Beyond Achievement: Motivation-related Evidence from a Partnership Between a Targeted Project (TASEL-M) and a RETA (MSP-MAP)

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Evidence from research on student learning in general (see Pintrich & Schunk, 2002; Pintrich & Maehr, 2004), and mathematics and science in particular (e.g., Fennema, 1989; Schoenfeld, 1992), demonstrates that students' motivation, affect, strategies, and beliefs about knowledge in these disciplines can influence their learning and performance. Further, research suggests that students' motivation and related outcomes are sensitive to characteristics of the learning context, including teachers' instructional practices as well as school climate (Ames, 1992; Anderman & Maehr, 1999; Eccles & Midgley, 1989). It is important, therefore, for reform efforts to determine how their programs affect student motivation, especially since such changes can precede, or even occur in the absence of, targeted cognitive outcomes. The primary goal of the MSP - Motivation Assessment Program (MSP-MAP) is to develop and make available reliable, valid, and practical tools to assess student motivational beliefs for mathematics and science, affect, strategies for self-regulated learning, and beliefs about the epistemology of mathematics and natural sciences. These tools are being used with different MSPs to support evidence-based claims about the effects of their interventions, and to explore the role of motivation-related outcomes as mediators and moderators of student achievement in intervention models (Maehr & Karabenick, 2004).

MSP-MAP's most extensive collaboration to date is with TASEL-M, a standards-based, data-driven program designed to improve students' academic performance in mathematics by giving their teachers the knowledge and tools to accurately diagnose students' deficiencies,

assess their progress, adjust the curriculum and pedagogy, and transform the departmental culture to maximize student learning in mathematics. Over the last year, MSP-MAP and TASEL-M have collaborated to assess changes in motivation of each of TASEL-M's 14,000 students over the course of the school year. Early findings have been disseminated to teachers and TASEL-M project staff as part of professional development activities that serve as a major component of the TASEL-M intervention, as well as through individual reports to teachers. The professional development activities are expected to change administrative practice in the school and in the classroom, effecting a cultural change that creates a sustainable climate of improvement and achievement.

Our evaluation summit presentation will inform discussions about student learning and participation with data from the first year of our collaboration on student motivation and how it changes over time. In addition, we will discuss how early findings are influencing project design and professional development by showing how data are being presented to teachers in ways that encourage dialogue about change in practice.

Method

Design

The partnership between TASEL-M and MSP-MAP to date has involved three waves of student motivation surveys in the beginning, middle and end of the school year, as well as two waves of teacher attitude and belief surveys. Data from the beginning and end of the year student surveys are presented here. Students completed questionnaires in their regular math classrooms four weeks after the start of the school year and again approximately four weeks before the end of the school year. All students in class on the

day of administration participated. Students were told that the purpose of the study was to find out their thoughts and feelings about the subject of math and their own math class. Students were guided through a sample item and then independently completed a one hundred and ten question survey during their math period. The survey took approximately thirty minutes to complete. The surveys were administered by trained research assistants. The teacher was present in the room while the survey was being completed, but the teacher remained seated and unobtrusive during the procedure and did not view any of the survey responses.

Participants

Participants were 12,348 students (49% female) from 487 classroom in 14 ethnically diverse, working class public middle and high schools in California (72% Latino/a, 16% Vietnamese, 6 % Caucasian, 6% Other - primarily SE Asian).

Measures

Motivation was measured along 4 dimensions with a 26-item instrument adapted from previous work. Items were rated on a 5-point Likert scale (1 = not at all true; 3 = somewhat true; 5 = very true), and all questions were worded to have students focus on the domain of mathematics. Utility was concerned with (8 items, $\alpha = .88$) students' beliefs about the usefulness of math as an area of study (e.g., "Math is useful to me for things I do outside of school"). Interest (6 items, $\alpha s = .95$) referred to students' attraction to, liking for, and enjoyment of math. (e.g., "I find math very interesting"). Efficacy items assessed (General: 8 items, $\alpha = .89$, Problem Solving: 4 items, $\alpha = .71$) students'

judgments about their ability and confidence to perform adequately in math (in general and in terms of problem solving strategy use) (e.g., "How sure are you that you can do even the most difficult math work," and "How sure are you that you could use pictures or graphs to solve difficult math problems?) Achievement goals (three 5-item scales items, αs = .87, .84, .79) referred to students' purposes when approaching, engaging in, and responding to math instruction. Mastery goals focus on learning and understanding (e.g., "My goal in math is to learn as much as I can"), performance-approach goals focus on demonstrating ability and outperforming others (e.g., "My goal in math is to look smarter than other students"), and performance-avoid goals focus on not looking dumb (e.g., "My goal in math is to avoid looking like I can't do my work").

Results

General findings by course

Figure 1 shows students' beliefs about their ability to do math in general and solve problems in their math class. In general, students felt somewhat confident in their ability to understand math and solve math problems, with students in more challenging courses reporting higher levels of efficacy.

Did students value the math they were studying in school? In general, students saw math as useful and important for their lives, even though most students reported low levels of interest in mathematics (See Figure 2). Interest was higher in more advanced courses, but utility was almost uniformly high. Middle school students (see Figure 3) valued math even more than did high school students, with means near 4 out of 5 for utility in most classes. Middle school interest was in line with high school interest, with

sixth graders as the notable exception. At the beginning of the school year, sixth graders reported high interest in and enjoyment of mathematics, though this would change considerably over the year. It is important to note that, though high interest is certainly desirable, low levels of interest need not prevent engagement in the classroom. If students can be helped to see the usefulness of what they are studying, the resulting value can sustain meaningful engagement.

Students' reasons for engaging in mathematics generally focused on mastery goals of learning and understanding, with most students reporting markedly higher levels of mastery goals, relative to performance goals (see Figure 4). Students did report focusing on competition and demonstrating competence. Though they were somewhat more concerned with demonstrating competence than with avoiding the demonstration of incompetence, the concern with not appearing stupid factored into their decisions about engagement in the classroom. Across different courses, the most adaptive patterns of goals were seen with students more advanced or honors courses. These students reported more concern with mastery, as well as lower levels of performance approach and performance avoid goals.

Changes from fall to spring

Students in TASEL-M schools showed expected drops in motivation over the course of the school year. They became less interested, saw math as less useful, and felt less confident in their ability to understand math and solve math problems. In addition, they reported lower levels of achievement goals, with lower means on all three goals. While a decreased focus on mastery goals of learning and understanding is problematic,

the associated decrease in a focus on competition should be considered an adaptive change.

The overall decrease in motivation across the school year is far less important than the variability we see across schools and between courses. We can learn a lot from the cases where motivation changed far more or less than the norm, or where motivation changed in a different direction. Looking at these changes relative to the norm formed the basis for much of the dialogue during professional development activities. For example, sixth graders were particularly disadvantaged over the school year, with the greatest drop-offs over the year. They were less interested, they saw math as less useful, and were less confident in their math abilities. A positive change was the decreased focus on competition and not looking dumb, but this was accompanied by less of a focus on learning and understanding.

In other cases, students showed a positive change in interest from fall to spring, reporting that they were more interested in math at the end of the school year than the beginning. Most of these positive changes occurred in lower level or remedial course where students started with very low levels of interest. During professional development activities, teachers discussed possible reasons for these unexpected increases.

Links between motivation and achievement

A final group of findings to report concerns the links between motivation and achievement. Students were categorized as high or low achievers based on prior year state standardized test scores. Students with scores in stanines 1-3 were considered low performers, while students with scores in stanines 7-9 were considered high performers.

Details about all of the relations are beyond the scope of this presentation, but sample graphs will be available for the discussion period and findings will be briefly summarized.

Higher performers are more likely to believe they can learn math, be interested in math, and believe math is more important. They also report more positive and less negative feelings about math. High performers have higher personal mastery goals, lower personal performance goals, perceive their classes as more mastery focused, and perceive less of a focus on competition (both demonstrating competence and avoiding the demonstration of incompetence). These analyses are only correlational, with data collected at one time point. However, our next year of data collection will allow us to investigate how motivation influences and is influenced by achievement with motivation and achievement assessed over multiple years.

The first year of collaboration between MSP-MAP and TASEL-M has included large-scale data collection from hundreds of teachers and tens of thousands of students. What we have presented here is but a small piece of a very large effort. We have documented changes in students beliefs about their ability to do math, the value they place on math, and the reasons they endorse for engaging (or not engaging) in achievement-related behaviors. These motivation-related beliefs vary according to ability, age, and course content, and these beliefs have implications for achievement. Over the next year we will continue and expand our student and teacher survey administration, while using the results to inform ongoing professional development. Through ongoing

data dialogues these projects are working together toward increased data driven decision-making, and we look forward to having more to share next year.

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Figure 1

Fall efficacy beliefs

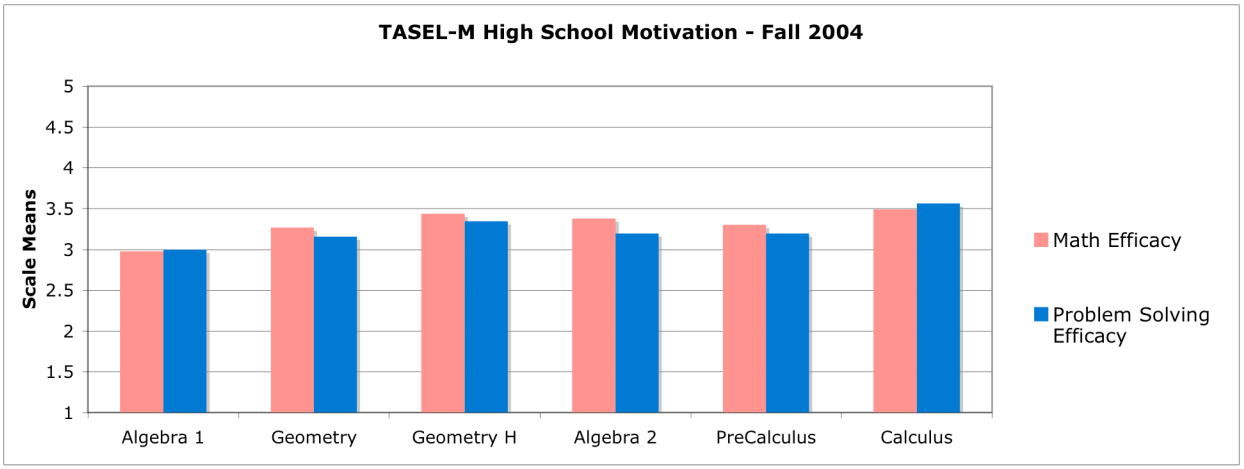

Figure 2

Fall value beliefs (High School)

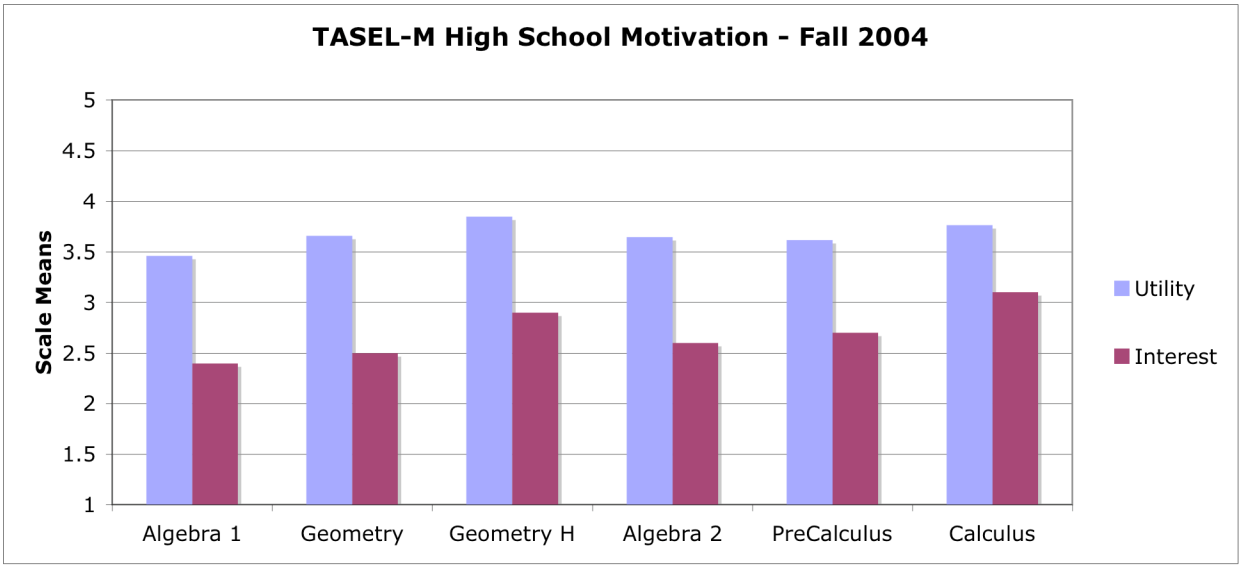

Figure 3

Fall value beliefs (Middle School)

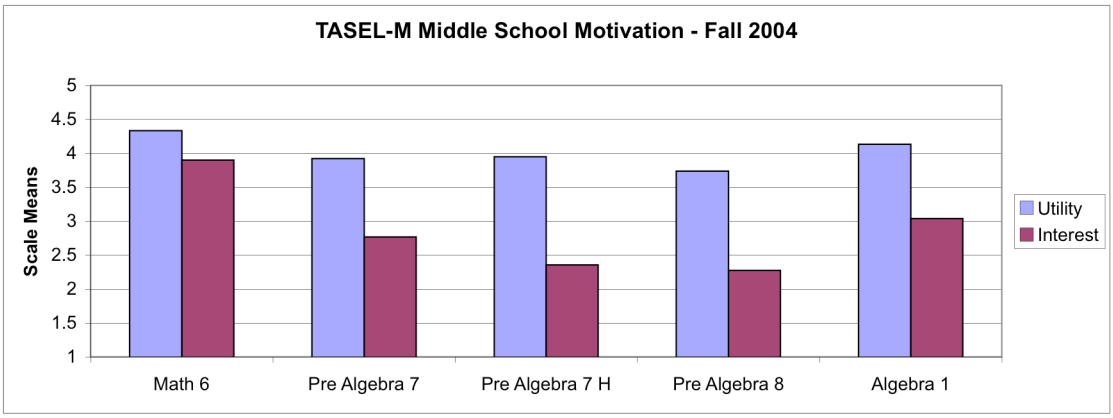

Figure 4

Fall achievement goals