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Achievement Goal Orientations of Community College Mathematics Students and the Misalignment of Instructor Perceptions

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Abstract

This study reports on the results of a survey of achievement goal orientations administered to a sample of 777 students enrolled in remedial and college-level mathematics courses at a community college. Results indicate that students' achievement goal orientations are consistent with adaptive learning patterns: Students are interested in developing competence, expect and believe they can handle challenging work, avoid self-handicapping behaviors, and exhibit a positive mathematics self-concept. However, interviews with faculty members teaching the courses in which the students were enrolled revealed that instructors had a more negative perspective. This discrepancy suggests that instructors might not be taking advantage of the high confidence and motivation to learn that their students bring to the mathematics classroom.

Keywords

achievement goal orientations, mastery goals, performance goals, academic self-efficacy, academic pressure, self-handicapping behaviors, mathematical self-concept, remedial mathematics, mathematics instruction, faculty perceptions

Earning a college degree is becoming more prominent in the national discourse (Office of the Press Secretary, 2010) as it has been associated with high paying jobs and increased levels of health, wealth, and civic participation (Baum & Ma, 2007; Baum &

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Payea, 2005; Dowd et al., 2006). The rising costs of higher education have made the community college an attractive institution for starting the path toward a college degree: In the fall of 2005, 44% of all undergraduates in the United States were in 2-year colleges (Lutzer, Rodi, Kirkman, & Maxwell, 2007), and the trend is increasing. Simultaneously, there is a pressing concern that the United States is lagging behind other countries in maintaining a science, technology, engineering, and mathematics (STEM) workforce (Committee on Science Engineering and Public Policy, 2007). At the core of these concerns is the need to ensure, first, access to higher education programs, in particular in the STEM fields; second, retention in those programs; and, finally, success, understood as graduation within a certain number of years. Community colleges can make an important contribution, yet the transfer rates from community colleges to STEM fields are relatively low (Phillippe & Gonzalez Sullivan, 2005).

There is substantial documentation on how community college student characteristics such as age, prior achievement, ethnicity, and patterns of course taking (including whether or not students are required to take remedial courses) are related to retention and success (Adelman, 2005; Feldman, 1993; Goldrick-Rab, 2007; Pascarella, Wolniak, Pierson, & Terenzini, 2003; Stigler, Givvin, & Thompson, 2010; Waycaster, 2001). But there is little research on how mathematics instruction is related to retention and success in community colleges (Mesa, 2007), particularly for students with an interest in pursuing a STEM major. Some studies have started to investigate this connection by looking at how students and teachers discuss mathematical content (Mesa, in press; Mesa, Lande, & Whittemore, 2011) and by analyzing how textbooks use examples to illustrate mathematically demanding work (Mesa, 2010; Mesa & John, 2009; Mesa, Suh, Blake, & Whittemore, in press). The focus of this article is on students' achievement goal orientations and how instructors perceive those goals.

Achievement goal orientations refer to students' reasons or purposes for engaging in academic behavior as well as to the standards used to assess performance (Friedel, Cortina, Turner, & Midgley, 2010; Meece, Blumenfeld, & Hoyle, 1988; Midgley et al, 2000). Attending to both achievement goal orientations and to teachers' perceptions of them is important, because research on students' attributions of their ability to learn suggests that such attributions have a direct impact on learning and classroom work (Bruinsma, 2004; Dweck, 1986; Meece, 1991) and that specific aspects of instruction—the nature of tasks (cooperative or competitive), the types of recognition that teachers give (focused on individual improvement or on ability relative to others), and the locus of responsibility (teacher's or students')—are related to the goal structure that students perceive and to the personal goals that students espouse (Ames, 1992; Friedel et al., 2010).

The lack of information about the achievement goal orientations of community college mathematics students, together with perceptions that community college students bring unclear or conflicting goals toward learning (Cox, 2009; Mesa, 2008; Seidman, 1985; Wheeler & Montgomery, 2009), prompted this study. Using scales from the Patterns of Adaptive Learning Scales (PALS; Midgley et al., 2000) and from the

Views About Mathematics Survey (VAMS; Carlson, 1999), I sought to establish the achievement goal orientations of community college mathematics students as well as the perceptions their instructors have of those orientations. This information can help instructors devise strategies that can reshape students' achievement goal orientations in ways that will help them attain their college goals.

Background

This study uses a goal theory model of achievement motivation (Anderman & Maehr, 1994; Anderman & Midgley, 1997; Kaplan & Midgley, 1999), positing that students' beliefs about their efficacy in learning are predicted by their personal achievement goals, which are immersed in sociocultural contexts and are the result of prior and current experiences in those contexts (Friedel et al., 2010). The achievement goal framework includes two types of goals—a mastery goal orientation and a performance goal orientation (Dweck & Leggett, 1988; Meece, 1991). A mastery goal orientation is characterized by a drive to develop competence and extend mastery and understanding, by the perception that learning is an end unto itself, and by judgments of performance that are based on "improvement over time or progress relative to an absolute standard" (Friedel et al., 2010, p. 103; Midgley et al., 2000). On the other hand, performance goal orientation is characterized by an emphasis on measuring success in terms of the ease with which an individual completes a task relative to the performance of others (Muis, Winne, & Edwards, 2009). Substantial research has been conducted to establish the connection between each type of goal (mastery or performance) and educational outcomes. Positive associations have been found between mastery goals and learning-related outcomes such as self-regulation, self-efficacy, interest, positive affect, help-seeking behaviors, emotional well-being, persistence, and transfer (e.g., Ciani, Ferguson, Bergin, & Hilpert, 2010; Muis, 2004; Muis et al., 2009). Compared to individuals with a performance orientation, individuals with a mastery orientation are less likely to react defensively in the face of failure or other difficulties and more likely to pursue challenging tasks (Ciani et al., 2010, p. 379).

Goal theory highlights how contexts play an important role in the development of goals, stressing in particular that students "are sensitive to the emphasis teachers place on different types of achievement goals as expressed through instructional practice and the ways in which teachers respond to students' accomplishments or shortcomings" (Friedel et al., 2010, p. 103). Students can reliably identify when their teachers foster a competitive versus a cooperative classroom, and when they focus on individual improvement rather than on ability relative to others. Moreover, students' espoused beliefs are strongly shaped by their teacher behaviors (Ames, 1992; Anderman & Midgley, 1997; Church, Elliot, & Gable, 2001; Meece, 1991; Middleton, Kaplan, & Midgley, 2004; Patrick, Anderman, Ryan, Edelin, & Midgley, 2001; Turner, Thorpe, & Meyer, 1998; Urdan & Schoenfelder, 2006). Ames (1992) has suggested that instructional strategies associated with three aspects of the structure of instruction (i.e., tasks, authority, and evaluation and recognition) have strong connections to individual motivation patterns such as a focus on effort and learning, intrinsic interest in activities and active engagement in them, attributions of success to effort, use of effective learning and other self-regulatory strategies, positive affect toward high-effort tasks, feelings of belonging, and high tolerance for failure. Instructional strategies related to tasks include focusing on the important aspects of the learning activities (i.e., focusing on meaning and connections rather than on rote learning); designing tasks for novelty, variety, and diversity so that they align with students' interests; and designing tasks that are reasonably challenging for students. Instructional strategies related to authority include letting students participate in the decision-making process, giving opportunities to develop responsibility and independence, and supporting the development of self-management and monitoring skills. Finally, instructional strategies related to evaluation and recognition include focusing on individual improvement, progress, and mastery; making evaluations private rather than public; recognizing student effort; providing opportunities for improvement; and encouraging students to view mistakes as part of learning. All these strategies support a mastery goal orientation in classrooms (Ames, 1992, p. 267).

These studies have shown more specifically that when teachers are perceived as focusing on performance, their students' sense of self-efficacy and orientations toward mastering content decline. But when students perceive that their teachers emphasize mastery, their perceptions of self-efficacy increase, which, in turn, increases the students' mastery goal orientation (Friedel et al., 2010). Although the literature is consistent regarding these findings, most studies have based their conclusions on middle or high school students and on only one specific aspect of goal orientation, self-efficacy, mainly because this construct is a good predictor for goal orientation.

There are very few studies on goal orientation that deal with populations similar to those at community colleges. Two studies are relevant and merit more elaboration here although they focus only on self-efficacy. Carmichael and Taylor (2005) studied the self-efficacy of adult students (median age = 29 years) enrolled in a mathematics preparatory course at the University of Southern Queensland. The researchers attempted to determine whether motivation was correlated with student success in this course, which enrolled an average of 800 students per semester, including students with non-traditional backgrounds and with negative past experiences in mathematics. Attrition and failure in this course were quite high; an average of 30% of the students withdrew each semester, and 40% to 45% failed the course. The authors speculated that low motivation could explain the high rates of attrition and failure. Using the Motivation and Self-Regulated Learning Questionnaire (Pintrich & DeGroot, 1990) with a sample of 120 students, they found a very moderate correlation between student achievement and motivation (as measured by the scales on the questionnaire), suggesting either that their sample was too small or that for this particular population of students other variables might have been at play. For example, they reported that female students had lower levels of confidence than males but that there was no difference between the academic performance of these two groups. A similar finding was reported when results were compared for students who had interrupted their postsecondary studies and students who had started postsecondary education immediately after graduating from high school; they differed in their levels of motivation, but their academic performance was similar. The instrument used in the study does not collect information on how the classroom environment supports students' motivation and self-regulation, which, in turn, might be connected to the high failure rate of the course.

Hall and Ponton (2005) compared the self-efficacy reported by students ($n = 80$) in calculus courses to those of students ($n = 105$) placed in remedial mathematics (intermediate algebra) at the University of Mississippi. Using a revision of the Mathematics Self-Efficacy Scale (Betz & Hackett, 1993), they found that students in calculus reported higher levels of self-efficacy than students placed in the remedial course; there were no effects by gender. The authors explained the differences in terms of the assumed past experiences that students placed in remedial courses might have had, indicating that their lack of exposure to mathematics could explain their lower sense of self-efficacy because "it is difficult for students to objectively evaluate themselves on topics for which they have little knowledge" (Hall & Ponton, p. 28). Although Hall and Ponton also suggested that teachers of remedial courses are under greater pressure to make their students succeed, given the connection between the number of mathematics courses completed and student success in college generally, they did not provide evidence for this statement. But their findings, focusing on self-efficacy rather than goal orientation, do suggest that there might be differences between university undergraduate students in remedial and nonremedial courses. Because remediation is so prominent in community colleges, it would be important to establish whether these differences exist in this setting as well.

Studies of motivation have used self-reported measures collected via surveys. This approach makes sense, given the interest in establishing students' perceptions about their learning and their environment. Because students' ratings of teacher behaviors appear to be consistent with the ratings of external observers (e.g., Patrick et al., 2001), asking students for their perceptions of their learning environments is usually enough to create reliable measures of teacher behaviors. Missing from the literature, however, are inquiries regarding instructors' perceptions of their students' goal orientations. A common theme in the literature on school reform in mathematics is that teachers are usually unaware of the resources—cognitive, personal, and cultural—that students bring to class (Cohen, Raudenbush, & Ball, 2003). When teachers are aware of these resources (e.g., knowledge of concepts in home contexts, misunderstandings of concepts, second language proficiency, work ethics, personal interests, family expertise), they can plan lessons that are more effective and that involve all students, especially minorities, with authentic learning (Civil, 1996, 1998; Fennema, Carpenter, Franke, & Carey, 1992; Fennema, Franke, Carpenter, & Carey, 1993; Khisty, 1995; Ladson-Billings, 2009; Moll et al., 1990). Students' goal orientations are a type of personal resource, and teachers have at their disposition tools that can shape those goal orientations to help students become more successful in their classrooms. It is therefore important to find out how instructors perceive their students' goal orientations, and also, whether those perceptions differ between instructors teaching remedial courses and instructors teaching college-level courses, as those differences may contribute to the lower levels of self-efficacy that Hall and Ponton found among remedial students.

Because the literature is mostly based on school-aged children, I sought to fill a gap by studying goal orientations in a community college setting. In addition, I augmented the student information with teachers' perceptions of their students' orientations. In this study I asked the following questions:

1. What are the achievement goal orientations of students enrolled in remedial and nonremedial mathematics courses at a community college?
2. Are there differences in achievement goal orientations between students taking remedial mathematics courses and students taking college-level mathematics courses?
3. What are teachers' perceptions of their students' achievement goal orientations?
4. In which ways do teachers' perceptions of their students' achievement goal orientations differ by type of course?

Method

Sampling

The data for this study come from a sample of 777 students enrolled in remedial and college mathematics courses taught at a large suburban community college in the Midwest that is part of a larger study seeking to characterize community college mathematics instruction. The mathematics department in the college is similar to other mathematics departments in large community colleges in the United States (as described by Lutzer et al., 2007) in terms of courses offered (e.g., remedial, college preparatory, courses for professional and technical careers), proportion of students in the college enrolled in the department (45%), class size (approximately 22 students), and composition of the faculty (75% are part-time). An invitation to take part in the study was extended to all instructors in the department ($N = 70$) who were teaching entry-level, remedial, or college-preparatory courses; courses at the level of calculus and beyond were excluded, because the focus of the study was on courses that prepare students for coursework in STEM majors. Twenty-five instructors (36%) consented to participate and gave the survey to the students in the courses they were teaching. Of the 25 instructors, 10 (40%) were male, 4 (16%) were employed on a full-time basis, and 16 (64%) were teaching at least one remedial class; this compared to 19 (42%), 5 (11%), and 31 (69%), respectively, of the 45 nonparticipating instructors.

The survey, which took between 15 and 20 min to complete, was administered to 40 sections of 10 courses between the fall of 2009 and the fall of 2010, about 6 weeks after the semester had started (see Table 1) when classroom norms have already been established. All levels of remedial courses were included. The courses were offered

Table 1. Courses and Sections Surveyed

Name of course	Number of sections surveyed (number of students)	Type of course
Foundations of Mathematics	6 (86)[a]	Remedial
Foundations of Algebra	12 (228)[b]	Remedial
Intermediate Algebra	4 (87)	Remedial
Everyday College Mathematics	2 (45)	College level
Functional Mathematics for Elementary Teachers	3 (51)	College level
Math Applications for Health Science	1 (20)	College level
College Algebra	2 (35)[c]	College level
Trigonometry	8 (173)[d]	College level
Pre-Calculus	2 (50)[e]	College level
Total	40 (777)	

Note: Twenty-five different instructors administered the survey in their courses. All levels of remedial mathematics offered in the college are included in the sample.
a. One section taught by a full-time instructor.
b. Two sections taught by two full-time instructors.
c. Two sections taught by a full-time instructor.
d. Four sections taught by two full-time instructors.
e. Both sections taught by a full-time instructor.

at different times of the day (from 8:30 a.m. to 9:00 p.m.) and on different days of the week (Monday through Saturday), thus including a wide range of students; this is important because instructors perceived that there are “different colleges,” depending on the times students take their courses. Of 858 surveys administered, 12 (1%) were from students who opted out of the survey, 62 (7%) were from underage students (i.e., under the age of 18 and ineligible to participate without parental consent), and 7 (1%) were not analyzed because of incomplete responses (i.e., less than 15% of the items had responses) or because there were a large number of invalid answers (i.e., more than 50% of items had more than one response). The net response rate was therefore 92%.

Sixty-nine percent of student respondents were White, 51% were female, 48% were between 18 and 21 years old, 16% were between 22 and 25 years old, and 36% were above 25. The proportions for ethnicity and gender in the sample were similar to those of the college, though the proportion of students in the 18 to 21 years old age group was larger. The majority of the students in the sample (73%) were single, did not take care of children or family members (77%), and had a paid job (79%). A large proportion of the students (69%) had completed part of, or finished, high school, and about 80% expected to transfer. Personal funds, loans, and grants were important sources of funding, although it is notable that about two fifths of the sampled students received financial help from their families. About one fifth of the students (18%) reported that they had repeated a mathematics course in college, and 41% of the sample was taking a remedial course (see Table 2).

Table 2. Frequency and Percentage of Students in the Sample by Selected Characteristics

Characteristic (*n* of responses)	*n*	%
Female (768)	392	51
Age (768)		
18-21 years old	370	48
22-25 years old	126	16
26-45 years old	236	31
46 and above	36	5
Marital status (766)		
Single	560	73
Married or marriage-like relationship	206	27
Number of caregiver (761)		
Not a caregiver	583	77
Caregiver for 1 or 2 persons	117	15
Caregiver for 3 or more persons	61	8
Ethnicity (542)		
White	376	69
Non-White	166	31
Hours of employment (751)		
Not employed	157	21
1-20 hours per week on paid job	160	21
21-40 hours per week on paid job	321	43
More than 40 hours per week on paid job	113	15
Level of education (756)		
High school or less	524	69
Some college or associate's degree	209	28
Bachelor's or more	23	3
Goals[a] (764)		
GED	15	2
Associate's degree	251	33
Transfer	603	79
Technical certificate	53	7
Career change	104	14
Enrichment	112	15
Sources of funding (minor or major)[a]		
Own (393)	287	73
Family (355)	142	40
Employer (332)	59	18
Grants (383)	244	64
Loans (370)	206	56
Public assistance (326)	44	14
Repetition and remediation		
Repeated college course? (758)	139	18
Taking a remedial course? (777)	315	41

a. Percentages within this category do not add to 100 because students could choose more than one option.

The respondents had taken about 2 college mathematics courses ($M = 1.91$, $SD = .74$) and reported a better experience with mathematics in college than in high school, as measured by responses to separate Likert-type items asking students to rate their experience with mathematics at both levels, $t(524) = 10.22$, $p < .001$. Note that about 31% of participants reported having done some college work or completed an associate's or a bachelor's degree. There were 67 participants (9% of the total) who had completed these degrees and were taking a remedial course.

Twenty-one percent of the students enrolled in a college-level course were taught by a full-time instructor, compared to only 8% of students enrolled in remedial courses. These proportions are aligned with reports of the distribution of instruction between full- and part-time instructors at community colleges generally, which indicate that full-time mathematics instructors tend to teach more college-level than remedial courses (Lutzer et al., 2007).

Instrument

The instrument administered contained 58 items derived from two surveys, the PALS (seven scales) and the VAMS (four scales). In addition, it contained 11 demographic and background items eliciting information on gender, ethnicity, age, marital status, prior experience with mathematics courses, number of college mathematics courses completed, academic goals, employment status, funding sources used to pay tuition, and whether or not students had had to repeat any mathematics courses while in college.[1] All surveys were administered at the beginning of class.

Of the original 20 scales included in the PALS survey, seven (Student Mastery, Student Performance, Teacher Mastery, Teacher Performance, Academic Press, Academic Self-Efficacy, and Self-Handicapping Behaviors) were relevant to this study and selected for inclusion in the questionnaire (41 items). Student Mastery and Student Performance assess the basic distinctions between the two main orientations, centering on students' own assessment of their goals. Teacher Mastery, Teacher Performance, and Academic Press seek to assess students' perceptions of their teachers' preference toward the two main orientations (i.e., mastery vs. performance) as well as the students' perceptions of their teachers' dispositions toward requiring demanding work. These scales were included because instructor' behaviors define normative organizations of classroom practice that can favor one orientation over the other and set the tone for what is acceptable, demanding work (Ames, 1992; Bruinsma, 2004). Finally, the scales about Academic Self-Efficacy and Self-Handicapping Behaviors were included because they assess students' behaviors that either support or undermine their goals.[2] The PALS items were rated with a 5-point Likert-type scale: 1 (*strongly disagree*), 2 (*disagree*), 3 (*neutral*), 4 (*agree*), and 5 (*strongly agree*). Some items referred to a year-long course; those were modified to reflect the semester-long nature of the courses at the college.

Because of my interest in students' perceptions about mathematics specifically, I also included 17 items that were adapted from the VAMS (Carlson, 1999) and that are associated with four scales on that instrument: Mathematics Self-Concept, Attitudes Towards Problem Solving, Talent, and Effort. These items measure perceptions of behaviors associated with success in mathematics and were added because they complement the more general assessment of students' goals provided by the PALS.

The VAMS instrument uses a contrasting alternative design. In it, individual items consist of a statement followed by two contrasting alternatives. An example is as follows: "For me making unsuccessful attempts when solving a mathematics problem is: (a) a natural part of my pursuit of a solution to the problem [or] (b) an indication of my incompetence in mathematics" (Carlson, 1999, p. 249). Respondents are asked to balance their opinion using an 8-point scale. Options 1, 2, and 3 indicate that the respondent leans toward alternative "a" exclusively. Options 5, 6, or 7 indicate that the respondent leans toward "b" exclusively. Option 4 indicates that the respondent leans equally toward "a" and "b," while option 8 indicates that the respondent leans neither toward "a" nor "b." Carlson's rationale for this design is that by offering two clearly articulated benchmarks ambiguity is reduced and "reliability increased" (Carlson, p. 249).

Unfortunately, there is no information about the reliability or validity of the items or scales, and several items had wording that appeared ambiguous and difficult to interpret. In addition, keeping a single format for answering all the items would be practical; the contrasting design could be prone to misinterpretation, would take time to explain to the students, and would require a different analysis. Thus items on the VAMS were adapted for use in the current study by restating each alternative option as an individual item. For example, the particular VAMS item noted above was transformed into two statements: "For me, solving math problems is usually an enjoyable experience" and "For me, making unsuccessful attempts when solving a math problem is an indication that I'm not good at math." Students were asked to respond to the adapted VAMS items with the same 1 to 5 Likert-type scale used in the PALS. I set a threshold of .35 for accepting items in the factor analysis to create a given scale.

Because of the adaptation of the items in the VAMS, I conducted a confirmatory factor analysis to ensure that the items were loading correctly into each scale. After generating the factors, I analyzed the internal consistency and the reliability of the scores within each scale using Cronbach's alpha, which estimates the proportion of the true score variance that is captured by the items in the scale. All but four items were kept within their scales. The Cronbach's alpha of the PALS adapted scales (Table 3) were within the ranges reported by Midgley and her colleagues, .71 to .89 (e.g., Anderman & Midgley, 2004; Midgley et al., 2000) and, thus, the data gathered by the instrument were considered suitable for analysis.

As indicated earlier, the original VAMS instrument does not have information on scale reliability. The factor analysis confirmed the original constructs, but I decided to keep scales with Cronbach's alphas greater than .70, which resulted in the exclusion of three VAMS scales (Attitudes Towards Problem Solving, Talent, and Effort) from the analysis.

To generate the scales, I averaged the items within each scale, reversing one negatively worded item to maintain the direction of the scales. The scores obtained followed similar trends as those reported in the literature (e.g., Friedel et al., 2010;

Table 3. Scales Used in the Survey

Scale	Description	No. of items	Reliability (Cronbach's α)
Student Mastery	Students' purpose or goal is to develop their competence. They seek to extend mastery and understanding.	5	.844
Student Performance	Students' purpose is to demonstrate competence or avoid demonstrating incompetence; they are focused on the self.	7	.880
Teacher Mastery	Students' perceptions that their teachers' goals are oriented towards mastery	5	.802
Teacher Performance	Students' perceptions that their teachers' goals are oriented toward performance	6	.828
Academic Press	Students' perceptions that their teachers press them toward challenging work and thinking	7	.810
Academic Self-Efficacy	Students' perceptions that they can do academic work	5	.831
Self-Handicapping Behaviors	Students' perceptions that they engage in behaviors that can reduce their opportunities for success in college	6	.847
Mathematics Self-Concept	Students' self-image as mathematics learners; a low score represents positive self-image, and a high score represents negative self-image.	5	.767
Attitudes Towards Problem Solving	Students' engagement in productive mathematical problem solving patterns	6	.592
Talent	Students' perceptions that talent is needed for succeeding in mathematics	3	.564
Effort	Students' perception that effort is needed for succeeding in mathematics	3	.545

Muis et al., 2009), which confirmed the suitability of the scales. In addition, I calculated correlations between the scales to determine if they were in the expected directions and to determine whether the subscales appear to be measuring the same constructs (Table 4). The correlations indicate that self-efficacy is positively associated with mastery goals and academic press, and negatively associated with self-handicapping behaviors and mathematics self-concept (this scale is worded negatively). In addition, in spite of the significance, the correlations are moderate, suggesting that, overall, the scales are distinct and therefore addressing different constructs.

Instructor Interviews

Instructors were invited to discuss the results of the survey administered in their courses. Fifteen out of the 25 instructors agreed to be interviewed; two of them were full-time instructors and seven were teaching college-level courses (see Table 5).

Table 4. Descriptive Statistics and Pearson Correlations for the Scales of Interest ($N = 777$).

Student variables	1	2	3	4	5	6	7	8
1 Student Mastery	—							
2 Student Performance	.03	—						
3 Teacher Mastery	.43**	.01	—					
4 Teacher Performance	−.14**	.36**	−.13**	—				
5 Academic Self-Efficacy	.49**	−.02	.51**	−.16**	—			
6 Self-Handicapping Behaviors	−.22**	.29**	−.11**	.44**	−.18**	—		
7 Academic Press	.42**	.12**	.66**	−.04	.41**	−.03	—	
8 Mathematics Self-Concept[a]	−.29**	.25**	−.16**	.34**	−.37**	.45**	−.05	—
Mean	4.23	2.67	3.97	2.00	4.15	2.16	3.75	2.58
SD	.59	.80	.60	.70	.63	.82	.56	.53

a. $N = 489$ for Mathematics Self-Concept, because by mistake the question was left out from some surveys.
** $p < .01$.

Table 5. Courses Taught by the 15 Interviewed Instructors

Course (type)	Instructor identification codes[a]
Foundations of Mathematics (R)	E5, E22, E28[b]
Foundations of Algebra (R)	E5, E11, E12, E14, E22, E28[b]
Intermediate Algebra (R)	E3, E6, E10
Everyday College Mathematics (C)	E14
Functional Mathematics for Elementary Teachers (C)	E9, E15
Math Applications for Health Science (C)	—
College Algebra (C)	E27[b]
Trigonometry (C)	E21, E29, E30
Precalculus (C)	—

a. Instructors are denoted with a letter and a number.
b. Denotes a full-time instructor.

During the interview, before seeing the aggregated scores for their courses, each instructor was asked to predict how his or her students, as a group, would score on each of the scales and to give a justification for the prediction. After the predicted scores for all scales were recorded, instructors received the scores for their groups of students. They were then asked to comment on the scores as well as on the similarities and differences between their predicted scores and the actual scores. These interviews were audio-recorded, and relevant portions (those related to the anticipated scales and those related to their reasons for the differences) were transcribed. The instructors' anticipated scores were collected into a spreadsheet and used for the comparison with the scores obtained from their students' surveys. Verbatim quotes from the interviews are used in this article to present instructors' perspectives. No further interpretation was conducted, and thus interrater reliability for this portion of the analysis was not considered necessary.

Analysis

I performed four analyses with the survey data using confidence intervals and *t* tests with α set at .05 to answer the four research questions. To determine students' goal attributions (Question 1), confidence intervals (at 95%) were used. To determine whether there were differences in achievement goal orientations between students taking remedial mathematics courses and students taking college-level courses (Question 2), I conducted an independent samples comparison of means (*t* test). To answer the third question regarding teachers' perceptions of their students' described achievement goal orientations, I aggregated the scores per class and compared that average to the teacher's prediction using a *t* test of independent samples ($n = 15$). This analysis was repeated by type of course (remedial, $n = 7$; college-level, $n = 8$) to answer Question 4.

Limitations

The study has five limitations. First, because it is a single-institution study, the findings cannot be generalized to other institutions although they provide a point of reference that can be used for contrasting the results of other studies conducted within different settings. Second, the students surveyed were those taking mathematics courses, so it is unclear if it would be possible to generalize the findings to all students in the college. However, most students who plan to transfer require a mathematics course, and the majority of these students at the college where this study was conducted take the mathematics courses surveyed here. In addition, there was a large representation of transfer students in the study sample, which suggests that the findings might apply to those students in the college who have plans to transfer to a 4-year institution. Third, I discussed the findings with a small sample of instructors (15 out of 86), and only about half of these instructors were teaching remedial courses. Interviews with a larger group of instructors might have yielded different results. Fourth, I did not collect an academic outcome measure (e.g., final course grade, or a concept inventory score) that would allow me to test how these scales relate to academic performance. My priority was to determine whether the instrument yielded the type of data that could be used in a subsequent study examining the connection to academic performance. Finally, it is possible, as with most self-report measures, that the students responded with what they perceived to be appropriate responses rather than with their actual personal experiences. It is difficult to rule out this social desirability effect, but two characteristics may ameliorate it in this study: First, students selected all the possible values for the Likert-type scale on each item, and, second, the

Table 6. Mean, Standard Deviation, and Lower and Upper Bounds for a 95% Confidence Interval for Each Scale (*N* = 777)

Scale	Mean	*SD*	Lower bound	Upper bound
Student Mastery	4.23	0.59	4.19	4.27
Student Performance	2.67	0.80	2.62	2.73
Teacher Mastery	3.97	0.60	3.93	4.01
Teacher Performance	2.00	0.70	1.95	2.05
Academic Self-Efficacy	4.15	0.63	4.11	4.20
Self-Handicapping Behaviors	2.16	0.82	2.10	2.22
Academic Press	3.75	0.56	3.71	3.79
Mathematics Self-Concept[a,b]	2.58	0.53	2.53	2.63

Note: Responses vary between 1 (*strongly disagree*), 2 (*disagree*), 3 (*neutral*), 4 (*agree*), and 5 (*strongly agree*).
a. Only 489 students had valid data for the Mathematics Self-Concept scale, as the question was left out from some surveys.
b. Responses of 4 and 5 in the Mathematics Self-Concept scale represent a negative self-concept.

survey was anonymous, so there was no evident gain to be had by responding in ways that differed from one's own experiences.[3] Future applications of the survey should consider including the Paulhus Deceptions Scales (Paulhus, 1998) to control for this adverse bias in the responses. In spite of these limitations, I believe it would be wrong to dismiss the findings from this study, because they offer a counterintuitive view of the achievement goal orientations that the students in this college have, which might resonate with students in other colleges and offer opportunities for instructors to capitalize on the goals students bring.

Findings

Achievement Goal Orientations

Table 6 shows the means, standard deviations, and lower and upper bounds for the estimates of the values of the scales. It is important to notice that none of the intervals included the score of 3, which would be a hypothetical score indicating neutrality regarding the measured scale; thus the results suggest that the responses represent relatively strong views from the students. The students in this sample rated the mastery scales higher than the performance scales. These ratings were consistent across all subgroups (gender, age, ethnicity, marital status, work and education levels, goals, sources of funding, and type of course)[4] and they were in the expected direction. That is, students' goals were oriented toward developing competence and understanding, rather than toward attending to external judgments regarding their ability, an orientation that has been associated with higher student academic achievement (House, 2006). These results are further confirmed with the ratings of Academic Self-Efficacy, Self-Handicapping Behaviors, and Academic Press: Students indicated that they

Table 7. Mean Scale Ratings for the Full Sample and by Type of Course (Remedial or College Level)

Scale	Total sample ($n = 777$)	Remedial courses ($n = 315$)	College courses ($n = 462$)
Student Mastery	4.23 (.588)	4.33 (.557)	4.16 (.599)***
Student Performance	2.67 (.801)	2.72 (.809)	2.63 (.794)
Teacher Mastery	3.97 (.599)	4.11 (.561)	3.87 (.605)***
Teacher Performance	2.00 (.698)	2.09 (.733)	1.94 (.665)**
Academic Self-Efficacy	4.15 (.626)	4.21 (.587)	4.11 (.649)*
Self-Handicapping Behaviors	2.16 (.815)	2.16 (.876)	2.16 (.773)
Academic Press	3.75 (.562)	3.86 (.519)	3.67 (.577)***
Mathematics Self-Concept[a]	2.58 (.530)	2.58 (.525)	2.58 (.536)

Note: Scores can range from 1 to 5. In each scale, t tests were employed to assess the statistical significance between the mean scores of students in the remedial courses and the mean scores of students in the college-level courses.
a. Only 489 students had valid data for the Mathematics Self-Concept scale.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

believe that they can master the material and work hard, that they tend not to engage in self-handicapping behaviors, and that they expect their teachers to press them to do challenging work. In addition, the score in Mathematics Self-Concept indicates that students have a better-than-neutral perception of their own ability to do mathematical work.

Achievement Goal Orientations by Type of Course

Table 7 shows the students' mean scores and standard deviations on the assessed scales by type of course in which the students were enrolled. Students taking remedial courses rated their orientations toward mastery, their sense of self-efficacy, and their interest in being challenged to think and work hard higher than students taking college-level courses; they also rated their teachers' orientation toward mastery and performance higher than students in college-level courses. These results portray students taking remedial mathematics courses as highly motivated toward success and more motivated than students who are taking more advanced courses.

Instructors' Perceptions of their Students' Achievement Goals

Instructors' predictions of their students' scores differed from actual student ratings on three of the scales: Student Mastery, Academic Self-Efficacy, and Mathematics Self-Concept (Table 8). Instructors rated their students' orientations toward mastery and their sense of academic self-efficacy lower than students did, and by rating their students' self-concept in mathematics higher than their students did, teachers indicated

Table 8. Mean and Standard Deviation of Students' Scores and of Instructors' Predictions, ($n = 15$)

Scale	Students' scores	Instructors' predictions
Student Mastery	4.30 (.314)	3.73 (.523)***
Student Performance	2.83 (.424)	3.00 (.959)
Teacher Mastery	4.09 (.337)	4.11 (.369)
Teacher Performance	2.14 (.264)	1.87 (.779)
Academic Self-Efficacy	4.22 (.340)	3.24 (.770)***
Self-Handicapping Behaviors	2.37 (.372)	2.61 (.726)
Academic Press	3.88 (.370)	3.65 (.387)
Mathematics Self-Concept	2.62 (.143)	3.14 (.793)*

Note: For each scale, *t* tests were employed to assess the statistical significance of the difference between students' mean scores and instructors' mean predictions.
*$p < .05$. ***$p < .001$.

a more negative perception of students' self-concept in mathematics than their students did.

Referring to the Student Mastery scale, a full-time instructor said prior to seeing the results for his classes,

> They don't care if they understand it, as long as they can do it and get a good grade on the test. But at the same time, [. . .] wanting to understand [the content] may be a stress-reliever for them. . . . so much of their dislike of mathematics has to do with anxiety. So I'm sure if they understood it, they'd be less anxious and maybe they wouldn't hate it so much. [. . . .] I don't think there's a lot of internal intrinsic motivators in a lot of my students. I think they're motivated by getting a good grade [. . .], a good enough grade that they can keep their financial aid. That is a motivator for my students. (E28)

Thus, although this instructor believed that understanding the material might be important in reducing anxiety, he believed that his students did not have an intrinsic motivation to learn. Similar sentiments were expressed regarding Academic Self-Efficacy; some teachers suggested that being more or less familiar with content and expectations might determine a higher or lower score for Academic Self-Efficacy: "In [an earlier class, they] had learned the process of how to take a college class, so (they) have a better feeling of how to handle college work" (E12); "This [course] is harder than what they get in public schools; it is more rigorous, I don't think they feel as confident."(E06). A part-time instructor who was teaching the second remedial course in a sequence of two, rated Academic Self-Efficacy with a 2.5, saying,

> The types of students taking [this course] or liberal arts . . ., they don't have confidence in their math activity. [In contrast] students ending in pre-calculus

> have a natural maturity, a longer history of success. [A high score] might make more sense there because they would have taken college algebra and trig so they would have succeeded in 3 classes or in their placement test so they have the content and therefore are more confident and [have] more positive history and maturity. Not in [this class]; they need to remember [everything] from high school, they don't have good self-confidence. (E14)

Instructors who rated the self-efficacy scale high indicated that their students "thought" they could do it if they put in enough effort. For example, when asked to predict student Academic Self-Efficacy scores, one instructor replied, "All 4s. It's their idea, they think they can do it if they make an effort" (E15).

Instructor sentiments about their students' Mathematics Self-Concept were similar. One part-time instructor was teaching two remedial courses, one a prerequisite for the next, and rated the scale at 3.0 and 3.2 for each course, respectively, saying,

> I have so many students say they hate math! [In the first remedial course] they are more likely to give up. They did not want to do the problems more than one way; they are more frustrated. But confidence is more of an issue in the [first remedial course] than in [the second]. (E22)

This full-time instructor, like the majority of the instructors in the sample, indicated that his students did not think they were confident in mathematics and that they resisted doing things in different ways. One instructor rated the scale at 4.5, indicating that "they [students] have a low self-image—as said before in other comments." Some instructors suggested a 3, because they felt that in their classes they had students with both high and low self-concepts and that taking the scores together, they would "average out."

These findings suggest a mismatch in perception, in which instructors underestimate their students' achievement goal orientations and interest in mathematical course work in college. But it is important to note that some of the instructors accurately predicted their students' scores, and in some cases their predicted scores were the same as the actual average scores of their students.

Instructors' Perceptions by Type of Course

Differences were also found when the analysis was performed by type of course. Instructors of remedial courses made predictions that did not match actual student ratings regarding the Student Mastery, Student Performance, and Academic Self-Efficacy scales (see Figure 1). These instructors rated Student Mastery lower than their students and Student Performance higher than their students, indicating opposed perceptions of the goals that their students in remedial courses bring to the class. In addition, by rating the Academic Self-Efficacy scale lower than the students did, the instructors appear to have underestimated their students' perceptions of their ability to do the required work.

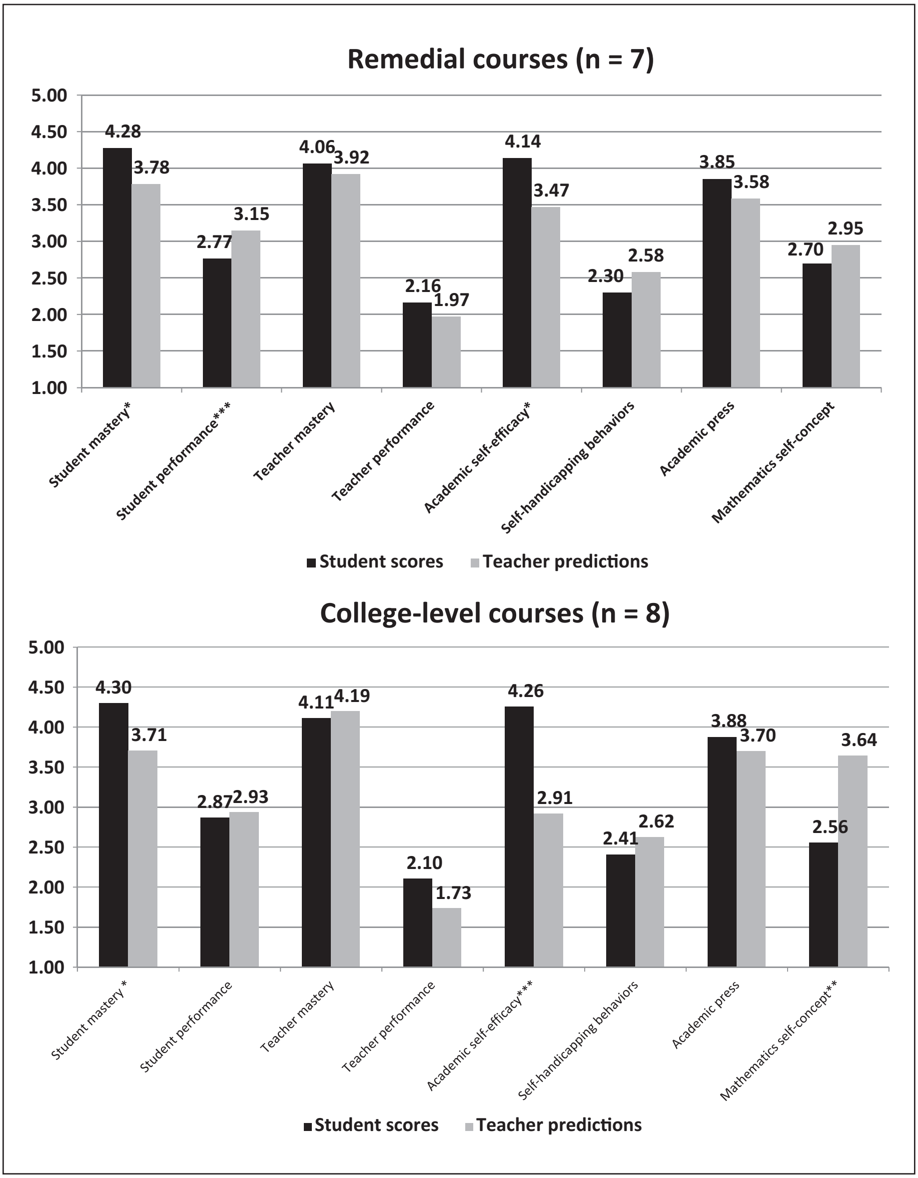

Figure 1. Mean student scores and mean instructor predictions for remedial courses and college-level courses, by scale

For each scale, *t* tests were employed to assess the statistical significance of the difference between student scores and teacher predictions.

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

Instructors of college-level courses rated the Student Mastery and the Academic Self-Efficacy scales lower than their students, indicating that the instructors underestimated their students' inclination to understand course material as well as their students' perceptions of their ability to do the work. Instructors of college-level courses also perceived that their students' mathematics self-concept was worse than what their students reported.

There were no differences in the instructors' ratings by type of course, indicating that there is some homogeneity in the teachers' perceptions of their students although this might be an effect of the small sample size considered ($n = 15$).

Discussion

The purpose of this study was to investigate the achievement goal orientations of community college mathematics students and their instructors' perceptions of those goals. In addition I sought to investigate whether there were differences by type of course, remedial or college level. Findings are discussed below in terms of the four research questions of the study.

Student Achievement Goal Orientations

Consistent with the literature on achievement goal orientations, based mostly on middle school students (Friedel et al., 2010; Patrick et al., 2001), the surveyed students in the community college setting favored mastery over performance, had a high sense of self-efficacy, expected their teachers to challenge them and press them to work hard, and avoided engaging in self-handicapping behaviors. A possible explanation for these findings is that, in general, people have a preference for setting goals in which mastering and understanding are more important than showing competence relative to others. It might be possible that the open-door admissions policy of the community colleges attracts students who are more intrinsically motivated to learn, as they seek to overcome difficulties that they may have experienced in the past and that arise from the complexity of their personal circumstances. To test this possibility, it would be important to apply the survey in postsecondary institutions without an open-access policy, as these institutions attract a different profile of students.

Student Goal Orientations in Remedial- and College-Level Courses

Contrary to the findings reported by Hall and Ponton (2005), students taking remedial courses in this community college indicated higher motivation toward mastering content, higher self-efficacy, more appreciation for how teachers press them to learn, and better mathematics self-concept than students taking the college-level courses. The difference between the findings of this study and the findings of the study conducted by Hall and Ponton could be due to the different instruments that each study used. It is possible, however, that the differences also stem from the different populations taking these surveys. Hall and Ponton's students were from a 4-year institution, where the stigma associated with taking remedial courses might be greater than at community colleges, which enroll larger proportions of students who need remediation. Indeed, community college students might see the opportunity of studying in college—even if the course is remedial—as a fundamental step in accomplishing their goals, whereas students in a 4-year institution may perceive taking remedial courses as a step back in the timely accomplishment of their goals. It would be important to replicate the study with samples of students in remedial and college-level courses at community colleges and at 4-year institutions to test these hypotheses.

Instructor Perceptions of Student Achievement Goal Orientations

There were discrepancies between students' self-reported goals and their instructors' perceptions of those goals. Instructors in this sample rated their students lower on measures of their orientations toward mastering content, their sense of self-efficacy, and their mathematics self-concept. This suggests that instructors underestimated the motivation, goal orientations, and expectations that their students bring to mathematics classes. One reason for this might stem from the organization of community colleges. Community colleges are commuter campuses, with most students coming to take one or two classes per term. In addition, instructors either have a higher teaching load (full-time instructors are responsible for an average of 15 credit hours of teaching per term; Lutzer et al., 2007) or they also commute to teach one or two courses per term. Thus the opportunities that instructors and students have for getting to know each other are limited to the class or to office hours. Whereas classes are usually devoted to presenting content, with very few opportunities for students to talk about their goals, office hours tend to be attended by the students who are more likely to need help. Instructors may wrongly generalize the characteristics of the students who seek help during office hours to the whole group of students they teach.

The varying competencies and demographic characteristics of students taking these courses might explain part of these results. Community college students know that they need to master basic mathematical knowledge to continue with their studies, and because of the openness of the college admission process, they might assume that it is a priority of the college and its instructors to ensure that they become competent in learning the material. In principle, students are willing to indicate that they will work hard to accomplish their goals. What instructors see is a wide range of competencies that students bring to class and that put them in different positions to learn the given content. Instructors might either adapt their plans to address students' difficulties, which results in less time to cover the required syllabi, or cover all the prescribed content without attending to students' difficulties. In either case, the perception from the instructors' point of view is that students have unrealistic goals of what they need to be successful or that the students will need more resources (e.g., time) than what they have at hand to master the material. As a result, instructors will tend to rate their students lower on several of these scales.

Instructor Perceptions by Type of Course

Instructors of both types of courses underestimated their students' ratings of their orientations to mastering course content and of their sense of self-efficacy. In addition, instructors of remedial courses overestimated their students' inclinations toward performance, whereas instructors of college-level courses underestimated their students' mathematical self-concept.

These findings reveal potentially missed opportunities for instructors to capitalize on the goal orientations that students bring to mathematics classes in the community college. The first finding suggests that instructor perceptions of student goals and self-efficacy are consistent regardless of the type of course students are in; instructors recognized neither their students' interest in mastering the content nor their sense that they will be able to do the work they have to do. It might be that, as discussed earlier, instructors perceived that these goals are unrealistic given the amount of material that students need to learn. Instructors might also have perceived that in spite of the students' sense that they can do the work, their life conditions might get in the way of their being successful. Interestingly, instructors of remedial courses saw their students as more inclined toward performance than the students themselves did, perhaps revealing a perception that students in remedial courses worry about appearing smarter than the other students or about not being perceived as incapable of doing the work. On the other hand, a common theme among instructors during the interviews was that students in remedial courses have experienced failure in the past and are therefore concerned about their image and reluctant to appear incapable; instructors were then very sensitive to promote their students' self-images as competent and capable. But the results of this small study suggest that instructors may not need to worry so much; the remedial students participating in the study were more interested in learning the material than in appearing that they can perform well.

Instructors of the college-level courses had lower perceptions of their students' mathematics self-concept than the students themselves did. It may be that instructors expected that their students, because they were in college-level courses, would be more attuned to what a college-level course looks like, and were therefore surprised by the attitudes of a few vocal students who might have had a poor mathematics self-concept. What instructors may not have realized is that if students had successfully passed remedial courses to get into the college-level courses, they may have already overcome their perceptions that they could not do mathematical work. If students had been placed directly into a college-level course via the college's placement test, then this may have given them the sense that they are capable of doing the mathematics of that course. In either case, from the students' point of view, they were in the right course, and they believed that they would be able to do the required mathematical work.

When shown the differences, instructors showed genuine surprise and were puzzled. They offered explanations that fell into two broad categories: survey application issues and sources of information about students.

Most instructors tried to remember when the survey was given to the students, thinking that if the survey had been administered too early in the term, students would not have learned about course expectations or would still have unrealistic expectations about college-level mathematics work. However, all surveys were administered after the 6th week in the 15-week-long semester and within a week or so of a major examination; by that time, it was anticipated that most of the norms for engaging in the classroom had been well established (McClain & Cobb, 1997; Yackel & Rasmussen, 2004). In addition, some instructors doubted that the responses could be so consistent. However, because each scale had more than three items, and because the confirmatory factor analysis retained most of the items in the predicted scales, this possibility is unlikely. In addition, repeated applications of the surveys with different groups of students ameliorated this issue. In this case, I applied the survey first to a small group of students in three college-level courses (College Algebra, Trigonometry, and Pre-Calculus) and in one remedial course (Foundations of Algebra). I contrasted the results from this application with the application to a different group of students taking only trigonometry courses. Finally, I extended the application to a wider sample of students and courses in the college. In each case the results were similar.

One instructor wondered whether his students had understood the questions as intended. This is a possibility with any survey that is administered to a new sample of students. Interviews with a wide range of students as they responded to the questions might have determined the extent to which this was the case. Because prior research using the PALS (from which most items in this study were derived) suggests that it is valid (Jagacinski & Duda, 2001), and because the students selected all possible options in the Likert-type scales employed in the questionnaire, I think that the survey was interpreted accurately by the students and that the results reflect their position on each scale.

As discussed earlier, some instructors suspected that the discrepancies between their predictions and actual student responses were caused in part by the tendency to "hear only from the struggling students," the ones who speak out only when they have problems or "excuses" for missing work. Interestingly, instructors perceived that students who ask questions were struggling, suggesting that they ask questions because they might have missed class. The instructors said that they might have made an inappropriate generalization to the whole group based on a handful of students. Other instructors wondered about the opportunities that they had created to get to know all their students on a more personal level, which would allow them to assess their goals and motivations more holistically; they felt that they had been "giving students less credit than they deserved" and were curious about ways in which they could adapt their practice to fit this new knowledge.

Implications

Research

Future studies should be conducted to confirm or rule out possible explanations for the findings of this work, particularly those that can be linked to differences between

4-year institutions and community colleges. It is important to see whether the stigma associated with remediation is a 4-year-college phenomenon and whether this stigma is less evident in community colleges. This knowledge would be crucial for changing the negative perception that exists toward remediation (Bailey, 2009), specifically because many students need remedial courses to do college-level work. Surveys could include items that control for the potential threat of "socially desirable" answers as well.

It would also be important to extend the application of the survey to students from a more diverse set of community colleges. In that application, it would be of paramount importance to include a measure of student achievement (e.g., course performance) that would allow us to confirm the connection between goal orientation and student academic outcomes, a strong aspect of the motivation theory. Along with measures of social desirability, such a survey would give us a good picture of community college students' achievement goals for learning, an important factor that contributes to classroom instruction and learning (Cohen et al., 2003).

Another set of studies should investigate how community college faculty members promote performance or mastery achievement goals during instruction. Investigations of the quality of assigned tasks, the type of authority that faculty members espouse and enact, and the type of behavior they promote—cooperative or competitive—could shed light on how the instructors capitalize on teaching to shape students' achievement goal orientations. Some studies have suggested that faculty members offer limited opportunities for students to engage in the highly demanding, cognitive work in mathematics (Mesa, in press) and that even when instructors use strategies meant to support students' learning, they tend to use routine questions that reinforce rote learning (Mesa, Celis, & Lande, 2011). In addition, students usually have little autonomy in undergraduate mathematics classrooms and engage in little cooperative work (Mesa & Chang, 2010). Thus, the work that instructors do in designing lessons, establishing their authority, and organizing students' work during class needs to be studied more closely, because this work shapes students' goals and ultimately determines what students learn.

Practice

Most of the instructors saw the importance of the results but did not know how to capitalize on these findings. This suggests the need for faculty development that guides community college instructors in learning about and taking advantage of the motivation and goal orientations that their students bring to class. For example, making an initial assessment of students' achievement orientations, their levels of self-efficacy, and their willingness to be pressed academically might help instructors gauge the level of challenging work that needs to be maintained throughout the semester. If the results of these surveys hold, instructors will find it pleasantly surprising that students are inclined to master the content and do what it takes to accomplish their goals.

Instructors can also purposefully check on all students, including those who are not struggling, to gain a truer perspective on what their students are able and inclined to do. For example, having periodic anonymous reports from students about what is difficult or easy in class and in life, and sharing a summary of this information with the class (as appropriate), can keep instructors and the class informed about each other and give a better sense of what the students, as a group, want and of their willingness to do what it takes to accomplish their goals.

Instructionally, faculty members need training so that they can implement activities that foster and promote students' goal orientations toward mastery. As indicated previously, attention to the challenge of the tasks expected of the students, the type of autonomy exerted, and the level of cooperation in the classroom can positively influence students' orientations toward maintaining goals that are aligned with mastering content. In particular, how these activities are carried out in mathematics is crucial. The information from documents such as Blair's (2006) *Beyond Crossroads: Implementing Mathematics Standards in the First Two Years of College*, could be used to tailor faculty development that provides mathematics teachers with strategies they can use in their classrooms. Likewise, many documents from the K-12 literature (e.g., National Council of Teachers of Mathematics, 1991, 1995, 2000) could be used as springboards for designing faculty development at the collegiate level that attends to the ways that faculty members can foster the goal orientations of students.

The rising costs of higher education have made the community college a natural, and in many cases, the only, option for completing postsecondary studies (Dowd et al., 2006). Because mathematics is an almost universal requirement for all students in community colleges (Lutzer et al., 2007), mathematics departments have to spend a considerable amount of resources in preparing the large number of students who are not ready for college-level work. Faculty members in community colleges have very few tools for improving practice (Grubb & Associates, 1999), so increasing their knowledge about the achievement goal orientations their students bring to the mathematics classroom is a step toward improving the educational opportunities for students in these courses. Knowing that students want to focus on developing competence, feel self-efficacious, and have a high mathematics self-concept, gives instructors the space to create classrooms in which challenging mathematical work can be the norm.

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Notes

1. Questionnaire items used in the study can be obtained from the author.
2. I did not include three scales that asked students about their perceptions of the classroom goal structure (e.g., "in our class, getting good grades is the main goal") as these have been reported to have problematic cognitive validity (Koskey, Karabenick, Woolley, Bonney, & Dever, 2010). Another four that were not included dealt with parents, home life, and neighborhood; these referred to school contexts that are not necessarily shared by the community college setting. Finally, six scales concerning academic behaviors (e.g., cheating, engaging in disruptive behavior) were also not included. Although the items in these scales are probably applicable, they were deemed less relevant than those relating to perceptions of mathematics.
3. I recently conducted interviews with individual students about their understanding of mathematics (trigonometry and algebra), and as part of the interview I asked about their goals and their perceptions of mathematics teaching in the college. All the students had high aspirations, believed that they can do the work, and indicated that their teachers really wanted them to understand and learn the material.
4. Specific results are available upon request.

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