotional support, teacher academic support, student emotional support, student academic support, promotion of mutual respect, and promotion of interaction, respectively. Thus, whereas there were individual differences regarding students' perceptions of the same classroom, it is informative to know that there was also some shared agreement.

Analysis Plan

To test our hypotheses, we used structural equation modeling, which is the method of choice for assessing hypothesized structural relations, particularly those that involve mediation. First, the analysis involved confirming the measurement properties of the instruments. Second, to test the main hypothesis relating classroom social environment variables and student engagement, we tested a model that posited direct relations between the various social environment variables and the engagement variables and between the engagement variables and achievement, while controlling for individual differences. Third, to test our hypothesis concerning the mediating roles of motivational variables, we tested a model that posited relations between the social environment variables and the motivational variables, between the motivational variables and the engagement variables, and between the engagement variables and achievement, while controlling for individual differences. Support for a mediating role of the motivation variables is indicated by a significant drop in the direct relations between the social environment variables and the engagement variables, in comparison with the model that tested the direct relations between these variables without mediation (Baron & Kenny, 1986). Finally, to increase confidence in the results from our hypothesized model, we tested an alternative model, with students' perceptions of the classroom social environment mediating direct relations between motivation

beliefs and engagement. We compared the results of this model with those from our hypothesized model.

Confirmatory Factor Analyses

All analyses were conducted with AMOS 5 (Arbuckle, 2003) and used maximum likelihood estimation procedures on covariance matrices. AMOS provides an efficient missing data modeling through the use of full-information (casewise) maximum likelihood estimation. In evaluating the fit of models, we report on multiple indexes of fit that correspond to different types of fit evaluation (see Hoyle & Panter, 1995). In addition to reporting the chi-square test statistic and the chi-square by degrees-of-freedom value as measures of absolute fit, we report the Tucker–Lewis index (TLI) and the comparative fit index (CFI) as measures of incremental fit and the root-mean-square error of approximation (RMSEA), which accounts for the number of degrees of freedom in the model in assessing fit. In assessing the adequacy of the models we tested, we used recommendations by several researchers (Hoyle & Panter, 1995; Hu & Bentler, 1998, 1999; Marsh, Hau, & Wen, 2004). The cutoff points indicating adequate fit in the absolute measures were nonsignificance of the chi-square statistic and less than 2.00 for the chi-square by degrees-of-freedom ratio. For the incremental indexes (CFI and TLI) a coefficient above .95 indicates an excellent or superior fit, and a coefficient above .90 indicates an adequate fit (Bryne, 2001). Finally, for the RMSEA, a coefficient under .05 with probability of over .50 indicates an excellent fit, and a coefficient under .08 indicates an acceptable fit.[1] A note should be made about the high bias of measures of absolute fit in investigations that involve many parameters, in which an accumulation of small discrepancies may result in an unwarranted rejection of an acceptable model. In such models, as is the case with the current study, more attention should be paid to the indexes that test for incremental approximation rather than absolute fit (Browne & Cudeck, 1993; MacCallum, Browne & Sugawara, 1996).

Measurement Model

The first step of the analysis involved testing the measurement model of the scales and the correlations among all variables in the model. This involved a confirmatory factor analysis procedure in which the assumptions regarding the factor structures of the various scales were tested. All the scales' items were entered into the same measurement model. Generally, the fit indexes suggested that the model was adequate, $\chi^2(1383, N = 602) = 2{,}857.38$, $p < .001$ ($\chi^2/df = 2.07$; CFI = .91; TLI = .89; RMSEA = .042, confidence interval [CI] = .040, .044, $p = 1.00$). An examination of the modification indexes indicated that one item measuring promoting mutual respect (i.e., "My teacher wants us to respect each others' opinions") had loadings above .35 on seven other scales, one item assessing engagement in task-related interaction (i.e., "I answer questions about math in class") also loaded .36 on the academic efficacy scale, and one item assessing teacher academic support (i.e., "Does your teacher like to help you learn?") had loadings over .35 on three other scales. These loadings indicated nonuniqueness of those items. After reexamining the three items, we noted that they were the most generally worded in their respective scales, which might have allowed for them to be influenced by overall classroom perceptions; therefore, we decided to drop them from further analyses. The modification indexes also indicated that there were correlated errors among three pairs of items in the scales measuring student academic and emotional support. The items indeed appeared very close in meaning, which provided justification for accounting for the correlated errors (correlations between these pairs of items were .16, .28, and .44).

The fit of the revised model (i.e., excluding three problematic items, adding three correlated errors) was improved, $\chi^2(1220, N = 602) = 2{,}322.80$, $p < .001$ ($\chi^2/df = 1.90$; CFI = .93; TLI = .91; RMSEA = .039, CI = .036, .041, $p = 1.00$). Descriptive statistics for the variables and Cronbach's alphas are shown in Table 1. All variables had adequate statistical characteristics except for teacher academic support, which was highly negatively skewed. Loadings of the items on their respective latent variables are presented in Table 2. The range of item loadings on their respective scales (i.e., unique paths from latent variables to their respectively indicated observed items) was .45 to .87.

The correlations among the latent variables in the model are shown in Table 3. Some of the correlations were very high, posing a risk for problems of multicollinearity. The correlations between student academic and emotional support ($r = .93$) and between teacher academic and emotional support ($r = .80$) suggested the possibility that these scales might not be distinct from each other in this sample. We tested this possibility by comparing the original model with one in which items in the two teacher support scales loaded on one latent variable of teacher support and with one in which items in the two student support scales loaded on one latent variable of student support. The results indicated that the additional information gained by keeping the scales separate was significant in both cases—student academic and emotional support, $\Delta\chi^2(15, N = 602) = 91.77$ $p < .001$; teacher academic and emotional support, $\Delta\chi^2(15, N = 602) = 125.70$, $p < .001$—justifying maintaining them as separate constructs.

In addition, there were high correlations among several of the exogenous and mediating variables. In particular, the correlation between teacher emotional support and social efficacy with the teacher and the correlation between student emotional support and social efficacy with peers were especially high (rs = .83 and .78, respectively).

[1] A few years ago, Hu and Bentler (1998, 1999) suggested the use of stringent cutoff points for various fit indexes, which are higher than what has been commonly used in the literature. There has been a fair amount of discussion about the appropriateness of this recommendation. Our approach to assessing the model fit in the present study corresponds particularly with two issues (among others) raised by Marsh et al. (2004): (a) Cutoff points of incremental indexes should be considered not as decision rules to accept or reject a model but as information regarding the improvement of a model in comparison with alternative null models, and (b) in complex models, such as those in the present study, stringent criteria are at high risk of increasing Type II error: rejection at the sample level of somewhat misspecified models that are acceptable at the population level. These assumptions led to the criteria we used in assessing the fit of the models.

Table 1
Descriptive Statistics for All Latent Variables

Variable	No. of items	*M*	*SD*	Skewness	α
Teacher emotional support	4	3.98	0.93	−1.19	.84
Teacher academic support	3[a]	4.53	0.65	−2.32	.64
Promoting interaction	3	3.28	1.02	−0.17	.70
Promoting mutual respect	3[a]	4.30	0.94	−1.54	.65
Student emotional support	4	3.55	1.08	−0.48	.88
Student academic support	4	3.38	0.96	−0.33	.81
Self-regulation strategies	6	3.63	0.83	−0.50	.77
Task-related interaction	4[a]	3.18	1.07	−0.20	.83
Mastery goals	6	4.07	0.76	−1.11	.86
Academic efficacy	5	3.93	0.86	−0.67	.85
Social efficacy: Teacher	4	3.92	0.86	−0.93	.78
Social efficacy: Peers	4	3.93	0.99	−1.05	.75

[a] One item was removed during testing of the measurement model.

Testing the Direct Paths Between Classroom Social Environment and Student Engagement

The second step in the analysis included a test of a structural model with direct paths from the classroom environment variables, prior achievement, and gender to the engagement variables and achievement. This model excluded the mediating variables of mastery goals and academic and social efficacy. A measurement model of the variables included in the model indicated a very good fit, $\chi^2(473, N = 602) = 838.20$, $p < .001$ ($\chi^2/df = 1.77$; CFI = .96; TLI = .95; RMSEA = .036, CI = .032, .040, $p = 1.00$).

We added the structural paths to the model next. In addition to paths from all exogenous classroom variables to the two engagement variables and from the engagement variables to achievement, we added paths from gender and prior achievement to the engagement variables and to achievement to account for variance explained by these individual differences. This model also had a good fit, $\chi^2(479, N = 602) = 881.80$, $p < .001$ ($\chi^2/df = 1.84$; CFI = .95; TLI = .94; RMSEA = .037, CI = .034, .041, $p = 1.00$). However, as we feared because of the high correlations between some of the exogenous variables, the results indicated the existence of attenuated coefficients. Standardized paths from teacher academic support, promotion of interaction, and student emotional support to both engagement variables were negative and at times over 1.00, with very large standard errors (to self-regulation strategies, $\gamma = -0.50$, $SE = 1.26$; $\gamma = -1.10$, $SE = 1.03$; and $\gamma = -10.74$, $SE = 5.68$, respectively; to task-related interaction, $\gamma = -0.29$, $SE = 0.94$; $\gamma = -0.45$, $SE = 0.58$; and $\gamma = -6.60$, $SE = 3.00$, respectively), whereas the respective zero-order correlations were positive. Moreover, the standardized paths between teacher emotional support and student academic support were enhanced beyond the respective zero-order correlations (to self-regulation strategies, $\gamma = 1.12$, $SE = 0.99$, and $\gamma = 11.11$, $SE = 8.52$, respectively; to task-related interaction, $\gamma = 0.72$, $SE = 0.67$, and $\gamma = 6.98$, $SE = 4.51$, respectively).

Such attenuated coefficients are likely due to two possible processes: multicollinearity and a suppression situation. When exogenous variables are correlated highly—a case of multicollinearity—and their shared variance is also shared with the endogenous variables, each exogenous variable may account for much of the variance that the other shared with the endogenous variable, thus misleadingly lowering the magnitude of the coefficients between them and the endogenous variables. However, when these correlations between exogenous variables are very high (rs $> .80$), this may result in problematic mathematical solutions and unstable

Table 2
Item Loadings of the Social Environment, Student Motivation, and Student Engagement Latent Variables

Variable	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6
Teacher emotional support	.77	.77	.67	.80		
Teacher academic support	.67	.45	.82			
Promoting interaction	.68	.68	.64			
Promoting mutual respect	.57	.74	.57			
Student emotional support	.87	.84	.72	.71		
Student academic support	.67	.87	.72	.80		
Self-regulation strategies	.78	.74	.53	.60	.54	.59
Task-related interaction	.74	.84	.62	.83		
Mastery goals	.60	.83	.66	.74	.79	.78
Academic efficacy	.75	.65	.75	.75	.82	
Social efficacy: Teacher	.76	−.66	.61	.79		
Social efficacy: Peers	.55	.72	.66	.67		

Note. All coefficients are unique paths from latent factors to respectively indicated observed items.

Table 3
Zero-Order Correlations Among Variables in the Measurement Model After Modifications of Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Teacher emotional support	—														
2. Teacher academic support	.80	—													
3. Promoting interaction	.58	.47	—												
4. Promoting respect	.56	.53	.44	—											
5. Student emotional support	.37	.27	.32	.23	—										
6. Student academic support	.37	.27	.38	.23	.93	—									
7. Self-regulation strategies	.53	.41	.47	.39	.41	.45	—								
8. Task-related interaction	.49	.38	.56	.31	.47	.51	.75	—							
9. Math achievement: fifth grade	.27	.34	.16	.15	.19	.14	.28	.43	—						
10. Math achievement: fourth grade	.05[a]	.11	−.02[a]	.05[a]	.08[a]	.03[a]	.18	.23	.66	—					
11. Gender[b]	.15	.18	.05[a]	.07[a]	.22	.21	.28	.21	.12	.06[a]	—				
12. Mastery goals	.57	.47	.47	.39	.35	.44	.78	.58	.22	.11	.17	—			
13. Academic efficacy	.45	.47	.39	.27	.26	.27	.64	.63	.50	.39	.04[a]	.60	—		
14. Social efficacy: teacher	.83	.62	.54	.44	.46	.47	.74	.69	.38	.16	.23	.71	.55	—	
15. Social efficacy: peers	.48	.40	.47	.36	.78	.69	.63	.70	.32	.19	.18	.48	.46	.62	—

Note. $N = 602$. Unless otherwise indicated, all coefficients are significant at least $p < .01$.
[a] Not significant. [b] Gender was coded 0 = male and 1 = female.

coefficients (Licht, 1995; Pedhazur, 1982). The very large standard errors of the coefficients in this model suggest that this is the case. However, some of the coefficients between the exogenous and endogenous variables were also inflated beyond their zero-order correlations. This indicates a suppression situation (J. Cohen & Cohen, 1983; Paulhus, Robins, Trzesniewski, & Tracy, 2004), in which the control of variance shared by the exogenous variables accounts for some variance in one of these variables that is not shared with the endogenous variables. The suppression of this "irrelevant" variance may result in a coefficient that represents only the "relevant" variance, thus inflating the relation between the exogenous variable and the endogenous variable beyond their zero-order correlations. Whereas such an effect is potentially important in revealing significant processes underlying the relations between the variables, in the present case the very high correlations result in unreasonably high coefficients that are impossible to interpret. The combination of problematic multicollinearity and uninterpretable suppression led us to follow J. Cohen and Cohen's (1983) recommendation that "less is more" (p. 169) and to reduce the number of highly correlated exogenous variables by eliminating one variable in each highly correlated pair, despite some evidence that they are distinct. A question arises, however, as to which variable to eliminate.

We ran a series of analyses to identify the variables that created the multicollinearity and suppression situation. These analyses involved an iterative procedure of testing the model while excluding one variable at a time, examining the effect on the paths, and mapping the change in paths among the various variables. This led us to identify that student emotional support created attenuated coefficients in the presence of student academic support and teacher promotion of interaction. In addition, teacher academic support created attenuated coefficients in the presence of teacher emotional support and student emotional support. Again, the findings of attenuated coefficients among these variables are not surprising given the theoretical and logical relations of the processes they measure, and we elaborate on this finding in the Discussion. The finding that the attenuated coefficients of teacher academic support and student emotional support with the engagement variables were negative, whereas those of teacher emotional support and student academic support were positive, suggests that the explanatory variance resides primarily in the two latter variables. Therefore, to continue testing our more general hypotheses, we decided to remove the teacher academic support and student emotional support variables from all further analyses. The structural model without these variables had a good fit, $\chi^2(294, N = 602) = 585.95$, $p < .001$ ($\chi^2/df = 1.99$; CFI = .95; TLI = .93; RMSEA = .041, CI = .036, .045, $p = 1.00$). All but one of the standard errors of the path coefficients in the model were smaller than .08 (standard error of the path from social efficacy with peers to task-related interaction was .14). Thus, the magnitudes of the standard errors indicate the coefficients' stability and enhance confidence about the findings. The structural part of this model is shown in Figure 2.

The results indicate that, after we controlled for the associations of gender and prior achievement with the student engagement variables, teacher emotional support, promotion of interaction, and student academic support contributed both to self-regulation strategies (γs = .18, .34, and .22, respectively) and to task-related interaction (γs = .14, .45, and .28, respectively). There was no significant path from promoting mutual respect to either self-regulation or task-related interaction. In turn, after we controlled for gender (which was not related to achievement) and prior achievement, task-related interaction, but not self-regulation strategies, was related to later achievement ($\beta = .33$). The classroom environment variables and individual differences in gender and prior achievement together explained 50% and 55% of the variance in self-regulation strategies and task-related interaction, respectively. The model, particularly task-related interaction and prior achievement, explained 52% of math achievement.

Testing the Mediating Effects of Students' Motivational Beliefs

In the third step we entered the personal motivational variables—mastery goals, academic efficacy, social efficacy with peers, and social efficacy with the teacher—into the model as

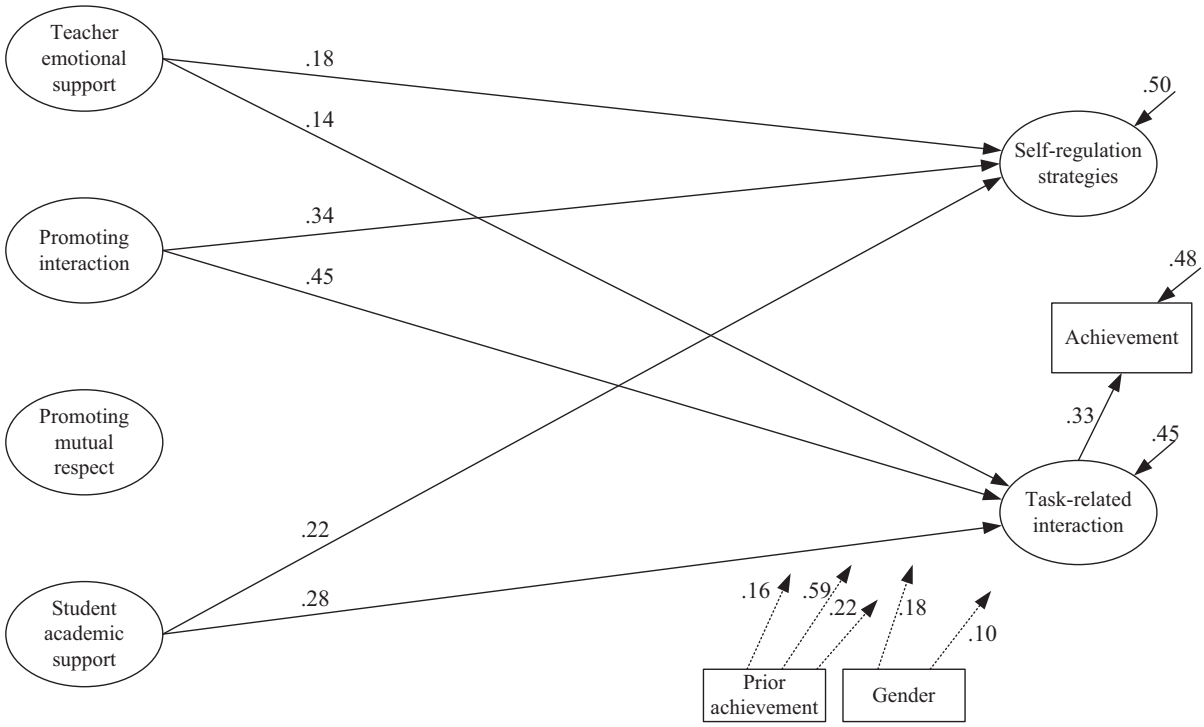

Figure 2. Associations between the classroom social environment and student engagement. All coefficients shown are completely standardized and significant at $p < .05$. Paths missing from exogenous variables to self-regulation and interaction were examined but found not to be significant. The path from self-regulation strategies to achievement was not significant. Correlations among variables are shown in Table 3.

mediating between the classroom environment variables and the engagement variables. Because we eliminated two exogenous variables that were present in prior measurement testing, we tested the measurement part of this model first. The test indicated a good fit, $\chi^2(912, N = 602) = 1{,}716.47$, $p < .001$ ($\chi^2/df = 1.88$; CFI = .93; TLI = .92; RMSEA = .038, CI = .036, .041, $p = 1.00$). We then added the structural paths from teacher emotional support to mastery goals, academic efficacy, and social efficacy with the teacher; from promoting interaction and promoting mutual respect to all mediating variables; and from student academic support to mastery goals, academic efficacy, and social efficacy with peers. We also added paths from gender and prior achievement to the mediating motivational variables. Finally, we added the direct paths from the exogenous variables to the engagement variables to assess any drop in their magnitude. The fit of this model was adequate, $\chi^2(931, N = 602) = 1{,}928.29$, $p < .001$ ($\chi^2/df = 2.07$; CFI = .92; TLI = .90; RMSEA = .042, CI = .040, .045, $p = 1.00$). However, again there were some attenuated coefficients. These included negative coefficients (despite positive bivariate correlations) from promoting mutual respect to mastery goals ($\gamma = -0.37$, $SE = .16$), academic efficacy ($\gamma = -0.43$, $SE = 0.17$), social efficacy with the teacher ($\gamma = -0.32$, $SE = 0.13$), self-regulation strategies ($\gamma = -0.31$, $SE = 0.17$), and task-related interaction ($\gamma = -0.57$, $SE = 0.34$); between student academic support and academic efficacy ($\gamma = -0.16$, $SE = 0.06$); and between mastery goals and task-related interaction ($\beta = -.31$, $SE = .15$). These were in addition to standardized paths from teacher promoting interaction to mastery goals ($\gamma = 1.08$, $SE = 0.26$), academic efficacy ($\gamma = 1.10$, $SE = 0.27$), and task-related interaction ($\gamma = 1.53$, $SE = 0.72$) that were greater than 1.00, with a few relatively large standard errors.

We ran a series of analyses in which we excluded each of the four mediating variables in turn and mapped the pattern of change in path coefficients to identify the variables involved in causing the attenuated coefficients. The source was located between teacher emotional support and social efficacy with the teacher, which were highly correlated ($r = .83$). The existence of the attenuated coefficients as a result of this high correlation is understandable in light of the conceptual relations between these variables, and we elaborate on its theoretical significance in the Discussion. Again, to continue testing our general hypotheses, we decided to remove the variable social efficacy with the teacher from the model.[2]

The final mediated model, depicted in Figure 3, had an adequate fit, $\chi^2(767, N = 602) = 1{,}615.15$, $p < .001$ ($\chi^2/df = 2.11$; CFI = .92; TLI = .90; RMSEA = .043, CI = .040, .046, $p = 1.00$). All but two of the standard errors of path coefficients in the model were smaller than .09. The two larger standard errors, for the paths leading from gender to achievement and from self-regulation strategies to achievement, were .13 and .11, respectively.

[2] Removing the variable social efficacy with the teacher from the model resulted in a drop of 8% in the explained variance in self-regulation strategies and a drop of 17% in the explained variance in task-related interaction.

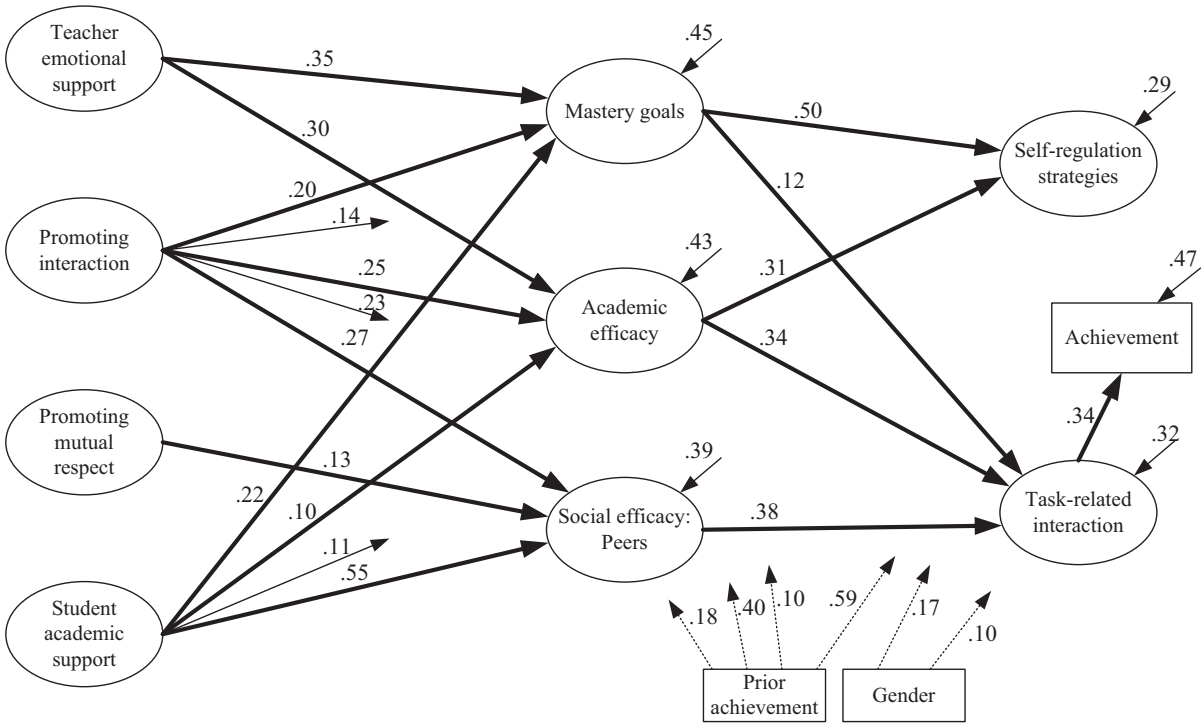

Figure 3. Motivational beliefs mediating relations between perceptions of the classroom social environment and engagement. All coefficients shown are completely standardized and significant at $p < .05$. Paths missing from exogenous variables to endogenous variables were examined but found not to be significant. Boldface paths depict mediation. Short paths depict direct relations from exogenous variables to outcome variables. Dotted paths depict relations from prior achievement and gender to mediating and outcome variables. Correlations among variables are shown in Table 3.

As can be seen from the difference in the magnitude of coefficients between the environment variables and engagement variables in the models shown in Figures 2 and 3, the relations between teacher emotional support and both student engagement variables (self-regulation strategies and task-related interaction) were fully mediated by mastery goals and academic efficacy. Similarly, most of the relations between promoting interaction and the engagement variables were mediated by these two motivational variables and by social efficacy with peers. In addition, the relation between student academic support and task-related interaction was fully mediated, and the relation between student academic support and self-regulation strategies was partially mediated, by the motivational variables. It is interesting that the relations between prior achievement and engagement were also fully mediated through the motivational variables. The addition of the mediating variables added 21% and 13% to the explained variance in self-regulation strategies and task-related interaction, respectively. Thus, overall, the variables explained 71% and 68% of the variance in students' reports of self-regulation strategies and task-related interaction, respectively. The classroom environment variables and prior achievement explained 55%, 57%, and 61% of the variance in mastery goals, academic efficacy, and social efficacy with peers, respectively.[3] The indirect and total effects in the model are shown in Table 4.

Supplemental Analyses

Research from an achievement goal framework has presumed a causal sequence whereby the perceived environment contributes to individual motivational beliefs, which lead, in turn, to engagement (e.g., Ames, 1992; Maehr, 1984). However, it has also been suggested that students' motivational beliefs shape the way they interpret and perceive their environment (Urdan, 2001, 2004). Thus, we also tested an alternative model, whereby dimensions of the classroom social environment mediated paths between personal motivation beliefs and engagement, with engagement leading to achievement as in the previous model. The first model we tested included the three motivational variables leading directly to the two engagement variables. After we controlled for associations of gender and prior achievement with the engagement measures,

[3] To ensure that our estimates were accurate, given the significant differences among classes in students' perceptions of the classroom social environment, we ran a series of hierarchical linear models in which we estimated all paths at Level 1 and controlled for class differences at Level 2. Overwhelmingly, the results were the same; there were minor magnitude changes, but the pattern of significance and conclusions were identical. Thus, the hierarchical linear modeling analyses provide assurance that our results and conclusions from the structural equation modeling analyses are appropriate despite significant classroom differences.

Table 4
Standardized Indirect and Total Effects for the Final Model

	Self-regulation strategies		Task-related interaction		Math achievement
Variable and mediator	Indirect	Total	Indirect	Total	Indirect
Independent variable					
Teacher emotional support	.26	.18[a]	.14	.12[a]	.03
Promoting interaction	.17	.32	.21	.44	.13
Promoting mutual respect	.01	.09	.04	−.02[a]	−.01
Student academic support	.14	.25	.27	.30	.08
Mediator					
Mastery goals					.01
Academic efficacy					.10
Social efficacy with peers					.13

[a] The lower total effect relative to indirect effect is due to negative yet not significant direct effects.

mastery goals, academic efficacy, and social efficacy with peers were related to both self-regulation strategies (γs = .47, .20, and .33, respectively) and task-related interaction (γs = .12, .32, and .53, respectively).

We then tested a model with the environment variables mediating the relations between the motivation beliefs and engagement variables. The fit of this alternative model, $\chi^2(774, N = 602) = 1{,}661.02$, $p < .001$ ($\chi^2/df = 2.15$; CFI = .92; TLI = .90; RMSEA = .044, CI = .041, .047, $p = 1.00$) was as good as the fit of the original model. However, a comparison of the significant paths in the hypothesized model and the alternative model suggests that the hypothesized model provides a better depiction of mediation. Except for teacher promotion of interaction (βs = .15 and .20 for self-regulation strategies and task-related interaction, respectively), none of the social environment variables was related to the engagement variables. Moreover, the pattern of relations among the motivational variables and the outcome variables did not change after the inclusion of the mediating environmental variables, indicating that the latter did not operate as mediators. Mastery goals were related to teacher emotional support, promotion of interaction, promotion of respect, and self-regulation strategies (γs = .47, .23, .32, and .53, respectively). Academic efficacy was related to teacher emotional support, promotion of interaction, self-regulation strategies, and task-related interaction (γs = .21, .15, .28, and .33, respectively). Finally, social efficacy with peers was related to promotion of interaction, promotion of mutual respect, student academic support, and task-related interaction (γs = .36, .20, .70, and .42, respectively).

In summary, the relation between students' motivational beliefs and their engagement was not mediated by most of the classroom environment dimensions (teacher and peer support, promotion of mutual respect). However, students' motivational beliefs did mediate associations between the classroom social environment and engagement.

Discussion

Our research finds strong evidence that the classroom social environment is important to student engagement. When students feel a sense of emotional support from their teacher, academic support from their peers, and encouragement from their teacher to discuss their work, they are more likely to use self-regulatory strategies and engage in task-related interaction. Students' personal motivational beliefs (mastery goals, academic and social efficacy) fully or partially mediated the relations between these perceptions of the social environment and students' engagement. Our results thus support the premise that adaptive classroom social environments enhance students' focus on mastery and feelings of efficacy and, in this way, facilitate engagement.

Students' classroom interaction about math was related significantly to their math achievement, beyond what would be expected from their achievement the previous year. This is consistent with considerable research on the positive effects of students discussing their school work with one another (e.g., Clark et al., 2003; Webb, 1983; Webb & Palincsar, 1996). Although students' reports of using self-regulation strategies were correlated significantly with their math grade, this did not explain significant variance beyond what would be expected from their achievement the previous year. However, the correlation between using self-regulatory strategies and math grades was similar to those reported in other studies of early adolescents (e.g., Patrick, Ryan, & Pintrich, 1999; Pintrich & De Groot, 1990). Pokay and Blumenfeld (1990) found no significant correlation between students' self-regulatory strategy use and their concurrent geometry test scores. These findings speak to the nature of assessments represented by grades:

> Behavioral engagement [e.g., interaction] is likely to be associated with teacher grades and scores on tests that tap basic skills, whereas links with cognitive engagement [e.g., self-regulatory strategies] are more likely to emerge when tests measure synthesis, analysis, and deep-level understanding of content. (Fredricks, Blumenfeld, & Paris, 2004, p. 71)

Thus, the extent to which using self-regulatory strategies improves achievement depends on the nature of the assessment; being thoughtful and using metacognitive strategies are likely to pay off only if the task requires them. It may be that our measure of student grades did not tend to assess deep understanding. Classroom grades often reflect a range of factors, including adherence to participation norms and teacher perceptions of effort (Jussim, 1991). Teachers are likely to be cued to participation and effort when students explain their work or help other students. It would be valuable to also consider, in future research, a model leading to students' scores on a test of conceptual mathematics understanding.

It is interesting that students' perceptions that the teacher promoted mutual respect in the classroom were not related significantly to either engagement outcome or motivational beliefs in the presence of the other classroom variables. This was unexpected, given the role that a respectful climate is believed to play in allowing students to focus on their learning rather than being anxious and distracted by thoughts of being ridiculed. Previously, a climate of mutual respect was found to be associated with increased use of self-regulation strategies and increased academic efficacy (A. M. Ryan & Patrick, 2001). In the current sample, perceptions that the teacher promoted mutual respect were correlated with both engagement measures; however, they were also correlated strongly with teacher emotional support. Thus, it appears that relations between mutual respect and engagement might have been subsumed by the positive associations with teacher support.

The findings of our study support arguments of the relevance of applying a social–cognitive perspective to understanding processes that link the social context of classrooms to students' motivation, engagement, and achievement. There was variation in the classroom perceptions of students in the same class. However, students' own perceptions of dimensions of their classroom social environment were related to their motivation and engagement. Thus, the current study applies a theoretical perspective to classroom climate research (e.g., Fraser & Fisher, 1982; Haertel et al., 1981), which has been criticized for being atheoretical (Ames, 1987). Although that research has shown significant relations between perceptions of different aspects of the classroom context, on the one hand, and motivation and achievement, on the other, it does not explicate the processes by which environment dimensions relate to student motivation and engagement. The present study integrates a social–cognitive theoretical view of motivation with classroom climate research by illustrating a process involving associations among dimensions of the classroom social environment, motivational beliefs, engagement, and achievement.

Our study also provides strong support for our hypotheses concerning the mediational role of motivational beliefs between the social environment and students' engagement. That is, it provides support for the premise that perceptions of the social environment affect students' academic and social beliefs about themselves, which, in turn, affect their behavioral and cognitive engagement in class and then their achievement. This had been investigated previously with respect only to perceptions about academic dimensions of classrooms (Church et al., 2001; Nolen & Haladyna, 1990).

The pattern of relations among the variables in the study also supports the structural and convergent validity of the constructs in the study (cf. Benson, 1998). On the one hand, the factor analyses demonstrate that students did make distinctions between academic and emotional support from peers, between academic and emotional support from the teacher, between emotional support from the teacher and efficacy relating to the teacher, and between peer and teacher support and students' own motivation and engagement. On the other hand, the relations between some of these variables were very high, supporting the theoretical assumptions concerning the important role of teacher and peer support in students' motivation and engagement. It is interesting that some of the strong relations were shared not only between two of the variables but among three or more. These cases of high multicollinearity resulted in problematic solutions that required applying the common remedy of eliminating some variables (Licht, 1995). However, the pattern of high correlations among variables in our study, and the problematic effects they created, does make sense theoretically (Paulhus et al., 2004; Pedhazur, 1982). This suggests, for example, that when teachers encourage and provide opportunities for interaction among students, students are very likely to perceive support from their peers and that these highly intertwined processes are together associated strongly with students' engagement. Also, students' perceptions of their teacher as providing academic support are intertwined with their perceptions of the teacher as providing emotional support, and these intertwined yet empirically distinct perceptions share a large amount of variance with students' orientation toward learning and understanding in class as well as with their engagement in schoolwork. Finally, students' perceptions of the teacher as providing emotional support were distinct from yet intertwined with their sense of efficacy in relating to their teacher, and these shared a large amount of variance with students' academic engagement. These findings support our assumption that the relations between the social environment and students' motivation and engagement are indeed very strong and intertwined. They shed light also on the nature of these constructs as they are perceived and construed by students. In particular, the fact that students' views of their teacher as being emotionally and academically supportive were closely connected with their own focus on developing competence or mastery orientation is consistent with the finding that classroom mastery goal structure is communicated by features of the teacher–student relationship (Patrick & Ryan, 2006). This finding helps to explain associations between teacher support and student motivation and achievement.

The present study has implications for motivation theories, such as achievement goal theory, wherein aspects of classrooms (e.g., goal structures) have become viewed almost exclusively in terms of the instructional practices and messages about academics (e.g., Church et al., 2001; Greene, Miller, Crowson, Duke, & Akey, 2004). The importance of the classroom social environment evident in the current study adds to the growing evidence that students' perceptions of the nature and quality of the teacher–student relationship are associated strongly with their adaptive motivation for and engagement in academics (e.g., Goodenow, 1993; Turner et al., 2003; Wentzel, 1997). More research is needed, though, to unpack the nature of associations among teacher practices, relationships, and motivational beliefs. However, the current study supports recommendations for practitioners (e.g., L. H. Anderman, Patrick, & Ryan, 2004) that attending seriously to the quality of social relationships and environments that foster them is an important factor in promoting positive student motivation and engagement.

One strength of the study is that we considered two different ways that students could engage positively in the classroom—their use of self-regulation strategies (a form of cognitive engagement), and their interaction about academic tasks with peers (a form of behavioral engagement). This follows the recent recommendation (Fredricks et al., 2004) that researchers take a multidimensional approach and investigate different types of engagement rather than combine different types in a single measure. This is necessary to identify whether there are different processes associated with facilitating, for example, cognitive rather than behavioral engage-

ment. Our findings of a different pattern of relations leading to each type of engagement (e.g., mastery goals were related more strongly to self-regulation strategies than to interaction) lend support to this approach.

Limitations of the current study include the homogeneity of the sample with respect to students' race and socioeconomic status. Further research should be conducted with students of different socioeconomic and racial or ethnic backgrounds, in addition to different grade levels. We expect, however, that the social environment will be important for all students. Another limitation is that all data, except for achievement, were collected at one time point, which precludes investigation of the causal sequence. Although the hypothesized relations portrayed in our model depicted mediation, in contrast to an alternative model with the reverse direction indicated, data that come from one time point are limited. Longitudinal research that addresses reciprocal effects over time (e.g., Marsh, Trautwein, Ludtke, Koller, & Baumert, 2005) would add valuable information to our understanding of how classroom perceptions and personal motivational beliefs mutually influence each other over time. Finally, although examining the role of gender was beyond the scope of the current study, an important direction for future research is to investigate whether the processes linking classroom environment perceptions, personal motivational beliefs, engagement, and achievement are equivalent for girls and boys.

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Appendix

Constructs and Items

Teacher Emotional Support

Does your teacher really understand how you feel about things?
Does your teacher try to help you when you are sad or upset?
Can you count on your teacher for help when you need it?
Does your teacher respect your opinion?

Teacher Academic Support[a]

Does your teacher care about how much you learn?
Does your teacher like to see your work?
Does your teacher want you to do your best in school?
Does your teacher like to help you learn?[a]

Promoting Interaction

My teacher often allows us to discuss our work with classmates.

My teacher encourages us to share ideas with one another in class.

My teacher lets us ask other students when we need help with our work.

Promoting Mutual Respect

My teacher does not allow students to make fun of other students' ideas in class.

My teacher makes sure that students don't say anything negative about each other in class.

My teacher does not let us make fun of someone who gives the wrong answer.

My teacher wants us to respect each others' opinions.[a]

Student Emotional Support[a]

In this class other students . . .

are nice to me.
like me.
care about my feelings.
really care about me.

Student Academic Support

In this class other students . . .

want me to do well in school.
want me to be successful.
care about how much I learn.
want me to come to class every day.

Mastery Goals

I like math work that I'll learn from, even if I make a lot of mistakes.

An important reason I do my schoolwork is because I like to learn new things.

I like math work best when it really makes me think.

An important reason I do my schoolwork is because I want to improve my skills.

(*Appendix continues*)

An important reason I do my schoolwork is because I am interested in it.

An important reason I do my schoolwork is because understanding the work we do is important to me.

Academic Self-Efficacy

I'm certain I can master the skills taught in math this year.

I can do even the hardest work in my math class if I try.

I can do almost all the work in math if I don't give up.

Even if the work in math is hard, I can learn it.

I'm certain I can figure out how to do even the most difficult math work.

Social Efficacy With the Teacher[a]

I can explain my point of view to my teacher.

I find it hard to get along with my teacher. (reversed)

If my teacher gets annoyed with me I can usually work it out.

I find it easy to just go and talk to my teacher.

Social Efficacy With Peers

I find it easy to start a conversation with most students in my class.

I can explain my point of view to other students in my class.

I can get along with most of the students in my class.

I can work well with other students in my class.

Self-Regulation Strategies

When I run into difficulty doing a math problem, I go back and work out where I went wrong.

When other students are distracting me in math class, I often find a way to keep concentrating on my work.

When I notice that I haven't been listening to my math teacher, I try to concentrate harder.

Before I begin my math work, I think about the things I will need to do.

When I'm working on a math problem, I think about whether I understand what I'm doing.

When I finish my math work, I check it to make sure it's done correctly.

Task-Related Interaction

During math class I explain how I work out math problems to other kids.

I help other kids with math when they don't know what to do.

I share my ideas and materials with other kids in math.

In math class I help other kids learn.

I answer questions about math in class.[a]

[a]Constructs and items excluded from the final version of the model.

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