Fairfield-Suisun Unified School District CaMSP Program Evaluation Report: Year One

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Fairfield-Suisun Unified School District CaMSP Year 1 Program Evaluation Report

Executive Summary

Fairfield-Suisun Unified School District completed their first of a three year California Math and Science Partnership (CaMSP) program in Spring 2010. To date, 43 teachers of grades 3-Algebra Readiness have participated for an average of 84 total hours. The professional development (PD) model implemented incorporates summer intensive institutes, school year coaching and workshops, and emphasizes improving teachers' conceptual and pedagogical knowledge of math, providing a variety of teaching strategies to allow teachers to address the specific needs of their students, and teacher reflection and collaboration around effective and student-centered instructional practice.

The evaluation employs a mixed methods approach to examining the impact of program participating on teachers and their students. Data collection includes:

- Principal interviews in all district elementary and middle schools;
- Teacher surveys;
- Teacher mathematics content knowledge tests;
- Teacher reflections;
- Student surveys (grades 5-Algebra Readiness);
- Analysis of student math achievement, using both Math CSTs and district benchmark assessments; and
- Establishing a comparison group of district teachers, selected to match participating teachers' experience, education, and grade-level teaching assignment to participate in teacher surveys, knowledge tests, student surveys, and student achievement analyses.

Impact on teacher knowledge, practice, and attitudes includes:

- Positive changes in teacher confidence and knowledge (as measured by survey responses and reflection documents) to the content of the PD;
- Self-reported improvements in pedagogy and instructional strategies, particularly in terms of being able to provide differentiated instruction, as a result of their involvement in the PD among the majority of participants;
- Increases in both practice of and appreciation for teacher collaboration; and
- Statistically significant improvements in math content knowledge related to patterns, functions and algebraic thinking.

The impact of teachers' participation in the CaMSP professional development on their students was measured by student surveys to assess student attitudes and interest and by analysis of student achievement on statewide and district standardized tests. Findings include:

- Little change in student perceptions and attitudes over the year, partially attributable to the ceiling effect of high initial ratings of teachers and math interest and possibly influenced negatively by administering the post-survey after the CST administration;

- A small but statistically positive effect (as determined by HLM analysis) of being placed in a participating teachers' classroom on student math CSTs (7-10 scale score point advantage), both overall and, in subgroup analyses, for students with disabilities;

- A correspondingly small (2-3 percentage points) but positive effect on student district benchmark assessment scores, both overall and, in subgroup analyses, among students who scored below basic on the previous year's CSTs.

Overall, findings suggest that the impact of the CaMSP program is already beginning to emerge in FSUSD, after only the first year of implementation. Participating teachers report increased confidence, collaboration, and improved classroom practice. Teachers demonstrate improved math content knowledge in the specific content areas emphasized during the first year of professional development programming. Students in participating teachers' classrooms perform, on average, somewhat better on the statewide standardized mathematics tests and district benchmark assessments than do their counterparts in non-participating comparison teachers' classrooms. The extent to which these gains are sustained and/or improved upon will become evident over the next two years of the program.

Fairfield-Suisun Unified School District CaMSP Year 1 Program Evaluation Report

Fairfield-Suisun Unified School District (FSUSD) is in its first year of participation in a three year California Math and Science Partnership (CaMSP) professional development program. This report summarizes the results of the first years of this grant. The professional development content has been provided by the University of California Mathematics Subject Matter Project

The professional development model implemented by the providers is based on the assumption that deepening teachers' understanding of math and exposing them to multiple perspectives on important math concepts, coupled with providing them with additional and better pedagogical approaches, will ultimately result in better teaching overall, and improved student academic achievement in math. An intermediate step in this model is the assumption that by training teachers to be more collaborative and reflective about their own teaching practices, teachers are better able to engage their students in learning and to recognize when individual students require a different approach or assistance. These skills cannot be taught in a single summer intensive institute. Consequently, many of the follow-up professional development hours are focused on building teachers' comfort with and skills in working collaboratively in order to develop a professional learning community to support their improvement efforts.

CaMSP teachers participated in intensive and follow-up professional development opportunities beginning in the summer of 2009 through the spring of 2010. Intensive professional development included a Summer Institute, totaling 37.5 hours, and four Saturday sessions, each six hours, for a maximum of 61.5 total possible hours of intensive professional development. Of the 43 CaMSP participating teachers, 40 (93%) completed all 61.5 hours of intensive professional development. Follow-up professional development was offered through nine two hour workshops as well as a six hour focus project for a maximum of 24 total possible hours of follow-up professional development. Thirty-nine (91%) of CaMSP participating teachers completed all 24 possible hours of follow-up professional development. On average teachers attended a total of 83.59 hours professional development (Table 1).

Table 1: Participant Hours

	Intensive	Follow-up	Total
Mean Hours Completed	60.94	22.65	83.59
Minimum Hours Completed	49.5	6	55.5
Maximum Hours Completed	61.5	24	85.5

Methods

Participants

Participants included 43 teachers who participated in the CaMSP professional development program and an additional 46 teachers who agreed to participate in the evaluation as a part of the comparison group. In addition, data were collected on the students taught by both the CaMSP teachers and comparison group teachers and on principals from schools throughout the district.

Selection of Teacher Comparison Group

The CaMSP comparison group was selected from a group of FSUSD teachers matched to participants by the following criteria: (a) grade span taught (grades 3-4, 5-6, or middle school math), (b) assignment to special education (yes/no), (c) gender, (d) assignment to site where no other CaMSP participants currently teach the same grade span or subject, (e) education level (bachelor's or bachelor's & up to 30 units, master's or master's & up to 30 units), and (f) years of teaching experience (1-3 years, 4-6 years, 7-10 years, 11-19 years, 20 plus years).

The comparison group was secondarily matched by ethnicity (White, Asian, Hispanic, African American, Filipino, all other). Of the 56 teachers identified as suitable comparison group constituents, 46 agreed to participate and comprise the comparison group analyzed for this study.

Data Collection and Analysis

The evaluation design is a mixed methods approach. Quantitative and qualitative data were collected on CaMSP and comparison teachers, as well as their students and principals using a variety of instruments including interviews, surveys, reflections, teacher content knowledge assessments, and student achievement assessments. Together, the triangulation of the data from these various sources provides an overview of the implementation and impacts of the CaMSP program. Each of these data collection instruments is described in detail below, along with a description of how the data from each instrument were analyzed.

Principal Interviews

To learn more about the impact on schools of teachers' participation in the CaMSP program, the evaluation staff conducted individual interviews with 19 school principals in FSUSD between the dates of September 22 and November 19, 2009. All elementary and middle school principals within the district were interviewed regardless of whether or not any of the teachers at their school were participating in CaMSP program. The purpose of these interviews was to establish a baseline measure of principals' perceptions of math instruction, students' math achievement, and teacher collaboration at their school. Principal interviews were confidential, conducted in-person or by phone, and lasted 30 to 60 minutes. To insure accuracy, the interviews were audio taped with the principal's permission. Audio taping was voluntary and principals were not excluded if they choose not to be taped. Information was collected in six main areas during the interviews: (a) background information, (b) student achievement and assessment; (c) professional development, collaboration and curriculum; (d) teacher turnover; (e) family/community involvement; and (f) looking forward. Principals will be interviewed again at the end of the grant, in 2012, to examine what changes they report in these school characteristics.

Teacher Surveys

Attitudinal surveys were administered to CaMSP participating teachers in the summer of 2009 and again in the spring of 2010. Both the pre and post surveys included Likert-type Scale items designed to measure the teachers' growth in practice, attitude, and application of best practices. In addition, the post survey included open ended questions that asked teachers to reflect on what they learned and what they found to be most valuable during their participation in the first year of the CaMSP program. All answers to open ended questions were reviewed and coded for analysis. Of the 43 teachers participating, 34 (60%) completed the pre survey and 31 (72%) completed the post survey, with 30 (60%) completed both the pre and post teacher survey and were included in the analysis.

Initially, paired sample t-tests were run on each Likert-type scale survey item to determine statistically significant differences between pre and post responses (see Appendix A for full results). In order to improve the validity of the results, constructs were created by combining conceptually and statistically related individual survey items (see Appendix B). Survey items were separated into two categories, confidence and teaching practice, and constructs were created within each category. Constructs within teacher confidence include (a) instructional ability, (b) differential instruction, and (c) collaboration. Constructs within teacher teaching practices include (a) use of games and manipulatives, (b) use techniques to access students' prior knowledge, (c) use of formative assessments, and (d) collaboration with other teachers. The internal consistency of the items within each construct was assessed using Cronbach's Alpha. Internal consistency was found to be relatively high for all constructs with each construct having a Cronbach's Alpha of .64 or greater.[1] Paired sample t-tests were used to examine differences between pre and post survey responses for each of these constructs.

Additionally, comparison teachers were administered the teacher survey in spring 2010.[2] One-way ANOVA was performed to compare participating teachers' survey responses in both pre and post surveys to those of comparison teachers. Because of the time lag between participating and comparison teachers' initial survey dates, it was not possible to compare CaMSP and comparison teachers' growth or change in responses over the course of the first year of the program. However, the comparisons provide some insight into whether the CaMSP teachers were more similar to the comparison teachers in prior to (pre survey) or after (post survey) participation in the program.

[1] See Appendix B for Cronbach's Alpha for each construct

[2] Due to the time required to obtain teacher characteristic and assignment data and to select and recruit suitable comparison teachers, surveys could not be administered during the fall for a pre-post comparison during this initial year of the study

Teacher Content Knowledge

Teachers' content knowledge was assessed utilizing the Learning Mathematics for Teaching (LMT) assessments developed by the University of Michigan Ann Arbor (http://sitemaker.umich.edu/lmt/home). The LMT is designed to measure what mathematics teachers must understand in order to teach mathematics in the content areas of number operations, pre-algebra, algebra, and geometry in grades kindergarten through eight. Specifically, teachers were administered three portions of the LMT (a) 2001 Elementary Patterns, Functions, and Algebra (EL PFA 2001), (b) 2001 Elementary Number Concepts and Operations (EL NCO 2001), and (c) 2004 Elementary Geometry (EL GEO 2004).

To determine if teachers experienced any gains in content knowledge during the first year of the program, pre assessments were administered prior to the start of the program and participating teachers were then assessed again at the end of the summer 2010 institute. Teachers were administered the A version of each test at pre and the B version of each test at post. The percentage of items each teacher answered correctly was calculated for each test because the A and B versions of the EL NCO 2001 and EL PFA 2001 include a different number of items. Paired sample t-tests were then run to compare the percentage correct at pre to the percentage correct at post to establish if teachers' content knowledge improved over the course of the first year of the CaMSP program.

The LMT was also completed by comparison teachers to establish a baseline measure of content knowledge for this group.[3] Comparison teachers were administered the A version of each subtest approximately six months after the test was administered to participating teachers. They will be administered the B version of each subtest at the conclusion of the program and the results will be discussed in the year three report.

Teacher Reflections

Upon completion of each of the CaMSP professional development activities (Summer Institute, four Saturday Intensives, Classroom Connection Follow-Up Workshops), teachers were asked to complete written reflections on the activity. Reflections provided the teachers with an opportunity to document the following: (a) the most useful information presented, (b) any "Ah-Ha!" moments, (c) suggestions, and (d) comments. In addition, teachers collaboratively designed lessons, individually taught the lesson in their own classrooms (without observations from their colleagues as will be done during formal lesson study in the coming year), and completed a written reflection on how the lesson went. These lesson reflections allowed teachers to document what went well in the lesson and identify areas for revision. Teacher reflections were analyzed to determine teachers' satisfaction with the CaMSP program.

[3] Results of the comparison teachers' LMTs are not yet available, and therefore, are not included in this report. Subsequent reports will include analyses of the comparison groups LMT scores determine differences between CaMSP and comparison teachers' content knowledge.

Student Surveys

Students in participating fifth, sixth, and seventh grade participating teachers' classes were administered surveys by their teachers in fall 2009 and spring 2010. Pre and post surveys were identical and asked students to rate various areas including attitudes toward math, preferred learning styles, and overall confidence in math ability on a four point scale (A = totally agree; D = totally disagree). At pre-administration, 602 students completed the student survey and at post 591 completed the survey. It was not possible to match individual students' pre and post responses; therefore, only cumulative classroom statistics were calculated for each survey administration.

Initially, independent samples t-tests were performed to determine any statistically significant differences between students at pre and post (see Appendix C for results). In addition, to determine if there was variation in the level of agreement between the responses of elementary and middle school students, the data for each grade span were examined separately and compared. Paired sample t-tests were performed based on the percentage of students in each class who agree/strongly agree. However, the small sample size limited the power to detect statistically significant results.

To enhance the validity of the results, survey items were grouped into related constructs including (a) student attitudes, (b) student learning styles, (c) student confidence, and (d) student perception of teacher ability (see Appendix D). The internal consistency of the items within each construct was examined using Cronbach's Alpha. The internal consistency for each construct was relatively high, with each construct having a Cronbach's Alpha greater than .62.[4] Independent samples t-tests were used to determine if there were statistically significant differences between students at pre and post on any of the constructs.

Student Achievement

The intent of the CaMSP program is to provide teachers with professional development to increase their effectiveness in teaching mathematics. In turn, this improvement in teacher effectiveness is expected to lead to improvements in students' mathematics achievement. In order to examine whether the CaMSP program had an impact on students' math achievement, we compared the math achievement of students taught by CaMSP teachers to the achievement of students taught by teachers in the comparison group. Math achievement was measured using two variables: students' 2009-10 California Standards Tests (CST) math scale scores and students' district benchmark assessment scores.

District benchmark assessments are administered to FSUSD students three times per year, at the end of the first, second, and third quarters. These assessments are designed to measure students' progress toward mastering the content standards within the students' grade, with each assessment covering approximately 8 of the essential standards. Students' scores on these three assessments

[4] See Appendix for Cronbach's Alpha for each construct

were combined to create a composite representing the students' achievement over the course of the year. The composite was created by averaging the percentage of items the student answered correctly across the three assessments.

Both the CST scores and the composite benchmark assessment scores were standardized by the student's grade level and the year of the assessment (mean = 0, SD = 1).[5] Therefore, a student's score represents how far he or she was from the mean score in that year. Positive scores indicate that a student scored above average within his or her grade level, whereas negative scores indicate that the student scored below average.

To analyze the impact of the CaMSP program on student achievement, hierarchical linear modeling (HLM) was used in order to account for the nested structure of the data, with students nested in classrooms (teachers) and classrooms (teachers) nested in schools. The ideal way to isolate the impact of a professional development program such as the CaMSP is to ensure equality of the treatment and control groups at the onset of the program, both in terms of teachers' effectiveness and student ability/achievement. If groups are equal prior to any intervention, then differences after implementation may be attributed to the intervention. Ideally, equality of groups is ensured through random assignment of teachers and students to the treatment and control groups; however this was not an option in the CaMSP program. As discussed previously, efforts were made to select teachers for the comparison group that were as similar to the treatment group as possible; however, because participation in the CaMSP program was voluntary, it is possible that there are systematic differences between teachers who chose to participate and those that opted not to (e.g., motivation or perceived need for training). In the absence of random assignment, initial differences between the treatment and comparison groups were controlled statistically, using student, teacher, and school level control variables (see Appendix E for a description of the specific control variables).

Students' prior achievement (i.e., 2008-09 math CST scores or benchmark assessment scores depending on the variable being modeled), as well as their demographic characteristics were included in the analyses to control student-level differences that may influence students' achievement. In addition, teacher characteristics such as teaching experience and educational attainment were included to control for initial differences in teacher effectiveness. However, because teacher characteristics (i.e., experience, level of education, etc.) are often poor indicators of effectiveness (Hanushek, 1997), the inclusion of these variables may not fully control for prior differences in teacher effectiveness. Therefore, a difference-in-difference model was used to control for differences in teacher effectiveness prior to the implementation of the CaMSP program.

[5] Standardization of the assessment scores makes it possible to compare scores across grades and for regression coefficients to be interpreted as effect sizes. Variables were standardized based on the sample of students used in the analyses.

This type of model includes student achievement data from students taught by CaMSP and comparison teachers in both the treatment year (2009-10) and the previous school year (2008-09) in order to compare the difference in the CaMSP and comparison teachers' effectiveness over the two years. For each group of students, two years of achievement data are included: 2008-09 and 2009-10 data for students taught by teachers in the 2009-10 school year and 2007-08 and 2008-09 data for students taught by teachers in the 2008-09 school year. The inclusion of two years of achievement data for two cohorts of students enables the model to statistically control for differences in students' achievement prior to being taught by the CaMSP or comparison teachers as well as differences in the CaMSP and comparison teachers' effectiveness prior to participation in the CaMSP program.

The model isolates (a) the difference in the effectiveness of CaMSP and comparison teachers in 2008-09 (as represented by differences in their students' 2008-09 math scores) and (b) the difference in the effectiveness of CaMSP and comparison teachers in 2009-10. The difference between these two comparisons (i.e., the difference-in-differences) represents the change in the CaMSP teachers' effectiveness relative to the comparison group, or, in essence, the effect of the CaMSP program. A more detailed overview of the HLM model is provided in Appendix E.

In addition to examining the overall impact of the CaMSP program on the math achievement of the general population of students, the program's impact on several subgroups of students was examined. The CaMSP program emphasized the use of differentiated instruction in order to gear instruction toward the specific needs of individual students. Consequently, it was hypothesized that the CaMSP program would improve teachers' effectiveness in instructing low-performing students and those who are at risk for poor academic achievement. To examine whether the program was associated with an impact on the achievement of these "at risk" students, the HLM difference-in-difference model was rerun separately for the following subgroups of students: (a) students with disabilities, (b) minority students,[6] (c) students eligible for free or reduced price meals, (d) English learners (ELs), and (e) students who scored at the basic, below basic, and far below basic proficiency levels on the 2008-09 math CST. Because running multiple comparisons on a series of subgroups can inflate the risk of spurious statistically significant findings (Schochet, 2008; Song & Herman, 2010), the Benjamini-Hochberg adjustment was used to control the false discovery rate (Benjamini & Hochberg, 1995).

Results

Teacher and student characteristics

Overall, 43 teachers participated in the CaMSP program and an additional 46 teachers participated in the comparison group. The teachers taught grades three through Algebra

[6] For the purposes of this evaluation, students who were Black, Hispanic, and in "other" racial/ethnic groups were classified as minority; whereas White and Asian/Pacific Islander students were classified as non-minority.

Readiness; however only a very small number of CaMSP teachers (2.3%). Approximately one-third of the CaMSP teachers taught third grade (34.9%) and just under one-third taught fifth grade (27.9%). Teachers who participated in the CaMSP program, as well as those who were in the comparison group, had a wide range of teaching experience, with some teachers having only one to three years of experience and others having over 20. The majority of teachers in the CaMSP and comparison groups had a bachelor's degree plus 30 units (72.5% and 58.7%, respectively) and an approximately one-quarter of each group had at least a master's degree. There were no statistically significant differences between the CaMSP and comparison teachers on any of these characteristics (Table 2).

Table 2: Teacher Characteristics

	CaMSP (n = 43)	Comparison (n = 46)
Grade Level (%)		
3	34.9	23.9[a]
4	14.0	37.0
5	27.9	28.3
6	9.3	8.7
7	11.6	2.2
8	2.3	0.0
Years of Experience (%)		
1 – 3 years	10.0	13.0
4 – 6 years	25.0	13.0
7 – 10 years	7.5	10.9
11 -19 years	25.0	37.0
20+ years	32.5	26.1
Education Level (%)		
Bachelor's Degree	2.5	8.7
Bachelor's Plus 30 Units	72.5	58.7
Master's Degree	5.0	6.5
Master's Plus 30 Units	20.0	19.6
Doctorate	0.0	6.5

[a]Two comparison group teachers taught a combined 2nd and 3rd grade class; however, for the purposes of the evaluation, they were included as third grade teachers because 2nd grade students are excluded from the analyses due to the dearth of prior achievement data on these students.
Note: There were no statistically significant differences between the CaMSP and comparison groups

The teachers who participated in the CaMSP program taught 1,553 students in the 2009-10 school year and the comparison teachers taught 1,259 students. The characteristics of these students are displayed in Table 3. The students taught by CaMSP teachers ranged in grade from third to Algebra Readiness, with between 9% and 22% of students at each grade level. The comparison group consisted of a statistically significantly larger proportion of students in fourth and fifth grades, and a smaller proportion of students in sixth, seventh, and Algebra Readiness grades.

Table 3: Student Characteristics

	CaMSP (n = 1,553)	Comparison (n = 1,259)
Grade Level (%)		
3	16.9	16.2
4	9.1*	34.4*
5	22.0	27.4*
6	13.1*	7.2*
7	16.2*	7.6*
Algebra Readiness	22.7*	7.1*
Gender (%)		
Male	48.6	51.7
Female	51.4	48.3
Race/Ethnicity (%)		
American Indian	0.8	1.1
Asian/Pacific Islander	17.1	18.2
Hispanic	40.7	34.0*
African American	22.7	23.8
White	18.7	22.9
Language Proficiency (%)		
EL	19.1	18.3
Not EL	81.7	81.7
Family Income (%)		
Low Income	63.5	57.7
Not Low Income	36.5	42.3
Disability Status (%)		
Student without Disability	93.2	89.4
Student with Disability	6.8*	10.6*
2008-09 Proficiency Level (%)		
Advanced	21.2*	29.2*
Proficient	30.6*	23.8*
Basic	26.8	24.1
Below Basic	17.4	16.8
Far Below Basic	4.1	6.0
2008-09 CST Standardized Math Score		
Mean (SD)	0.023 (0.97)	-0.028 (1.03)
2008-09 Benchmark Assessment Standardized Score		
Mean	-0.01 (0.99)	0.01 (1.01)

* $p < .05$

The largest proportion of the students taught by CaMSP teachers were Hispanic (40.7%), followed by African American students (22.7%), White students (18.7%) and Asian students (17.1%). For the most part, the racial/ethnic make-up of the students in the comparison group was similar to that of the CaMSP group; however the comparison group had a significantly smaller proportion of Hispanic students. Approximately 20% of students in both the CaMSP and comparison groups were EL students and 60% in each group were eligible for free or reduced price meals. The comparison group consisted of a statistically significantly larger proportion of students with disabilities (10.6%) than the CaMSP group (6.8%). There were no statistically significant differences in either the average 2008-09 math CST scores or benchmark assessment scores of the students in the CaMSP and comparison groups; however a larger proportion of the students in the comparison group scored at the advanced level on the CST (29.2% vs. 21.2%) and a smaller proportion scored at the proficient level (23.8% vs. 30.6%).

Principal Interviews

To learn more about the impact of teachers' professional development and student achievement, the evaluation staff conducted 19 interviews with elementary and middle school principals between the dates of September 22 and November 19, 2009. The purpose of these interviews was to establish a baseline measure of principals' perceptions of math instruction, students' math achievement, and teacher collaboration at their school. Confidential interviews with each principal were conducted in-person or by phone and lasted 30 to 60 minutes. To insure accuracy, the interviews were audio taped with the principal's permission. Audio taping was voluntary and principals were not excluded if they choose not to be taped. Information was collected in six main areas during the interviews: (a) background information; (b) student achievement and assessment; (c) professional development, collaboration and curriculum; (d) teacher turnover; (e) family/community involvement; and (f) looking forward. Principals will be interviewed again at the end of the grant, in 2012, to examine perceived changes in these school characteristics.

Beginning in the summer of 2009, the FSUSD experienced a district reorganization resulting in four school closures and teacher and principal reassignments and layoffs. As a result, principals who were assigned to new schools were less able to provide detailed information concerning their staff, students, and school community. Most principals (95%) who were interviewed were new administrators (five or fewer years of experience as a principal) and had previous experience as a classroom teacher.

Principals' Responses Regarding Student Achievement and Assessment

Most principals reported that their main goals/focus for the school year were to (a) improve Math & ELA achievement, (b) improve CST scores, and (c) provide instructional strategies for teachers. The majority of principals (58%) reported recent improvements in math achievement at their school. Those citing improvements mentioned, among other things, stable student and teacher populations and a school focused on math achievement. Principals citing mixed or negative achievement results noted problems with teachers shifting their class assignments and teachers' having a lack of math expertise and/or classroom management skills. Many principals (63%) identified ELs as the student subgroup whose needs were most challenging to support. Principals mentioned many strategies to support students (particularly those needing extra support) which generally fell into either specific instructional strategies (e.g. use of manipulatives, homework clubs, instructional scaffolding, etc.) or organizational strategies (e.g. more teacher collaboration, more classroom observations).

Most of the principals reported using benchmark and formative assessments (84% mentioned the district-wide benchmark assessments conducted three times a year and 89% reported formative assessments used in individual classrooms), followed by summative assessments such as the California Standards Test (CST) and the UC Davis Placement Test for Pre-Algebra. Principals indicated that the benchmark assessments were used to inform instructional strategy development, which included regrouping kids, creating academic plans for struggling students and re-teaching concepts. Data are also used to target and assess students' specific academic needs.

Principals' Responses Regarding Professional Development, Collaboration, and Curriculum

Professional Development Needs

In terms of the teachers' most pressing professional development needs in math, 68% of principals asserted that teachers required additional instructional strategies. One principal stated, "They [teachers] need to prioritize important points of each chapter and make sure it's conveyed clearly. We need to make sure the teachers understand the math they're teaching and its application and also see the context of their math instruction - how it lays the groundwork for the next level of instruction."

Collaboration

Most principals (68%) reported that teachers have regular collaborative time to share teaching strategies and assessment data. When asked what evidence they use to assess the effectiveness of the collaborative meetings, over half of the principals stated that they utilized observations, student data, and feedback from teachers (verbal or written reports submitted following the collaborative meetings) as evidence. Some principals indicated that they used a standardized rubric while conducting classroom walk-throughs. Also, principals asserted that they observed the extent to which students were engaged in the lesson and the instructional practices utilized by teachers during classroom observations.

Curriculum

All principals indicated that teachers utilized the newly adopted math curriculum. However, principals reported mixed opinions about the effectiveness of the curriculum and pacing guide. Finally, a little more than half of the principals were not sure which or how many of their teachers had completed SB 472 training (the required curriculum based professional development).

Assessing Teachers Content Knowledge

Sixty-three percent of principals reported conducting weekly classroom observations as a way to assess teachers' content knowledge. Principals also cited using student data (progress reports, report cards, CST results), grade level plans, and student/parent as well as teacher feedback as ways of assessing their teachers' professional development needs in math instruction. Again, the variety of responses were difficult to summarize as each principal had his/her own sense of what assessment of content knowledge means in their local context. Finally, all principals reported conducting informal classroom observations, in general (not specifically as teacher assessment tools), with 84% percent of principals reported visiting classrooms at least once a week.

Principals' Responses Regarding Teacher Turnover, Family/Community Involvement, and Looking Forward

Most principals reported a stable teacher staff or fairly low teacher turnover. A little more than half reported specific activities to engage families in their students' math activities and most reported frequent feedback to families about their students' performance. Finally, principals were cautiously optimistic about their schools' ability to continually improve student math performance and provide the tools and support that their teachers needed.

Summary of Principal Interview Results

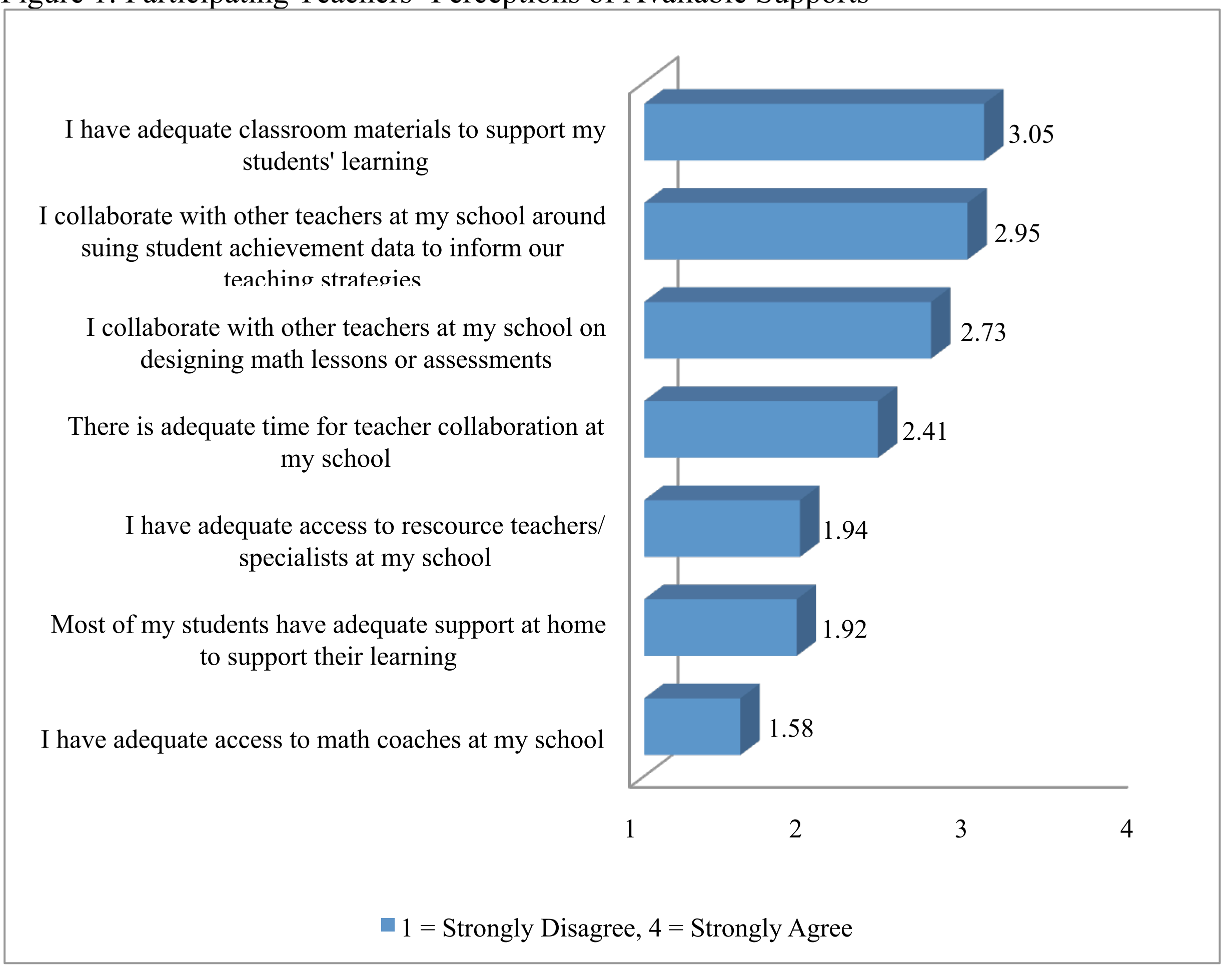
Overall, principals were focused on improving student achievement in Math and ELA, improving CST scores, and providing instructional strategies to teachers. Over half of the principals reported recent increases in CST math scores. Despite economic conditions culminating in four school closures, layoffs, and reorganization in the district, principals remained cautiously optimistic that honed instructional strategies, including a concerted effort to provide consistent professional development in math, could improve district math performance. Principals were becoming more aware of the professional development needs of their staff and the importance of new staff appropriately integrating available resources and tools into math instruction at their site. A majority of principals agreed that EL students were the most difficult subgroup to support. However, principals reported success utilizing existing instructional and organizational strategies as well as exploring new techniques as a means of improving math instruction and test scores. Principals uniformly cited conducting weekly classroom observations and many mentioned this as a way to assess teachers' content knowledge. This finding suggests that principals understand the importance of supervising the instructional process and developing as strong instructional leaders. In addition, all principals reported providing strategies or activities to parents to assist their child's math concepts mastery outside the classroom. Finally, the principals seemed dedicated to creating school communities that support students' academic needs and promote teacher professionalism and expertise.

Teacher Surveys

Teacher Perceptions of Support at Program Start

Within the initial survey (referred herein as the "pre") teachers were asked to rate their level of agreement about various areas of support available to both themselves and their students. Teachers indicated that they felt they had adequate access to materials as well as collaborative relationships to support student learning (Figure 1). However, low levels of support were reported in the areas of teacher access to coaches and resource teachers/specialists. Additionally, teachers indicated that they felt their students had relatively low levels support, with regard to math, at home.

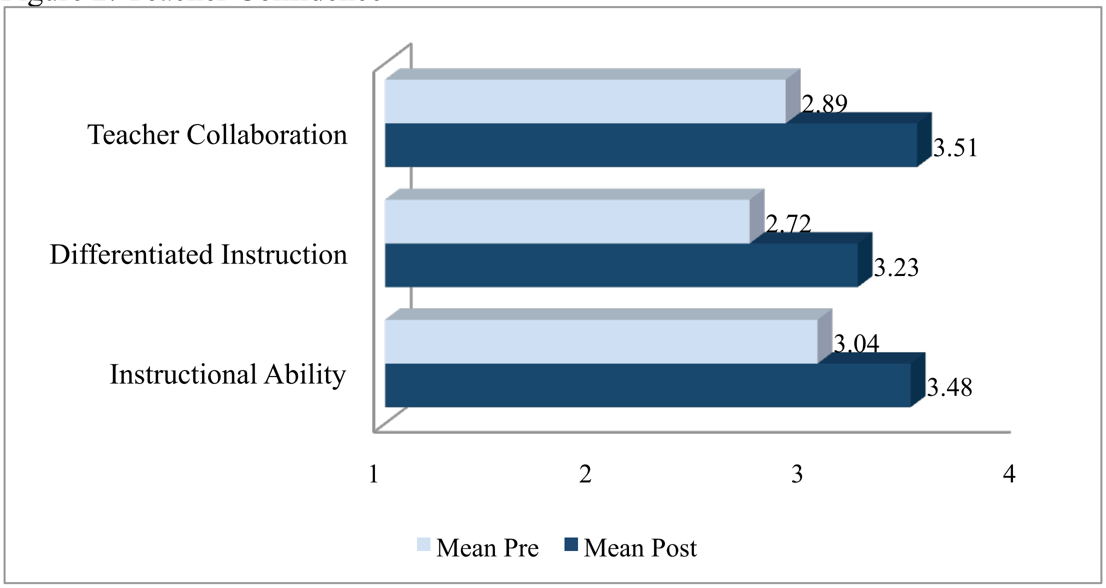
Figure 1: Participating Teachers' Perceptions of Available Supports



Teacher Confidence

Initial analyses of the teacher surveys revealed statistically significant increases in teacher confidence across all survey items between the pre and post survey administrations (see Appendix A). However, to improve the validity of the results, survey items were grouped into constructs. As shown in Figure **2**, teachers showed statistically significant gains in confidence within all three constructs: teacher collaboration (mean difference = 0.62), differentiated instruction (mean difference = 0.51,), and instructional ability (mean difference = 0.44). The most growth was seen in the area of teacher collaboration which included items such as (a) "Collaborate with other teachers to design math lessons/assessments," (b) "Collaborate with other teachers to develop teaching strategies," and (c) "Collaborate with other teachers to understand student work and test results to inform our teaching strategies."

Figure 2: Teacher Confidence



In addition to examining the differences in the mean ratings at pre and post, effect sizes were calculated for each construct. An effect size is a standardized measure of strength or magnitude of a relationship, in this case representing the magnitude of teachers' growth from pre to post on each construct in standard deviation units. The advantage of calculating an effect size instead of just the raw mean difference is that effect sizes take into account the scale of the measure as well as the variability. Therefore, the magnitude of effect sizes can be more accurately compared across different measures and there are commonly accepted criteria for evaluating the magnitude of standardized effect sizes (Cohen, 1988).

All three constructs were associated with large effect sizes (Table 4). Most notably, the improvement in teachers' confidence in differentiated instruction was associated with an effect size of 1.16, which is considered very large. This construct included items such as (a)"Use a variety of strategies to demonstrate math concepts," (b) "Tailor my teaching to individual students' needs," and (c) "Use a variety of strategies to encourage my students' deeper understanding of math concepts." This finding is particularly important as one of the major focuses of the CaMSP program was differentiated instruction.

Table 4: Teacher Confidence

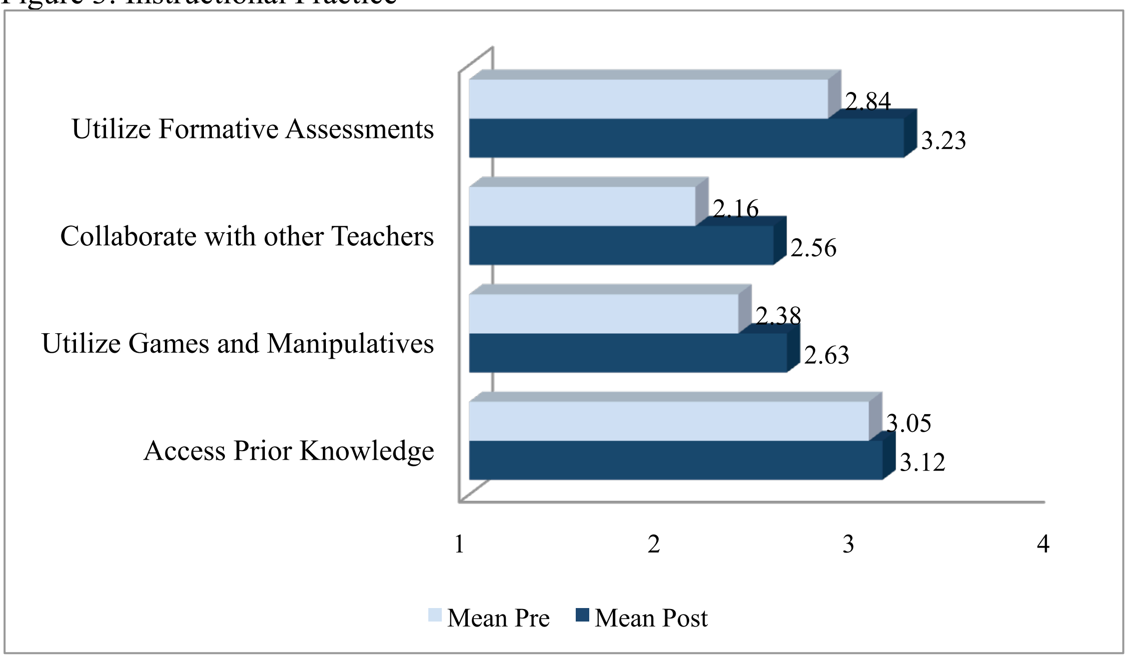
	Mean Difference	Effect Size
Differentiated Instruction	0.51*	1.16
Teacher Collaboration	0.62*	0.83
Instructional Ability	0.44*	0.80

* Statistically significant $p < .05$

Teacher Instructional Practice

Fewer statistically significant results were found when all survey items related to teacher instructional practices were analyzed (see Appendix A). Constructs were again created and paired sample t-tests were run to determine statistically significant differences between pre and post surveys for each construct. Statistically significant differences were seen in the areas of the utilization of games and manipulatives, collaboration with other teachers, and the utilization of formative assessments (Figure 3).

Figure 3: Instructional Practice



Effect sizes were calculated for each of the three construct that were associated with statistically significant differences. The effect sizes for these constructs ranged from 0.44 to 0.70, all of which are considered to be moderate effect sizes (Table 5). Utilizing formative assessments (e.g. “Check in with individual students to evaluate their understanding of the lesson” and “Do formative assessments mid unit to check students’ progress”) and collaboration (e.g. “Ask other teachers to review and comment on your lessons or activities” and “Ask other teachers to help you develop strategies to present math materials in different ways” both showed the largest average gains, with the changes related to formative assessments having the largest effect size.

Table 5: Instructional Practice

	Mean Difference	Effect Size
Utilize Formative Assessments	0.4*	0.70
Collaborate with other Teachers	0.4*	0.54
Utilize Games and Manipulatives	0.25*	0.44
Access Prior Knowledge	0.1	-

* Statistically significant $p < .05$

Teacher Perceptions of CaMSP Program

Participating teachers were asked to rate the importance of various training goals in the initial survey (pre) and then in the spring survey (post) they were asked to rate whether or not they felt that these goals had been met (Table 6). On the pre survey, teachers indicated their most important training goal to be learning effective teaching strategies (mean = 3.9) and at post teachers reported relatively high levels of agreement (mean = 3.4) with the statement "I learned new effective teaching strategies this year." On the post survey, teachers also reported establishing new collaborative relationships (mean = 3.6) and gaining a better understanding of math standards (mean = 3.4).

Table 6: Participating Teachers' Training Goals and Learning Outcomes

Participating Teacher Survey Pre		**Participating Teacher Survey Post**	
How important are each of the following training goals to you *Scale: 1 = Least important, 4 = Most important*	**Mean**	**How much do you agree or disagree with each of the following items** *Scale: 1 = Strongly disagree, 4 = Strongly Agree*	**Mean**
Enhance my math content knowledge	3.5	I enhanced my math content knowledge significantly this year	3.2
Learn effective teaching strategies	3.9	I learned new effective teaching strategies this year	3.4
Develop new assessment approaches	3.4	I developed new assessment approaches this year	2.9
Make contacts for future collaboration	3.2	I established new collaborative relationships with other teachers this year	3.6
Gain a better understanding of math standards	3.2	I gained a better understanding of math standards this year	3.3

The post survey asked to teachers to indicate their level of agreement to various statements in the areas of collaboration, teaching practice, and knowledge gains. Overall, teachers indicated high levels of agreement across all areas (

Figure 4). The highest rated areas were in the areas of collaboration, specifically establishing new collaborative relationships and collaborating with teachers from other schools. Additionally, CaMSP participant teachers reported high levels of agreement in their ability to teach math concepts and felt they had learned new and effective teaching strategies.

Figure 4: Post Test - How much do you agree or disagree with each of the following?

Additionally, on the post survey teachers were asked to respond to a series of open-ended questions that addressed what they gained from the CaMSP program and what changes to instructional practice were made as a result of the program. Consistent themes emerged when reviewing the answers to the open ended questions and answers were coded based on these themes.

When asked to report the single most useful skill they gained from the CaMSP program the results of the analysis revealed that the most common teacher response was the use of powerful questions and questioning strategies, which was a major focus of the CaMSP program. Powerful questioning was followed by developing students' conceptual learning and knowledge and collaborating with other teachers and colleagues, again, two important components of the professional development provided.

Table 7: What is the single most useful skill you gained during your participation in CaMSP?

	Percentage of Responses (n = 31)
Powerful questions/questioning strategies	29.0%
Developing students conceptual learning/knowledge	25.8%
Collaborating with teachers/colleagues - including lesson planning/development	22.6%
Model drawing and strategies (e.g. Singapore math)	19.3%
Using manipulatives to enhance student learning	12.9%
Multiple representations	9.7%

In addition, teachers were asked to report how they changed their math approach to impact student achievement. To this question the most frequent response was the utilization of instructional math strategies including Singapore math strategies, multiple representations, and games (Table 8).

Table 8: What is the single most powerful change you made in your math teaching approach this year, in terms of its impact on your students' understanding and achievement in math?

	Percentage of Responses (n = 30)
Instructional math strategies (e.g. Singapore math strategies, multiple representations, games)	36.7%
Utilizing powerful questions	26.7%
Using manipulatives	26.7%
Focusing on students conceptual learning/knowledge	20.0%
Adjusting the pace of the lesson and/or introduction of information	16.7%
Providing opportunities for student to problem solve/explain reasoning	6.7%

Finally, teachers were asked to report on the strategies they utilized to engage student learning. The most common response to this question was the utilization of powerful questions or questioning strategies, followed by the use of manipulatives (Table 9).

Table 9: Reflection on the skills/knowledge you gained this year, what strategies have you used to engage your students in learning math?

	Percentage of Responses (n = 29)
Powerful questions/questioning strategies	37.9%
Using manipulatives	27.6%
Allowing students' to dialogue/discuss math concepts/skills	24.1%
Multiple representations	20.7%
Model drawing and strategies (e.g. Singapore math)	17.2%
Lesson planning	13.8%
Math games (e.g. Survivor)	10.3%
Focusing on students conceptual learning/knowledge of math	10.3%
Technology - smartboards, geoboards	10.3%

Across all three open-ended questions, it is apparent that teachers appeared to find value in and apply several of the teaching strategies addressed in the CaMSP program. Powerful questions, the use of the manipulatives, model drawing and strategies, and developing students' conceptual learning were dominant themes that emerged in all three open ended questions. All of these areas were a heavy focus of the professional development provided by the CaMSP program.

Participant vs. Comparison Teachers

One-way ANOVA was used to compare the CaMSP teachers' pre and post survey responses to the comparison groups' responses to the survey administered to them in the spring of 2010. Without data from a pre survey of comparison teachers, administered during Fall 2009 as it was with the participating teachers, it is not possible to determine if the two groups of teachers were similar prior to participation in the CaMSP program or if the teachers in the CaMSP group showed more growth than did comparison teachers over the course of this first year. However, the analyses revealed fewer statistically significant differences in survey item ratings between comparison teachers and participant teachers at post than at pre, indicating that the two groups of teachers were similar in the spring of 2010 (see Appendix F for full results). One explanation for this finding is the fact that district-wide professional development was offered in the area of algebraic thinking for all teachers in grades three through five, during this school year, so many of the comparison teachers also received similar, if less intensive, mathematics professional development.

Statistically significant differences between comparison teachers and participant teachers at post were found in only three survey items (Table 10). Participant teachers reported higher levels of confidence in collaborating with other teachers to design lessons and assessments and reported using manipulatives and other aids more often than did comparison teachers. Conversely, participant teachers reported using lecture and demonstrating problems or concepts to the whole class less frequently than did comparison teachers.

Table 10: Participant vs. Comparison teachers' significant differences at post

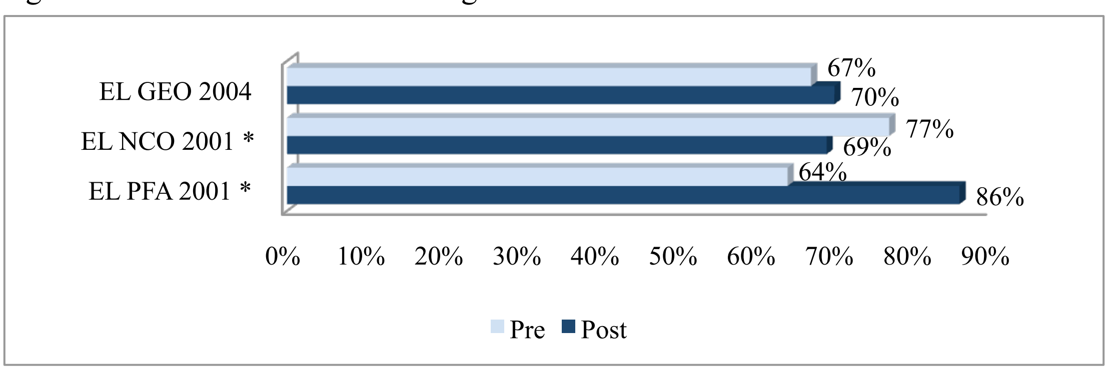
	Participant Mean	Comparison Mean	Mean Difference
Teacher Confidence			
Collaborate with other teachers to design math lessons/assessments	3.59	3.05	.54
Teaching Practice			
Lecture and demonstrate problems or concepts to the whole class	2.83	3.34	-.51
Use manipulatives or other aids	2.86	2.47	.39

Teacher Content Knowledge

Positive statistically significant results were found on the Patterns, Functions, and Algebra (EL PFA 2001) sub test of the LMT with participating teachers showing an average gain of 22 percentage points from pre to post test (Figure 5). However, statistically significant negative results were found on the Number Concepts and Operations (EL NCO 2001) sub test. There was no statistically significant difference in the pre and post test scores on the Geometry (EL GEO 2004) sub test.

The focus of year one professional development was on whole number sense as well as algebraic thinking, both of which were addressed in the Patterns, Functions, and Algebra subtest. Therefore, gains from this test are most representative of the impact of year one of the CaMSP program. The content addressed in the Geometry subtest as well as the Number Concepts and Operations subtest will be presented in years two and three respectively and, therefore it is anticipated that gains will be seen in these areas as the program progresses. The decrease in the percentage of items correct at post for the EL NCO 2001 subtest is not surprising as the professional development provider reports that, after a detailed item by item analysis, it was found that the B version of this subtest was not truly equivalent to the A version of the subtest administered at pre, with the B version being both more difficult and longer than the A version.

Figure 5: Teacher Content Knowledge



* Statistically significant ($p < .05$)

Teacher Reflections

Results of the written reflections completed by teachers at the end of each of the Saturday Intensives and Follow-Up Workshops, suggest that teachers were satisfied with the professional development activities provided by the UC Davis Math Project and Math professors within the CaMSP program. Among the four Saturday Intensives that the teachers attended, participants identified several topics that they found useful. Participants learned division strategies that included techniques to help students guess and check, and to perform repeated subtraction, forgiving division and relational multiplication. Similarly, teachers reported that the model drawing strategies (e.g. Singapore Math), which included techniques for working with bar graphs, word problems, and model representations were useful. Participants frequently mentioned that along with the strategies and games (Math Survivor), time to collaborate where teachers could share ideas and lessons was most beneficial. Overall, participants reported an appreciation for the opportunity to interact with their colleagues and learn/gain new strategies and resources from both the UC Davis Math Project and Math professors.

In addition to the Summer Institute and the Saturday Intensives, teachers were engaged in Classroom Connection Follow-Up Workshops. These Follow-Up workshops were tied to the Summer Institute and Saturday Intensives and provided teachers an opportunity to apply their newly acquired professional development skills to their classroom instruction. The Follow-Up Workshops encompassed three major themes: Multiple Representations, Powerful Questions and Closure. Teachers were also provided time to collaboratively plan lessons and reflect on the teaching of those lessons during workshop time. Again, participants overwhelmingly reported that the collaboration time was most useful. Teachers continually expressed their satisfaction with being able to use their collaboration time to work with their peers, to plan, review and discuss lessons, to share ideas, to reflect on their practice and to problem solve current issues. Teachers also reported the following activities as useful and/or "Ah Ha" moments: (a) lesson planning activities, (b) using powerful questions, (c) closure activities, (d) Smart Board software for Geometry, (e) using model drawing strategies (e.g. Singapore Math), (f) the Academic Language Quad Chart, and (g) aligning standards to the book and pacing guides. Overall, teachers reported gaining strategies and techniques that could be applied to math instruction in their classes. Finally, participants almost always expressed the desire for more planning time.

As previously mentioned, teachers were engaged in lesson planning and development during the Follow-Up Workshops. After teachers had taught the lesson in their classrooms, they were given an opportunity to reflect on the strengths, weaknesses and areas for revision. When teachers were asked to reflect on the use of multiple representations and powerful questions within their lesson, teachers reported high student engagement and their students' ability to connect the math concepts to real life situations. Teachers also cited using a variety of manipulatives during their lesson (e.g., tiles, arrays, patterns, blocks) and pictorial representations to build students' conceptual learning. When asked what questions were most powerful, teachers reported two types of questions: (a) questions that allowed students to demonstrate their understanding of the concepts (e.g. In what ways is multiplication connected to addition?) and (b) questions that allowed students to apply math concepts to real life situations (e.g. Orchard Supply Hardware gives a "no sales tax" weekend. Would a "no sales tax" purchase or would a 10% coupon be a better use of your money?). Teachers also reported that asking students, "Is your answer reasonable?" was not as powerful a question as they had thought. This is due in part because students required more instruction to understand and be able to determine if an answer was correct or reasonable. Finally, in terms of changes that could be made to the lessons, participants suggested the following: (a) providing more time and practice to help students better understand the concept, (b) spreading the lesson over more days, and (c) changing the sequence of concepts/items presented.

Overall, reflections documented that participants valued their participation in the program. More importantly, teachers appreciated the opportunity to collaborate with their colleagues as a means of lesson planning, sharing ideas, seeking assistance and problem-solving. The professional development activities also helped teachers gain strategies and techniques to enable their students to gain a greater conceptual understanding of math. As one teacher stated,

> The best thing that I get back from the grant was leaning how to ask my students questions to develop a deeper understanding of math. I have learned how to let the students discover the learning versus me lecturing them and teaching them what to do. Although it is still a work in progress, my students are experiencing math & discovering it.

Student Surveys

Initially, all items within the student survey were analyzed using independent samples t-tests (see Appendix C). Very little movement was seen from pre to post with regard to students' level of agreement. In order to improve the validity of the results, constructs were developed representing student perception of teacher ability, student learning style, student confidence, and student attitude (Figure 6). Independent samples t-tests indicate that there were only statistically significant differences on two of these constructs: perception of teacher ability and student attitudes. Students reported a statistically significant decrease in their perception of teacher ability as well as a statistically significant decrease in student attitudes around math. Although statistically significant, these decreases were minimal, -.085 and -.064 respectively. Effect sizes were calculated for each of these constructs and were also found to be minimal (Table 11).

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Figure 6: Student Survey Constructs

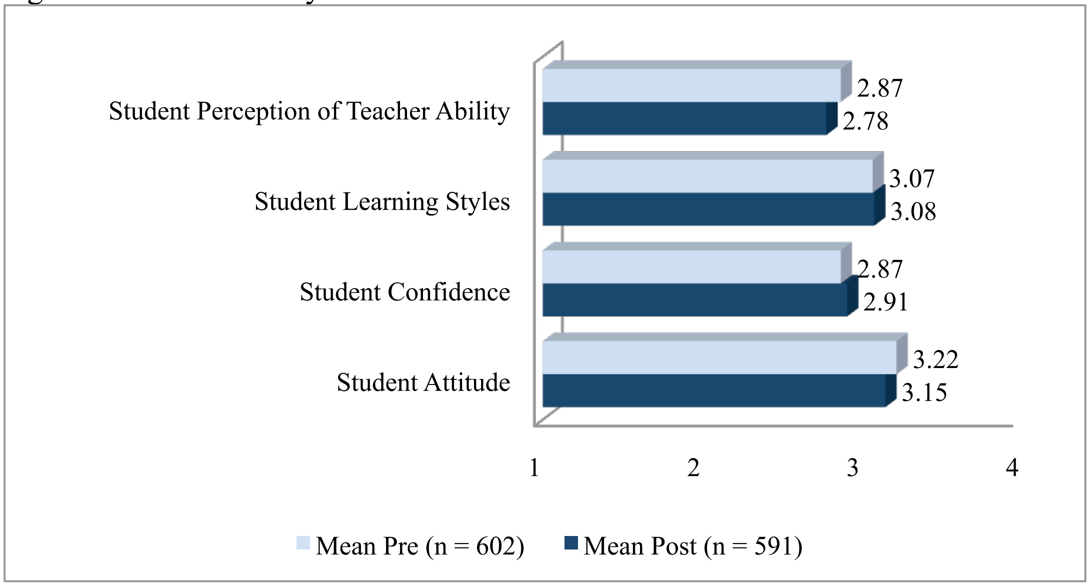


Table 11: Student Survey Constructs Effect Sizes

	Mean Difference	Effect Size
Student Perception of Teacher Ability	-.085*	-0.4
Student Attitudes	-.064*	-0.2
Student Learning Styles	.037	-
Student Confidence	.008	-

* Statistically significant $p < .05$

Several factors may influence the lack of meaningful statistically significant differences in survey results from pre to post for students of CaMSP teachers. Student surveys were administered two months into the school year, therefore it is possible that the pre survey results are biased by teachers already having an impact on their students' attitudes toward math. Another biasing factor could be the fact that the post survey was administered shortly after the administration of the CSTs in May. The evaluators have obtained anecdotal data suggesting that, due to the high stakes nature of the CST, the test preparation that is taught prior to the administration of the CST may have had a negative impact on students' responses. Additional biasing factors include the fact that students were generally positive about their teachers and math, especially at the beginning of the year, creating a "ceiling" effect and that there may have been changes in the classroom composition (e.g. student mobility) from pre to post. Additionally, general fatigue at the end of the year may have depressed student ratings in post-administrations. Efforts will be made in Year 2 of the evaluation to account for the mobility of students and the timing of survey administrations.

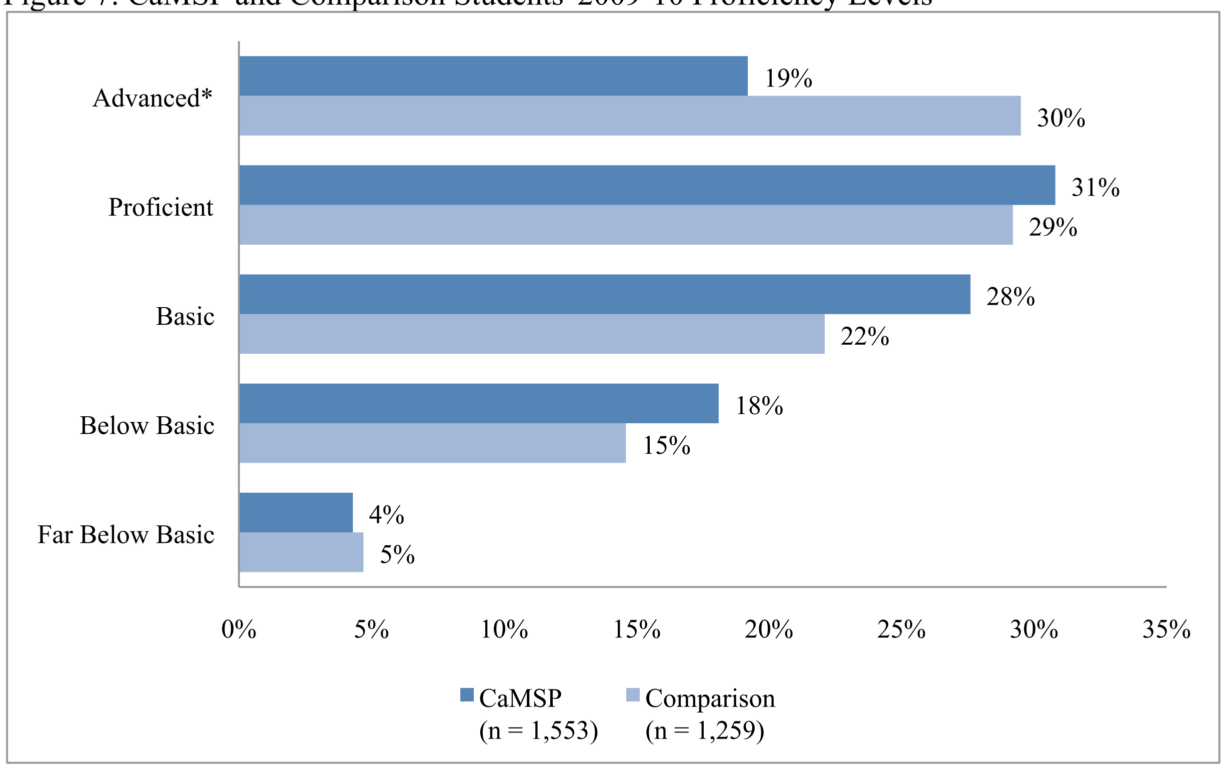
The Impact of CaMSP on Students' Math Achievement

Math CST Scores

The math CST scores of students taught by teachers who participated in the CaMSP program were compared to the scores of those who were taught by teachers in the comparison group. Students taught by CaMSP teachers had a mean standardized score of -.013 on the 2009-10 CST, whereas the students taught by comparison teachers had a mean standardized score of .011. This difference was not statistically significant.[7]

In addition, students taught by CaMSP teachers were compared to students taught by comparison teachers to determine whether there were statistically significant differences in the proportions of students who were at various proficiency levels based upon their 2009-10 CST scores (Figure 7).[8] Chi-square statistics indicate that there were statistically significant differences across the two groups.[9] Most notably, 29.5% of the students taught by comparison teachers scored at the advanced level, whereas only 19.2% of the students taught by CaMSP teachers were at the advanced level.

Figure 7: CaMSP and Comparison Students' 2009-10 Proficiency Levels



* $p < .05$

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[7] Differences were tested using an independent samples t-test ($t_{2810} = -.626$, $p = .531$)

[8] The California Department of Education also assigns a performance level to student CST scores of Far Below Basic (FBB), Below Basic (BB), Basic (B), Proficient (P), and Advanced (A), with the stated goal of all students achieving at the Proficient or Advanced level.

[9] (χ^2 [4, n = 2,812] = 44.50, $p < .001$)

Although these results suggest that a larger proportion of students taught by comparison teachers were at the advanced level, this difference cannot necessarily be attributed to the CaMSP program because the analyses do not take into account other variables known to have an impact on student achievement (e.g., prior achievement, language proficiency, disability, SES, etc.). Furthermore, the analyses do not take into account the teachers' effectiveness prior to the CaMSP program. In order to isolate the impact of the CaMSP program, HLM was used to control for the effects of student, teacher, and school characteristics. The results of this analysis are displayed in Table 12 below.

Table 12: HLM Analyses Examining the Impact of CaMSP

	Coefficient
School Level Variables	
Intercept	-0.003
% Proficient in 08-09	0.012*
% Eligible for Free/Reduced Meals	0.010
% Minority	-0.003
% EL	-0.002
Small	-0.031
Large	0.056
Teacher Level Variables	
CaMSP	-0.055
7+ Years Experience	-0.182**
Grade Taught (6th or Higher)	0.123
Graduate Degree	0.102
Student Level Variables	
Year	
Intercept	0.025
Year x CaMSP[a]	0.105^{+}
SWD	-0.153***
Male	-0.018
Free/Reduced Price Meals	-0.086***
EL	-0.055*
Minority	-0.110***
Prior Achievement	0.716***

$^{+}$ $p < .1$; * $p < .05$; ** $p < .01$; *** $p < .001$

[a]The Year x CaMSP coefficient represents the impact of the CaMSP program

Note: The dependent variable, math CST score, was standardized by grade and year, therefore the coefficients can be interpreted as effect sizes. The coefficients can be interpreted as the effect of that particular variable on students' CST scores, controlling for the other variables in the model. For example, the statistically significant coefficient for 7+ years of experience indicates that on average, students taught by teachers with seven or more years of teaching experience scored 0.182 standard deviations lower than students taught by teachers with less than seven years of experience, holding all else constant.

Results of the HLM analysis indicate that the CaMSP program had a marginally statistically significant effect on students' math CST scores.[10] The program was associated with a small effect size of 0.11, indicating that students taught by teachers who participated in the CaMSP program scored an average of 0.11 standard deviations higher than students taught by comparison teachers. Because scores were standardized based on the year and grade level, the magnitude of this effect in terms of CST scale scores varies slightly by grade level, but in general the CaMSP program was associated with an increase of between 6.0 and 9.6 scale score points, depending on the grade level of the students, for students of CaMSP teachers. Table 13 shows the effect size of 0.11 standard deviations in terms of scale score points by grade level.

Table 13: The CaMSP Effect Size (0.11 Standard Deviations) in Scale Score Points by Grade Level

Grade Level	Increase in Scale Score Points Associated with the CaMSP Program
3	9.6
4	8.5
5	8.8
6	8.1
7	6.0
8	6.9

Although this finding provides suggestive evidence that the CaMSP program may be effective, it is important to note that, because the effect was only marginally statistically significant, this evidence is extremely preliminary. Future reports on the second and third years of implementation will provide further insight into the effectiveness of the CaMSP program by coupling these findings with the evaluations of the second and third years of the program.

Subgroup Effects

Because the CaMSP program emphasized differentiated instruction, it was hypothesized that the most profound effects of the program may be on students in groups who are at-risk for poor academic achievement, including students with disabilities, minority students, students eligible for free or reduced price meals, EL students, and students who were scored below proficiency on the 2008-09 math CSTs (Basic, Below Basic, and Far Below Basic). To determine whether this was the case, separate HLM models were run on each of these subgroups of students. The results of the subgroup analyses are displayed in Table **14**. Results indicate that the CaMSP program had a positive impact on the math CST scores of students with disabilities,[11] with an effect size of 0.43. The results of the other subgroup analyses indicate that the CaMSP program did not have a statistically significant impact on the achievement of minority students, students who

[10] $t_{1.75,}$ $p = .08$
[11] $t_{80} = 3.09$, $p = .002$

were not proficient in math the prior year, students eligible for free or reduced price meals, or EL students.

Table 14: Subgroup Effect Sizes

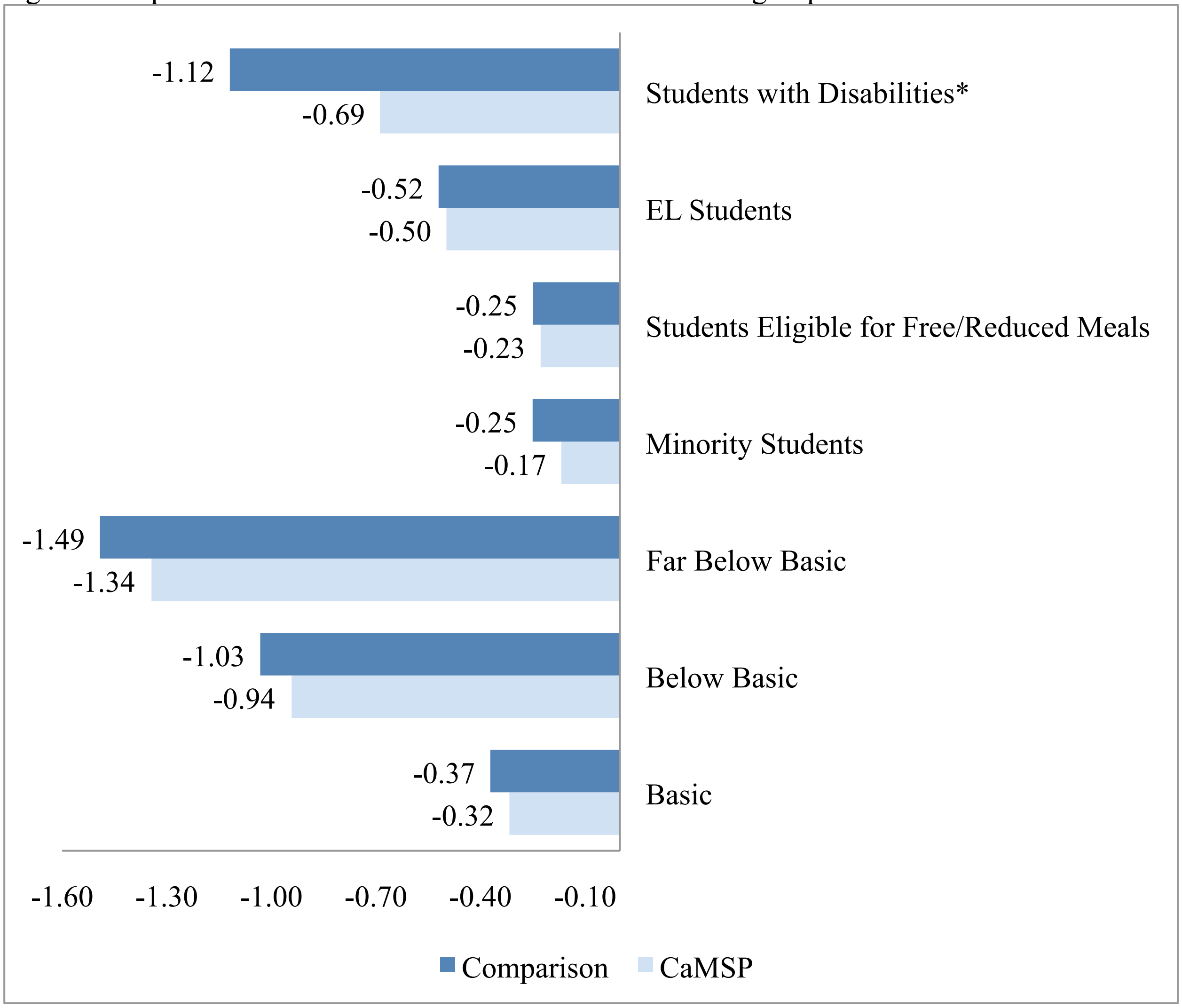
Subgroup	Effect Size
Students with Disabilities	0.43*
Minority Students	0.08
Students eligible for Free/Reduced Meals	0.02
ELLs	0.02
Students who Scored Below Proficiency in 2008-09	
Basic	0.05
Below Basic	0.09
Far Below Basic	0.15

* Effect size is statistically significant ($p < .05$) after applying the Benjamini-Hochberg adjustment

Figure 8 below provides the adjusted mean CST scores of students taught by CaMSP and comparison teachers, illustrating the impact of the CaMSP program on these at-risk subgroups. When interpreting the figure, it is important to note that the CST scores were standardized to have a mean of zero and a standard deviation of one. Therefore, negative mean scores indicate that the group of students scored below the average of the overall sample of students, whereas a positive score would indicate that the group of students scored better than the overall average. The mean score for each of these subgroups, regardless of whether they were in the CaMSP or comparison group, is negative, indicating that the students' achievement was below average. On average, the students in each of these subgroups scored between 0.15 and 1.05 standard deviations below the average for the overall sample of students.

As seen in the figure, students with disabilities who were taught by CaMSP teachers scored an average of 0.62 standard deviations below the overall mean, whereas students with disabilities who were taught by comparison teachers scored an average of 1.05 standard deviations below the mean, a statistically significant effect of 0.43. This positive effect suggests that the CaMSP program is associated with improvements in the math CST scores of students with disabilities, boosting their achievement almost half of a standard deviation closer to the overall mean. In terms of CST scale score points, this effect size indicates that, among students with disabilities, the CaMSP program was associated with an average increase of between 23.6 and 37.5 scale score points, depending on the grade level of the student. Although there were small differences between the average achievement of the CaMSP and comparison students in the remaining subgroups, with the CaMSP students having slightly higher scores, these differences were not statistically significant.

Figure 8: Impact of CaMSP on math CST scores of at-risk subgroups



* Difference between CaMSP and comparison group is statistically significant ($p < .05$)
Note: The scores were standardized to have a mean of zero and standard deviation of one. Therefore, subgroup scores indicated how far the students within the subgroup were from average score of the general population of student. The negative scores in this graph indicate that the student in the subgroups scored below average. Scores closer to zero indicate that the subgroup's achievement is closer to average whereas scores further from zero indicate that the subgroup's achievement is further from average.

District Benchmark Assessment Scores

To provide further insight into the impact of the CaMSP program on students' math achievement, students' district benchmark math assessment scores were examined. At the end of the 2009-10 school year, there was no statistically significant difference in the benchmark assessment scores of the students taught by CaMSP teachers and those taught by comparison teachers.[12] Although these results indicate that CaMSP and comparison students had similar math achievement at the end of the 2009-10 year, this analysis does not take into account

[12] Differences were tested using an independent samples t-test ($t_{2228} = 0.295$, $p = .768$)

students' prior achievement, teachers' effectiveness prior to participation in the CaMSP program, and other variables known to affect student achievement. Therefore, a difference-in-difference HLM model was used to examine the impact of the CaMSP program controlling for these confounding variables.

The results of the HLM analysis indicate that, after controlling for student, teacher, and school variables, the CaMSP program was associated with a statistically significant positive impact on students' math benchmark assessments (Table 15); however this effect was small (effect size = 0.15). This effect indicates that, on average, the CaMSP program was associated with a 0.15 standard deviation increase in students' benchmark assessment scores. Because students' benchmark assessment scores were standardized by grade level and year, the magnitude of this effect size in terms of the actual percentage correct on the benchmark assessments varies by grade level; however the variation is minimal. In general, the CaMSP program was associated with a 2 to 3 percentage point increase in students' benchmark assessment scores.

Table 15: HLM Analysis Examining the Impact of CaMSP on Benchmark Assessments

Fixed Effect	Coefficient
School Level Variables	
Intercept	0.03
% Proficient in 08-09	0.00
% Eligible for Free/Reduced Meals	0.01
% Minority	-0.01
% EL	0.00
Small School	-0.04
Large School	-0.08
Teacher Level Variables	
CaMSP	-0.05
7+ Years Experience	-0.16*
Grade Taught (6th or Higher)	0.13
Graduate Degree	0.06
Student Level Variables	
Year	
Intercept	0.02
Year x CaMSP	0.15*
SWD	-0.17***
Male	-0.03
Free/Reduced Price Meals	-0.08***
EL	-0.02
Minority	-0.12***
Prior Achievement	0.72***

* $p < .05$; ** $p < .01$; *** $p < .001$
[a]The Year x CaMSP coefficient represents the impact of the CaMSP program
Note: The dependent variable, math benchmark assessment scores, was standardized by grade and year; therefore the coefficients can be interpreted as effect sizes.

Subgroup Effects

As with the CST scores, HLM was used to examine the impact of the CaMSP program on the benchmark assessment scores of subgroups of students including students with disabilities, minority students, students eligible for free or reduced price meals, EL students, and students who were not proficient in math in the previous year (Far Below Basic, Below Basic, and Basic). Although, within each subgroup, students whose teachers participated in the CaMSP program tended to score higher than those taught by comparison teachers, these effects were not statistically significant for any of the subgroups with the exception of students who scored at the Below Basic level in 2008-09.[13] Among students who scored at the Below Basic level in 2008-09, students taught by CaMSP teachers scored an average of 0.34 standard deviations (5-6 percentage points) higher on the district benchmark assessments than students taught by teachers in the comparison group.

Subgroup	Effect Size
Students with Disabilities	0.36
Minority Students	0.14
Students eligible for Free/Reduced Meals	0.10
ELs	0.19
Students who Scored Below Proficiency in 2008-09	
Basic	0.05
Below Basic	0.34*
Far Below Basic	0.09

* Effect size is statistically significant ($p < .05$) after applying the Benjamini-Hochberg adjustment

Conclusions and Discussion

The findings from this evaluation suggest that, after only one year of implementation of the CaMSP program, effects of the program are beginning to emerge. The triangulation of data from various sources, including surveys, reflections, and assessments suggest that program is associated with positive, albeit sometimes small impacts on participating teachers and their students.

Impact on Teachers

Participating teachers report that the program has improved their confidence in collaborating with other teachers and that through the program, they have developed new, collaborative relationships with other teachers from throughout the district. Correspondingly, teachers reported collaborating with other teachers more frequently after completing the first year of the program. Increasing collaboration among teachers was a goal of the program and an important aspect of promoting teachers' development.

[13] Prior to the Benjamini-Hochberg adjustment, results indicate that the CaMSP program was associated with a positive impact on students who were not proficient on the math CSTs the prior year ($p = .044$) and on students with disabilities ($p = .047$). However, due to the multiple comparisons, using an unadjusted alpha-level of .05 inflates the risk of a false-positive finding.

An additional goal of the program was to improve teacher knowledge and use of various teaching strategies in order to increase their ability to differentiate instructions to meet the needs of individual learners. Preliminary evidence suggests that the program is associated with an increase in teachers' knowledge and use of a variety of teaching strategies. Teachers reported improvements in several aspects of their instructional practice and pedagogy including increasing their use of games and manipulatives, powerful questioning strategies, and the use of various math strategies such as Singapore math.

Finally, the CaMSP program was designed to enhance teachers' mathematical knowledge and deepen their understanding of the concepts they teach. Data from several sources suggest that, thus far, this aspect of the program has been successful. In reflections and surveys, teachers reported gaining understanding of the math standards and content knowledge. Furthermore, this self-report of enhanced content knowledge is supported by the results of the LMT. On this assessment, teachers showed improvements on the Patterns, Functions, and Algebra subtest, the subtest which most closely aligns with the focus of the first year of the CaMSP program.

In contrast to the positive findings from teacher surveys and reflections, data from the student surveys suggest that students' perceptions of their teachers' ability declined slightly over the course of the school year. However, this finding is likely due to the timing of the administration of the survey. The post survey was given to students shortly after the administration of the CSTs. Anecdotal data suggests that, due to the high stakes nature of the assessment, the focus of instruction shifted prior to the CSTs, with a stronger focus on test preparation, which in turn may have biased students' perceptions of their teachers and attitudes about math.

Despite the positive effects found in this evaluation, caution is warranted when interpreting these findings and attributing the effects to the CaMSP program. Many of the analyses included in this evaluation utilized a correlational design, without a control or comparison group. As discussed in the report, complete data on the comparison group of teachers, including follow-up survey data and LMT scores is not yet available. Consequently, the analysis of the teacher data utilizes a pre-post design without a comparison group. Therefore, the growth and changes in teachers' instructional strategies, pedagogy, collaboration, and content knowledge that were identified cannot necessarily be attributed to the CaMSP program rather than to natural growth over the course of the school year or to some other program. During the 2009-10 school year, an additional district-wide professional development was available to teachers, making it difficult to isolate the effect of the CaMSP program versus the other program. Analysis of further data on the second year of implementation of the CaMSP program as well as data on the comparison group of teachers will help tease apart the effects of these two programs.

Impact on Students

Although the improvements in teachers' instructional practice, pedagogy, and content knowledge are promising, the overarching goal of the program is that these improvements in teachers' effectiveness will translate into improvements in students' math achievement. This evaluation found suggestive evidence that the CaMSP program is associated with improvements in student achievement, both in terms of CST scores and district benchmark assessments. Controlling for other variables, the program was associated with an improvement of approximately six to ten scale score points on the CST and an improvement of two to three percentage points on the benchmark assessments. Although both these effects are relatively small, it is important to note that the program has only been in effect for one year and on average, teachers have only received 85.5 hours of professional development. Research suggests that the duration of a professional development program is positively associated with the impact of program (Garet, Porter, Desimone, Birman, & Yoon, 2001), therefore, it is likely that larger effects may observed after the second and third years of implementation.

Furthermore, significant impacts were observed on two subgroups of students. Students with disabilities who were taught by teachers who participated in the CaMSP program scored approximately 24 to 38 scale score points higher than students with disabilities who were taught by teachers in the comparison group. Similarly, among students who scored at the Below Basic proficiency level in 2008-09, those who were taught by CaMSP teachers scored approximately five to six percentage points higher than those taught by comparison teachers. These subgroup effects may be due to the program's focus on differentiated instruction – gearing instruction toward the individual needs of the students. While this was a focus of the first year of implementation of the CaMSP program, the second year of the program places an even stronger emphasis on closing the achievement gap and concentrates on students from subgroups that are at-risk for low achievement, including EL students, students with disabilities, and those from low socioeconomic families. Therefore, it is hypothesized that further subgroup effects will be found in the evaluation of the second and third years of implementation of the CaMSP program.

In sum, the program was associated with positive, albeit sometimes small, effects on both teachers and students. Given that the program has only been in effect for one year, these positive findings are promising, suggesting that after only one year the program is already making progress toward achieving its stated goals of improving teacher content knowledge and practice and improving student achievement. Subsequent reports on the second and third years of implementation of the program will provide evidence as to whether the trends identified in this report are sustained. Furthermore, future reports will include further data on the comparison group of teachers, making it possible to compare the growth experienced by participating teachers to a group of teachers who did not participate in the CaMSP program.

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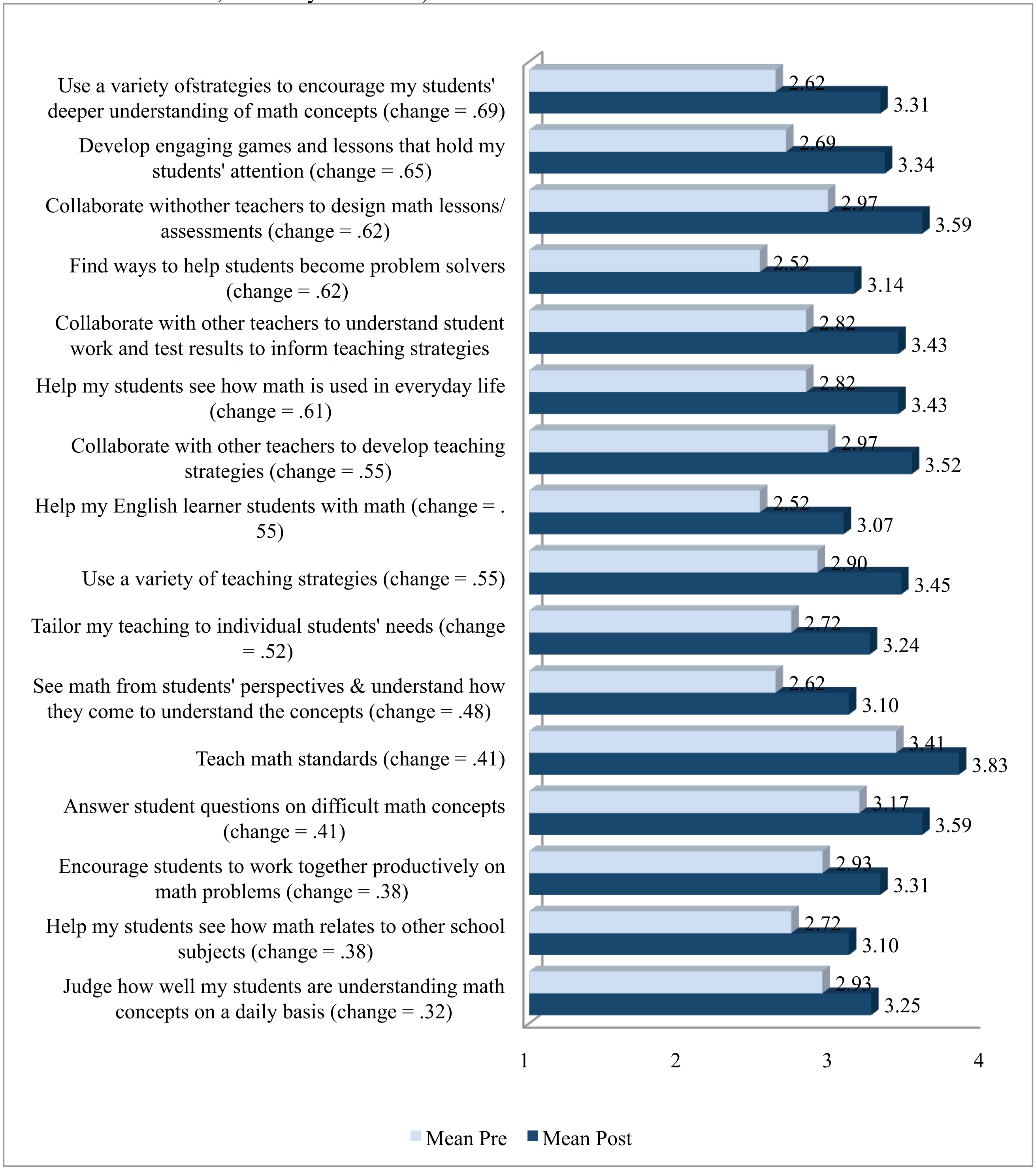
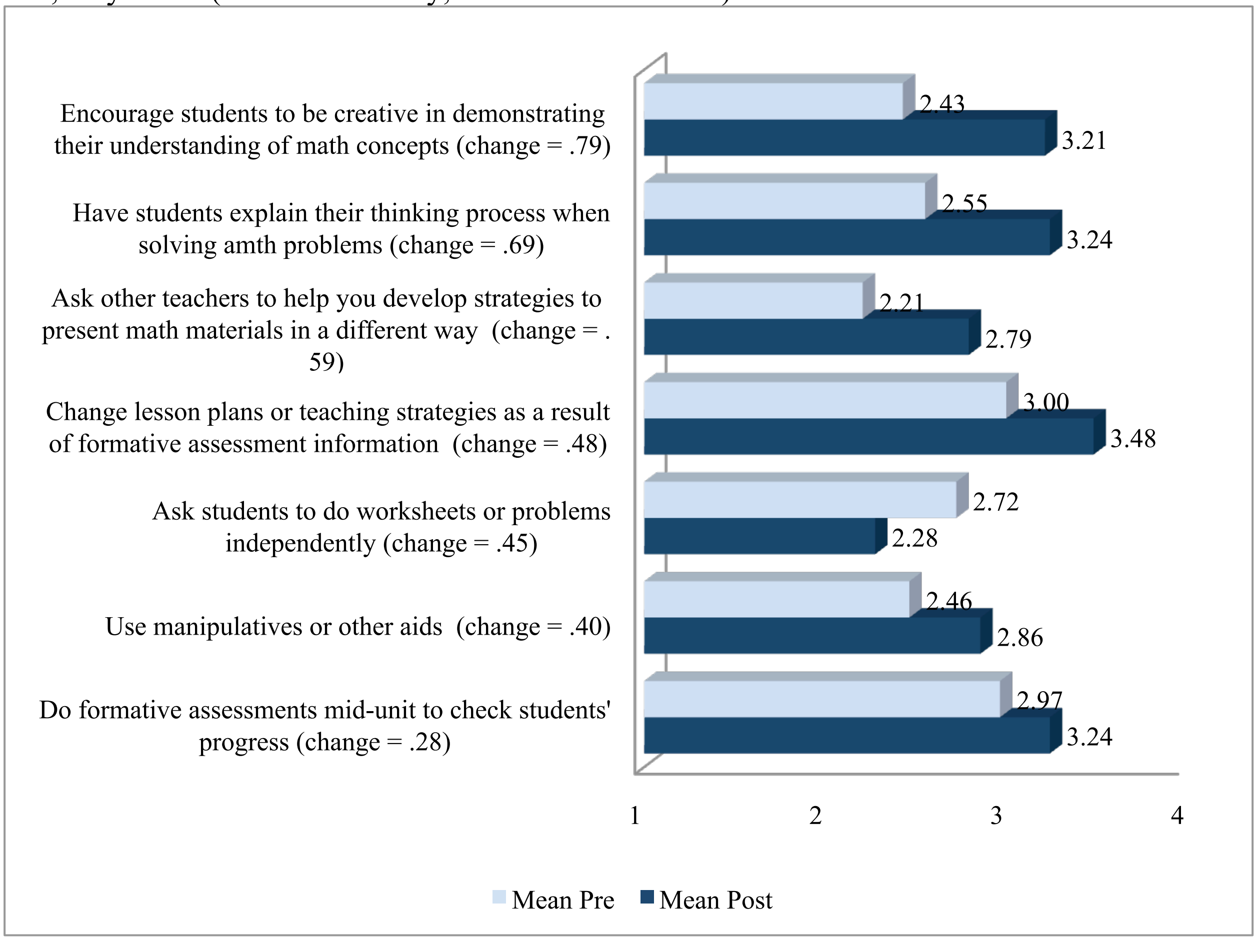
Appendix A - Teacher Survey Results

Figure 9: Teacher Survey Question 1: How confident do you feel in your ability to…* (Scale: 1 = Not at all confident, 4 = Very confident)



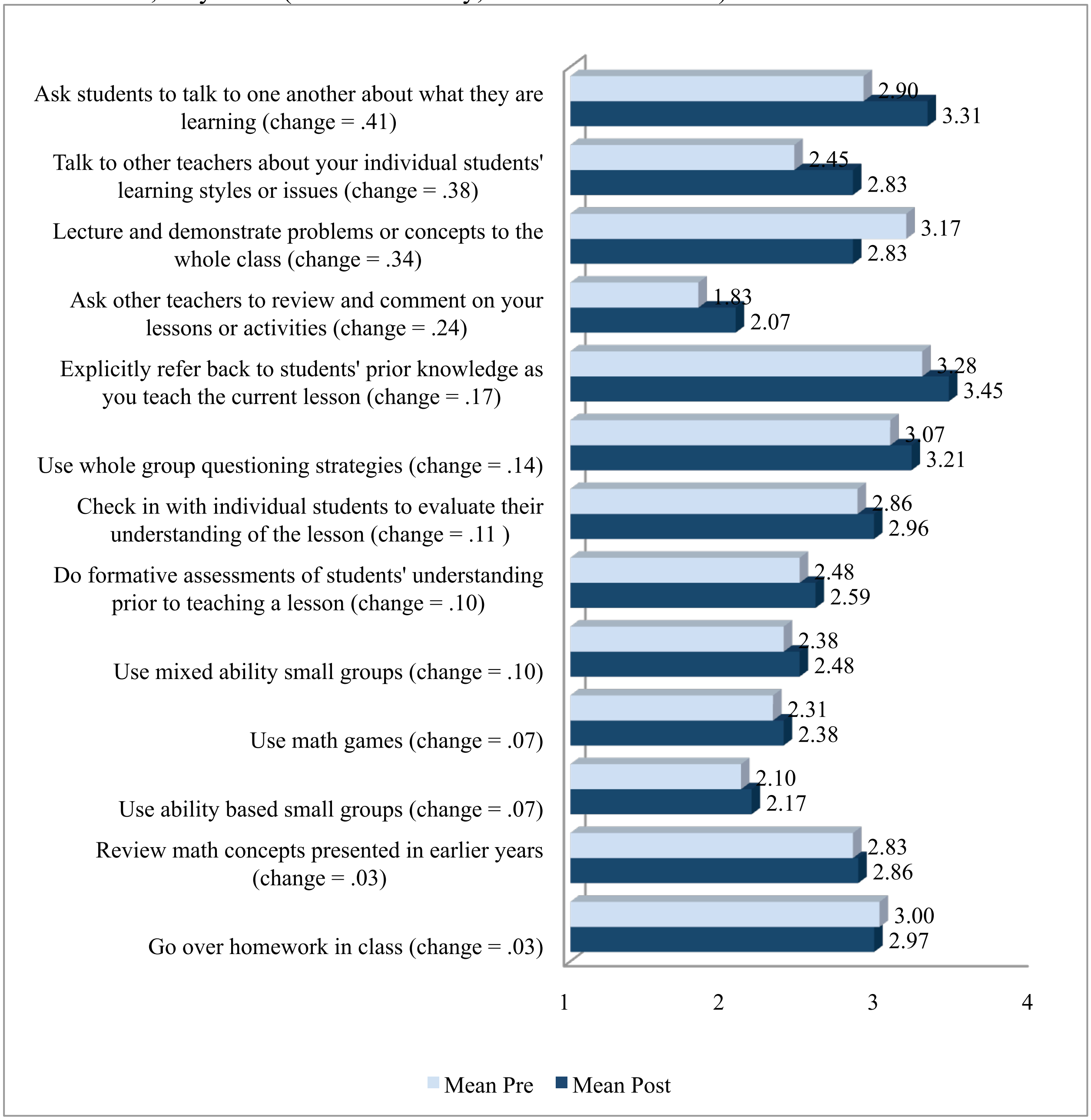
* All results statistically significant at $p < .05$

Figure 10: Teacher Survey Question 2 Significant Results: How often, in a typical math lesson or unit, do you…* (Scale: 1 = Rarely, 4 = Most of the time)



* All results significant ($p < .05$)

Figure 11: Teacher Survey Question 2 Non Significant Results: How often, in a typical math lesson or unit, do you… (Scale 1 = Rarely, 4 = Most of the time)



Appendix B - Teacher Survey Composites

Table 16: Teacher Confidence Composite

Instructional Ability (Cronbach's α = .71)	
	Teach math standards at my grade level
	Answer student questions on difficult math concepts
	Help my students see how math is used in everyday life
	Help my students see how math relates to other school subjects
Differentiated Instruction (Cronbach's α = .82)	
	Use a variety of strategies to demonstrate math concepts
	Use a variety of strategies to encourage my students' deeper understanding of math concepts
	Tailor my teaching to individual students' needs
	Help my English learner students
	See math from my students' perspectives and understand how they come to understand the concepts
	Judge how well my students are understanding math concepts on a daily basis
	Find ways to help students become problem solvers rather than just memorize procedures
	Encourage students to work together productively on math problems
	Develop engaging games and lessons that hold my students' attention
Collaboration (Cronbach's α = .87)	
	Collaborate with other teachers to design math lessons/assessments
	Collaborate with other teachers to develop teaching strategies
	Collaborate with other teachers to understand student work and test results to inform our teaching strategies

Table 17: Teacher Teaching Styles Composite

Games and Manipulatives (Cronbach's α = .84)	
	Use math games with students
	Use manipulatives or other aids
Access Prior Knowledge (Cronbach's α = .64)	
	Explicitly refer back to students' prior knowledge (from earlier lessons or grades) as you teach the current lesson
	Review math concepts presented in earlier years
Formative Assessments (Cronbach's α = .71)	
	Have students explain their thinking process when solving math problems
	Check in with individual students to evaluate their understanding of the lesson
	Do formative assessments mid-unit to check students' progress
	Change lesson plans or teaching strategies as a result of formative assessment information
Collaboration (Cronbach's α = .84)	
	Ask other teachers to review and comment on your lessons or activities

	Ask other teachers to help you develop strategies to present math materials in different ways
	Talk to other teachers about your individual students' learning styles or issues

Appendix C - Student Survey Results

Figure 12: Student Survey Pre Post Comparison: These are items where you would want to see high levels of agreement

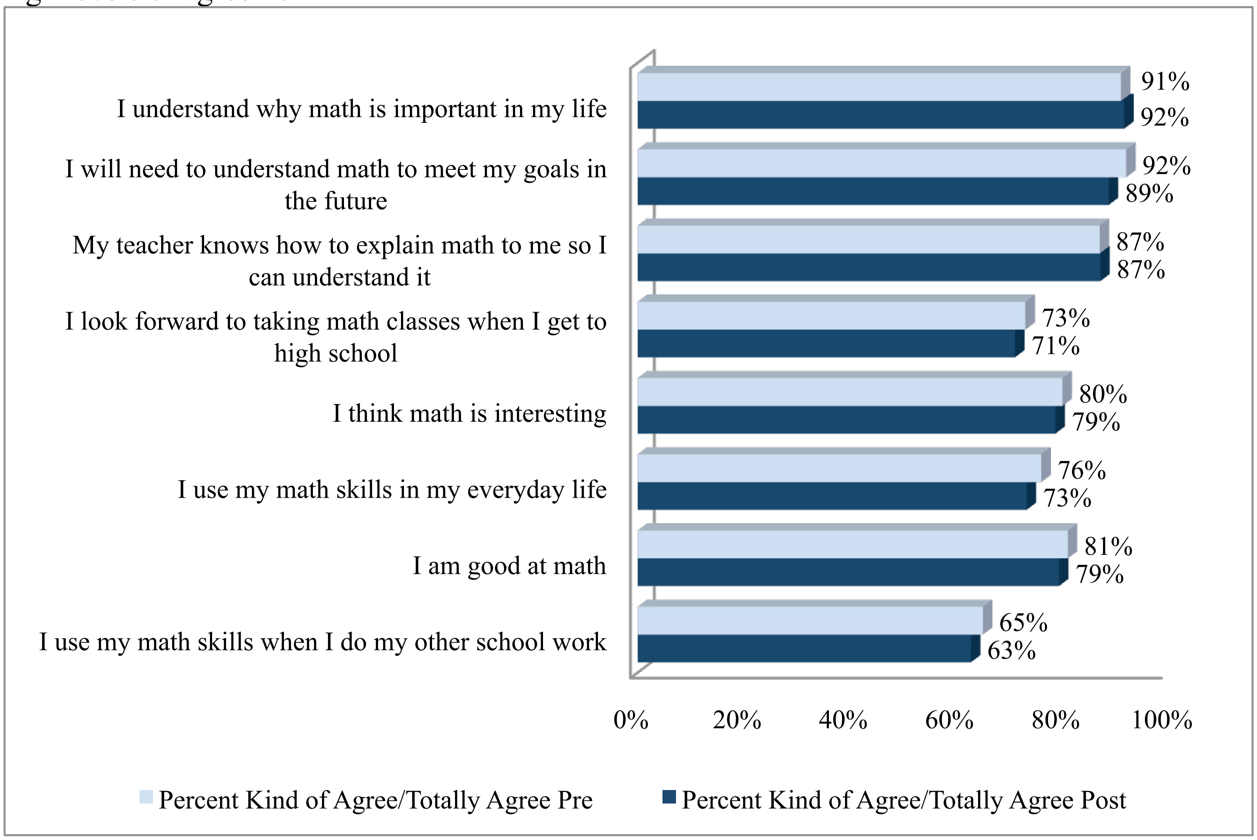


Figure 13: Student Survey Pre Post Comparison: These are items about students' learning styles and strategies

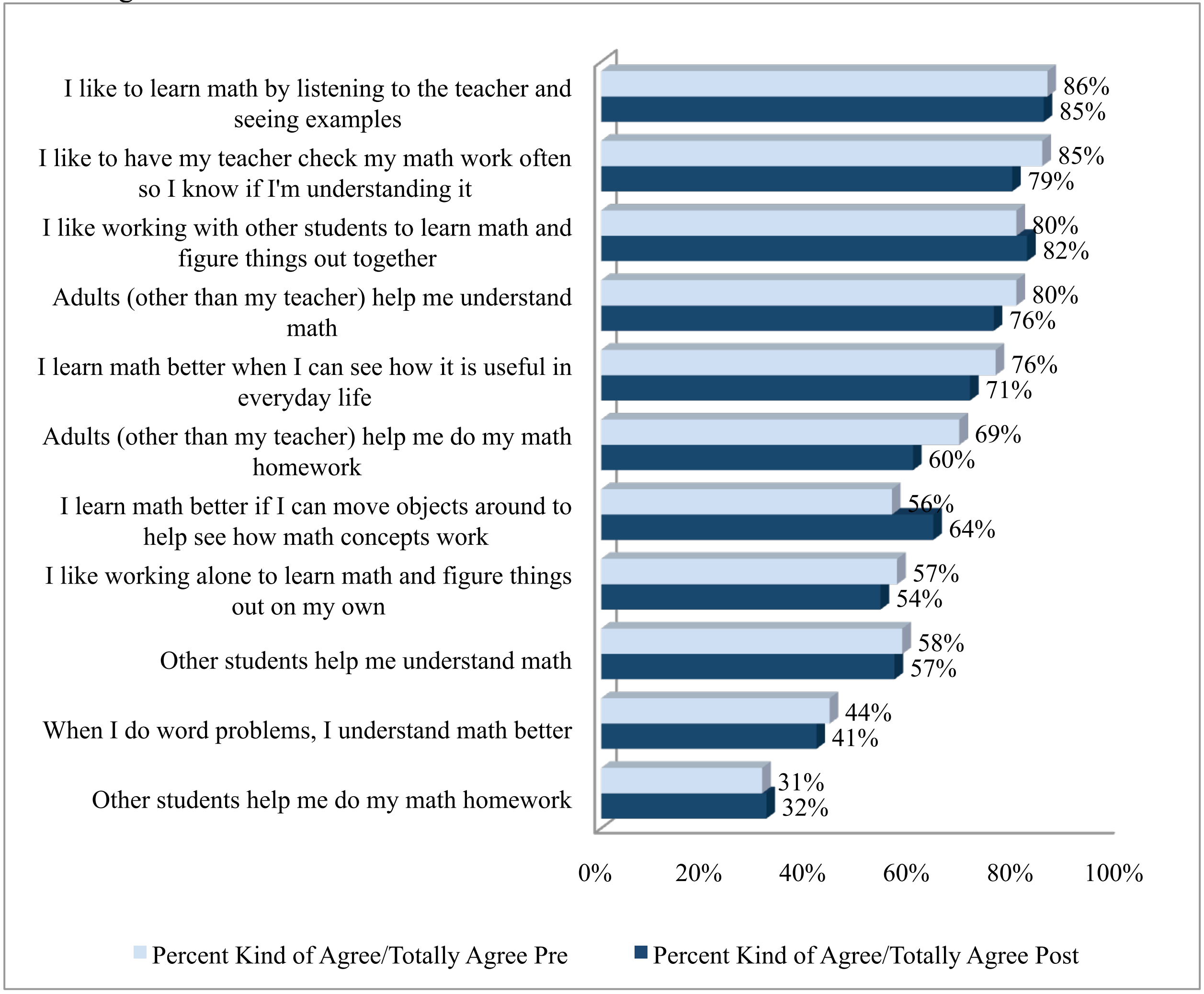
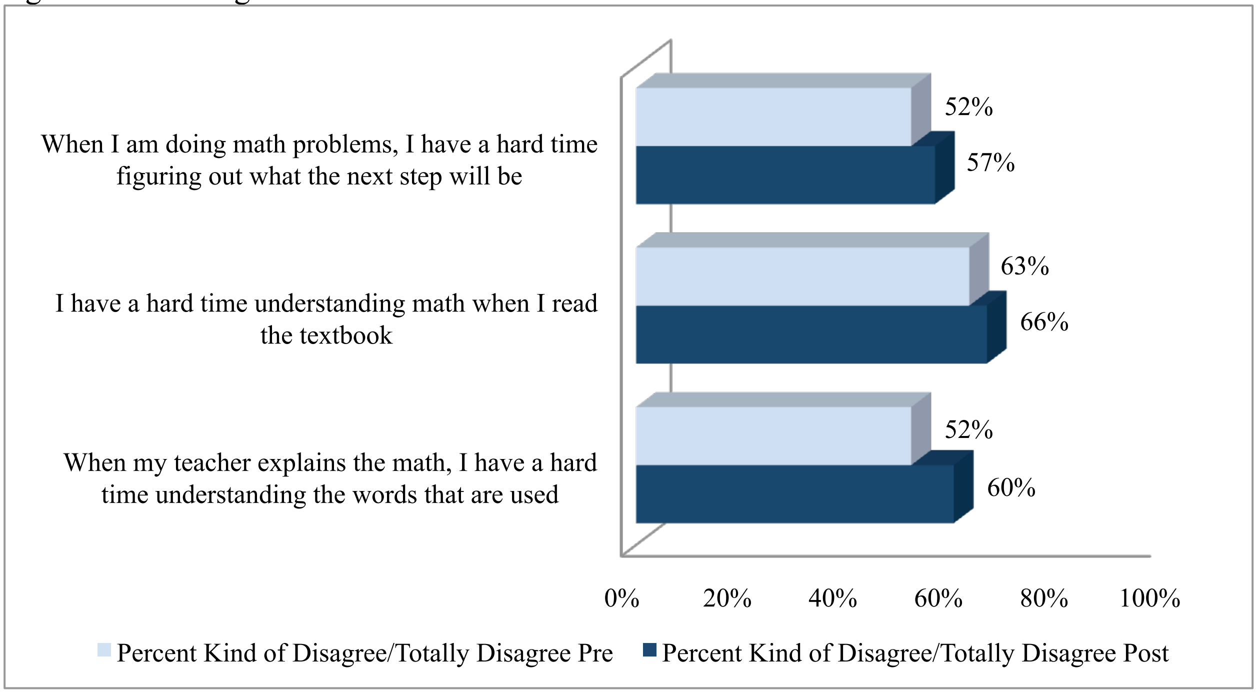


Figure 14: Student Survey Pre Post Comparison: These are items where you would want to see high levels of disagreement



Appendix D - Student Survey Constructs

Student Attitudes (α = .70)	
	I think math is interesting
	I understand why math is important in my life
	I will need to understand math to meet my goals in the future
	I look forward to taking math classes when I get to high school
	I use my math skills in my everyday life
	I use my math skills when I do my other school work
Student Learning Style (α = .66)	
	I like to learn math by listening to the teacher and seeing examples
	I like working alone to learn math and figure things out on my own
	I like working with other students to learn math and figure things out together
	I learn math better when I can see how it is useful in everyday life
	I learn math better if I can move objects around to help see how math concepts work
	When I do word problems, I understand math better
	I like to have my teacher check my math work often so I know if I'm understanding it
	Adults (other than my teacher) help me understand math
	Adults (other than my teacher) help me do my math homework
	Other students help me understand math
	Other students help me do my math homework
Student Confidence (α = .62)	
	I am good at math
	I have a hard time understanding math when I read the textbook
	When I am doing math problems, I have a hard time figuring out what the next step will be
Teacher Ability (α = .70)	
	My teacher knows how to explain math to me so I can understand it
	When my teacher explains the math, I have a hard time understanding the words that are used

Appendix E - Detailed Description of HLM Analyses

A difference-in-difference HLM model was used to isolate the impact of the CaMSP program on students' math achievement. This type of model compares the difference in the achievement of students taught by CaMSP and comparison teachers prior to the intervention (2008-09) to the difference in their achievement in 2009-10. Any change in this difference (i.e., the difference-in-differences) is associated with the CaMSP program. A positive difference-in-difference suggests that the effectiveness of teachers in the CaMSP program improved, relative to the comparison teachers, indicating that the CaMSP program had a positive impact.

Specifically, a 3-level HLM model was used to account for the nested structure of the data, with students group within classrooms grouped within schools. At level-1, math achievement was modeled using an array of student characteristics and a variable representing time (i.e., the year in which the student was taught by the CaMSP or comparison teacher). All student characteristics were grand-mean centered and fixed. The time variable was group mean centered, allowed to vary, and modeled at level-3. The level-model is represented by the following equation:

$y_{ijk} = \pi_{0jk} + \pi_{1jk}(TIME)_{ijk} +$ □=1□□□□□□□□□+□□□□

Where:

y_{ijk} represents the achievement of child i in classroom j in school k

π_{0jk} represents the mean achievement of classroom j in school k

$\pi_{1jk}(TIME)_{ijk}$ = the effect of time in classroom j in school k.

a_{pijk} is one of an array of p student characteristics for student i in classroom j in school k

$\pi_{pjk \text{ represents}}$ the coefficient associated with student characteristic p in classroom j in school k

e_{ijk} = the level-1 random effect that represents the deviation of child ijk's score from the predicted score based on the student level model.

At level-2, the level-1 intercept (average achievement within a classroom) was modeled as a function of a variable indicating whether or not the teacher participated in the CaMSP program and an array of teacher characteristics. The CaMSP variable and all teacher characteristics were grand mean centered and fixed. In addition, the coefficient (slope) for the Time variable was modeled as a function of the CaMSP variable. This cross-level effect is the difference-in-difference coefficient, representing the effect of the CaMSP program in the year of implementation (2009-10). The level-2 models are represented by the following equations:

$\pi_{0jk} = \beta_{00k} + \beta_{01k}(CaMSP)_{jk} +$ □=1□□0□□□□□□ $+ r_{ojk}$

Where,

β_{00k} represents the mean achievement in school k

$\beta_{01k}(CaMSP)_{jk}$ is the mean effect of being in the CAMSP group in school k. This is not the effect of the CaMSP program, rather, it is the initial difference in the effectiveness of the CaMSP teachers prior to the intervention.

x_{qjk} is one of an array of q classroom characteristics for classroom j in school k

β_{0qk} is the mean effect of the teacher-level covariate q in school k

r_{ojk} = the level-2 random effect that represents the deviation of classroom jk's level-1 coefficient from its predicted value based on the classroom-level model

And,

$\pi_{1jk}(TIME)_{ijk} = \beta_{10k} + \beta_{11k}(CAMSP)_{jk} + r_{1jk}$

Where,

β_{10k} represents the mean effect of time in school k. This effect represents the average difference between students' scores in 2008-09 and 2009-10, regardless of treatment group (CaMSP or comparison).

$\beta_{11k}(CAMSP)_{jk}$ = the cross-level interaction of TIME and CAMSP (DID effect)

r_{1jk} = the level-2 random effect that represents the deviation of classroom jk's level-1 coefficient from its predicted value based on the classroom-level model

At level-3, the level-2 intercept (average achievement within a school) was modeled as a function of school characteristics. All continuous variables were grand mean centered. Dummy variables were left uncentered. The level-3 model is represented by the following equation:

$\beta_{00k} = \gamma_{000} + \square=1\square\square\square\square\square\square w_{sk} + u_{pqk}$,

Where,

γ_{000} is the mean achievement among schools

w_{sk} is a school characteristic

γ_{pqs} is the mean effect of the school-level covariate

u_{pqk} is the level-3 random effect that represents the deviation of school k's coefficient from its predicted value based on the school-level model.

A description of the specific variables used in the HLM analysis is provided in Table 18, Table 19, and Table **20** below.

Table 18: Student Level Control Variables Included in the HLM Analyses Modeling 2009-10 Math CST Scores

Variables	Description
SWD	A dummy variable indicating whether or not the student had a disability and was receiving special education services (1 = SWD; 0 = no disability). This variable was grand mean centered and fixed.
Male	A dummy variable indicating whether the student was male or female (1 = male; 0 = female). This variable was grand mean centered and fixed.
Free/Reduced Price Meals	A dummy variable indicating whether or not the student was eligible for free or reduced price meals (1 = eligible; 0 = not eligible). This variable was grand mean centered and fixed.
EL	A dummy variable indicating whether or not the student was designated an English Learner (1 = EL; 0 = not EL). This variable was grand mean centered and fixed.
Minority	A dummy variable indicating whether or not the student was from a minority racial/ethnic group (1 = minority; 0 = not minority). For the purposes of this evaluation, students who were Black, Hispanic, and in "other" racial/ethnic groups were classified as minority; whereas White and Asian/Pacific Islander students were classified as non-minority. This variable was grand mean centered and fixed.
Prior Achievement	A continuous variable representing the students' math achievement in the prior year. For the analyses examining CST scores, the prior year's CST score was used; for analyses examining the benchmark assessments, the prior year's benchmark assessment score was used. This variable was grand mean centered and fixed.
Year	A dummy variable indicating whether the student was taught by a participating teacher (CaMSP or comparison) in the 2008-09 school year or in 2009-10, the year in which the CaMSP program was implemented (1 = 2009-10; 0 = 2008-09). This variable was group mean centered, allowed to vary, and modeled at level two.

Table 19: Teacher Level Control Variables Included in the HLM Analyses Modeling 2009-10 Math CST Scores

Variables	Description
CaMSP	A dummy variable indicating whether or not the teacher participated in the CaMSP program in 2009-10 (1 = CaMSP participant; 0 = comparison group). It is important to note that, due to the use of a difference-in-difference model, the coefficient associated with this variable does NOT represent the effect of the CaMSP program. Rather, it represents any differences in teachers' effectiveness prior to participation in the CaMSP program. The interaction of the CaMSP variable and Year variable represents the effect of the CaMSP program.
7+ Years Experience	A dummy variable indicating whether or not the teacher had 7 or more years of teacher experience (1 = 7 or more years; 0 = less than 7 years).
Grade Taught (6th or Higher)	A dummy variable indicating whether the teacher taught middle school (grades 6 and up) or elementary school (1 = middle school; 0 = elementary school).
Graduate Degree	A dummy variable indicating whether or not the teacher had at least a graduate degree (1 = graduate degree; 0 = no graduate degree).

Table 20: School Level Control Variables Included in the HLM Analyses Modeling 2009-10 Math CST Scores

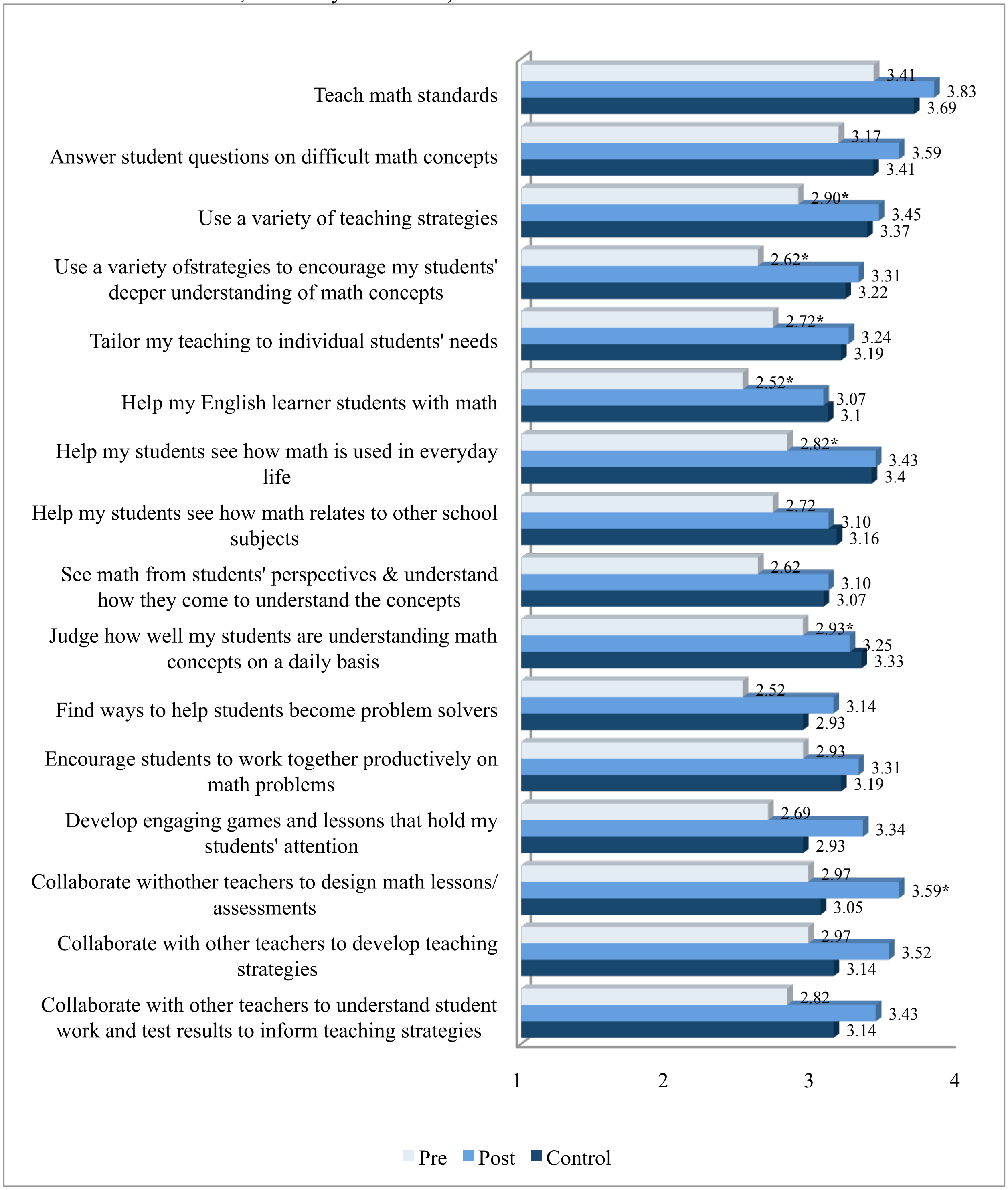
Variables	Description
% Proficient in 08-09	A variable representing the percentage of students in the school who were proficient in the 2008-09 school year (Mean = 54.1%; SD = 16.6).
% Eligible for Free/Reduced Meals	A variable representing the percentage of students in the school who were eligible for free or reduced price meals in the 2009-10 school year (Mean = 53.7%; SD = 24.6).
% Minority	A variable representing the percentage of students in the school who were minority in the 2009-10 school year (Mean = 58.1%; SD = 16.9).
% EL	A variable representing the percentage of students in the school where were ELs in the 2009-10 school year (Mean = 22.0%; SD = 14.6).
Small	A dummy variable indicating whether or not the school was small (400 students or less).
Large	A dummy variable indicating whether or not the school was large (more than 700 students).

This HLM model was used to examine the effect of the CaMSP program on both of these dependent variables for the overall population of students, as well as for five subgroups of students: students with disabilities, EL students, students who scored below the proficient level the prior year, students eligible for free or reduced price meals, and minority students.[14] Using multiple analyses to test for these subgroup effects inflates the risk of a Type I error (i.e., false-positive finding); therefore to control for the Type I error rate the p-values using the Benjamini-Hochberg adjustment to control the false discovery rate. For a description of the Benjamini-Hochberg adjustment see (Benjamini & Hochberg, 1995).

[14] For the subgroup analyses, the model was the same, except the covariate corresponding to that particular subgroup was left out of the model. For example, in the analyses examining students with disabilities, the variable indicating whether or not the student had a disability was removed.

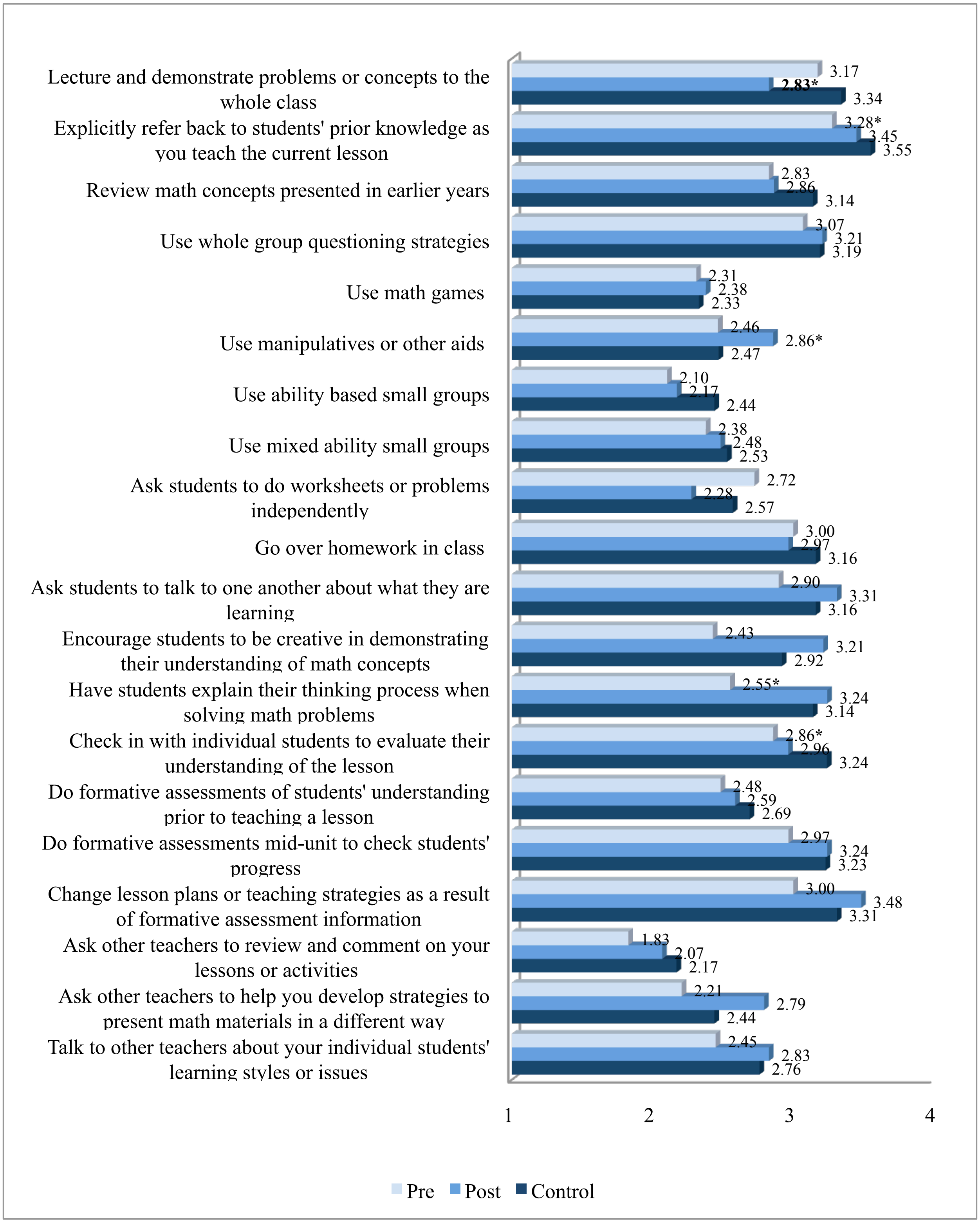
Appendix F - Comparison Group Analysis

Figure 15: Teacher Survey Question 1. How confident do you feel in your ability to …* (Scale: 1 = Not at all confident, 4 = Very confident)



* Statistically significant difference from comparison $p < .05$

Figure 16: Teacher Survey Question 2. How often in a typical math lesson do you… (Scale 1 = Rarely, 4 = Most of the time)



* Statistically significant difference from comparison $p < .05$