Project Make the Way

Santa Rosa City Schools

CaMSP Cohort 11

October 2016 YTD Local Evaluation Report

Submitted by:

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Section 1: Introduction

Project *Make the Way* is a Cohort 11 partnership funded by the California Mathematics and Science Partnership (CaMSP) program, which is administered by the California Department of Education's Science, Technology, Engineering and Mathematics (STEM) Office. CaMSP is a federally funded initiative of the US Department of Education's Mathematics and Science Partnership (MSP) Program under Title II of the Elementary and Secondary Education Act (ESEA).

Make the Way includes a target of 65 participating teachers in grades K to 8 from Santa Rosa City Schools (SRCS), which will reach approximately 4,090 students. SRCS is the lead school district for this partnership (Lead LEA) and is partnering with faculty members from Sonoma State University (SSU) –Departments of Mathematics and Statistics, Engineering Science, Literacy Studies and Elementary Education, Curriculum Studies and Secondary Education, and the California Mathematics Project: North Coast (CMP:NC). The IHE faculty will provide professional development and will focus on developing teachers' understanding of students' conceptual development of mathematics, engineering, and technology as it relates to the STEM Maker curriculum. The purpose of Project *Make the Way* is to develop and use Maker Design projects in the classroom as a vehicle for academic achievement and students' mathematical understanding and engagement, dispositions and attitudes towards mathematics and its real-world use.

Make the Way teachers participate in 60 hours of intensive, divided between an annual 30-hour Summer Institute and five Saturday Seminars (30 hours) that take place throughout the school year. *Make the Way's* 24 hours of classroom follow-up is based on a model of Lesson Study developed in previous CaMSP projects and enhanced to incorporate the development of STEM Maker curriculum. Lesson study groups will engage in planning and additional lesson study work during the Saturday seminars. Each group will participate in three cycles of lesson study facilitated by peer facilitators, who will receive additional coaching and training throughout the year.

- Year 1: Teachers will engage in grade appropriate multi-day Maker activities, each designed to serve as the core of a curricular mathematics unit. Teachers will focus on integrating Maker activities into their existing math curriculum.
- Year 2: Similar to Year 1, but with progressively more in-depth skill acquisitions and integration of Maker activities in classrooms.
- Year 3: SSU interdisciplinary faculty team will have developed 36 multi-day Maker activities, four per grade level, that have been piloted in the classrooms by participating teachers. Teachers will be providing one on one and small group coaching of other K-8 teachers in the district on ways to implement STEM Maker curriculum in their classrooms.

Make the Way Core Partnership

Santa Rosa City Schools (SRCS) is the Core Partnership Lead for the *Make the Way* grant collaborative. In addition to SRCS, the collaborative consists of several departments at Sonoma State University: Mathematics and Statistics, Engineering Science, Literacy Studies and elementary Education, Curriculum Studies and Secondary Education, and the California Mathematics Project: North Coast (CMP:NC).

Make the Way Regional Collaborative Partnership

The Core Partnership is further supported by the Regional Collaborative Partners (RCP), which includes the Sonoma County Office of Education, Santa Rosa Chamber of Commerce, Sonoma County Workforce Investment Board, Autodesk, and Maker Media.

Project Goals/Outcomes

Project *Make the Way* has the following specific goals:

1) Development and use of Maker Design projects in classroom as a vehicle for academic achievement and students' mathematical understanding and engagement, dispositions and attitudes towards mathematics and its real-world use.
2) Changes in instructional strategies and methods implemented in the classroom by participating teachers.
3) Impact teacher mindset about capacity for students to learn and engage in and access mathematics.
4) Build STEM capacity and engage educational leadership among participating teachers.
5) Impact SRCS and community-based partnerships to implement and sustain policies and practices that support STEM Maker curriculum.

About the Evaluation

Through an RFP process initiated by the California Department of Education, Public Works (PW) serves as the statewide evaluator and through the Cohort 11 RFA as the local evaluator for the twelve Cohort 11 partnerships funded under this initiative. As the statewide evaluator, PW conducts site visits; phone interviews; an annual survey of participating teachers, core and regional partners; and collects, analyzes and reports on outcomes related to standardized state student assessments in mathematics and science.

Under Cohort 11 guidelines, Santa Rosa City Schools, the lead LEA for the *Make the Way* partnership, has contracted with PW to serve as their local evaluator to administer a teacher content assessment and to create customized data collection tools to measure the impact of professional development activities on participating teachers and in classroom instruction. As the local evaluator, PW provides reports to meet state and federal reporting requirements, periodic quarterly reports for the leadership team and a summative evaluation report.

This report provides an update of the local evaluation for the first grant cycle in 2015-16 for the October 15, 2016 YTD and includes the following sections: 1) introduction to the

partnership, 2) results from the teacher content assessment, annual teacher survey and student outcomes on state assessments, 3) local evaluation instruments, data collection and analysis, and 4) findings to date and next steps in the evaluation.

Participating Teacher Attendance

For the three years of the CaMSP grant, this project targeted 65 participants, who are required to complete 84 hours of professional development (60 hours of intensive and 24 hours of follow-up). At the end of Year 1, 70 of the targeted 65 teachers had completed an average 82 hours of professional development.

Section 2: State Measures

Teacher Content Assessments

As a US Department of Education initiative funded under the Mathematics and Science Partnership Program of the Elementary and Secondary Education Act (NCLB Title II), the California Mathematics and Science Partnership Program (CaMSP) is required to measure teacher content knowledge as a federal priority for this partnership. Each CaMSP partnership is required to administer one of two teacher content assessments selected by the CDE STEM Office to each participating teacher, depending on its content focus of Mathematics and/or Science.

The Mathematical Knowledge for Teaching Measures (MKT), which was developed by the Learning Mathematics for Teaching (LMT) research consortium of the University of Michigan, School of Education was selected as the measure for this partnership.[1] The MKT, referred to as the LMT, is an online assessment of elementary and secondary mathematics teachers' content knowledge for teaching in the areas of Number Concepts and Operations; and Patterns, Functions, and Algebra. The teacher content assessments are administered for research purposes only and all individual results are kept confidential. Only group results are reported for the purpose of evaluating professional development initiatives.

Each participating teacher completes the content assessment two or three times each year during the grant. Results of the assessment are presented as average scores for the group, in standard deviations above (1.0) or below (-1.0) the national average (0.0)[2] for each content area. To measure the changes in scores, a paired t-test was conducted.[3] The evaluation question was whether teachers who participated in CaMSP professional development increased their mathematics content knowledge for teaching, as measured by gains in standard deviations from the national mean, from one test to the next.

Year 1 Teacher Content Assessment for Mathematics Results

Teachers participating in the professional development program completed the LMT in the summer of 2015 (pre), winter of 2016 (mid), and summer of 2016 (post).

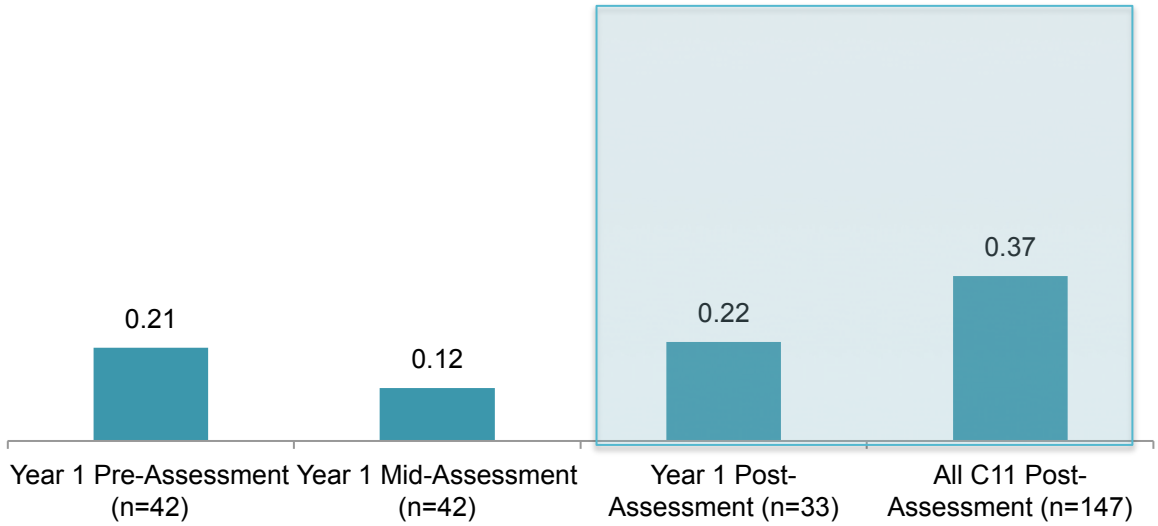
Elementary Teacher Results

The results for the 33 elementary teachers who were administered the Year 1 assessments, indicate the teacher's scores essentially stayed the same from the pre- to post-assessment on the Numbers and Operations section. Figure 2.1 shows that the elementary teachers' Numbers and Operations scores continued to be above the national mean (0.0), with a 0.01 increase on average from the pre- to the post-assessment in Year 1. This difference was

[1] The development of the MKT was funded by the National Science Foundation, and by a subcontract to the Consortium for
[2] As a condition of use, neither raw scores nor percent correct on the MKT/LMT can be presented in this report.
[3] Compares Year 1 pre-assessment to post-assessment, matched by teacher for current participants, whose results were also available at the first administration. Please note that the reduction in teachers with a matched pre and post assessment may reflect teachers who declined to participate in the second year of the project or who were unavailable when the assessment was administered.

not statistically significant[4], indicating that there was no measureable change in mathematical content knowledge of participating elementary teachers in Year 1 on the Numbers and Operations portion of the assessment.

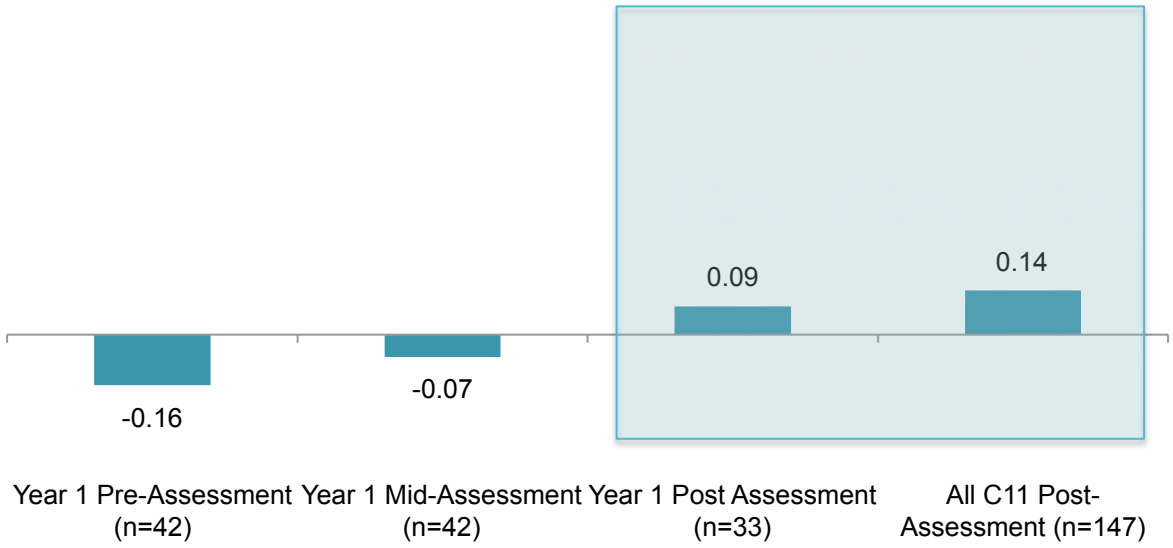
Figure 2.1: LMT Elementary Numbers and Operations



In Figure 2.2, the participating elementary teacher average scores on Patterns, Functions, and Algebra showed a gain from pre- to post-assessment in Year 1, where scores continued to be above the national mean (0.0), with a 0.25 increase on average from the pre- to the post-assessment. This was statistically significant[5], indicating there was a measureable change in mathematical content knowledge of participating elementary teachers in Year 1 on the Algebra portion of the assessment.

[4] Significance was not met by a $p<.05$ on a two-tailed paired t-test between Year 1 pre- and post-assessment average standard deviations from the national mean (0.0).
[5] Significance was met by a $p<.05$ on a two-tailed paired t-test between Year 1 pre- and post-assessment average standard deviations from the national mean (0.0).

Figure 2.2: LMT Elementary Patterns, Functions, and Algebra



Partnership Performance on the LMT Relative to Cohort

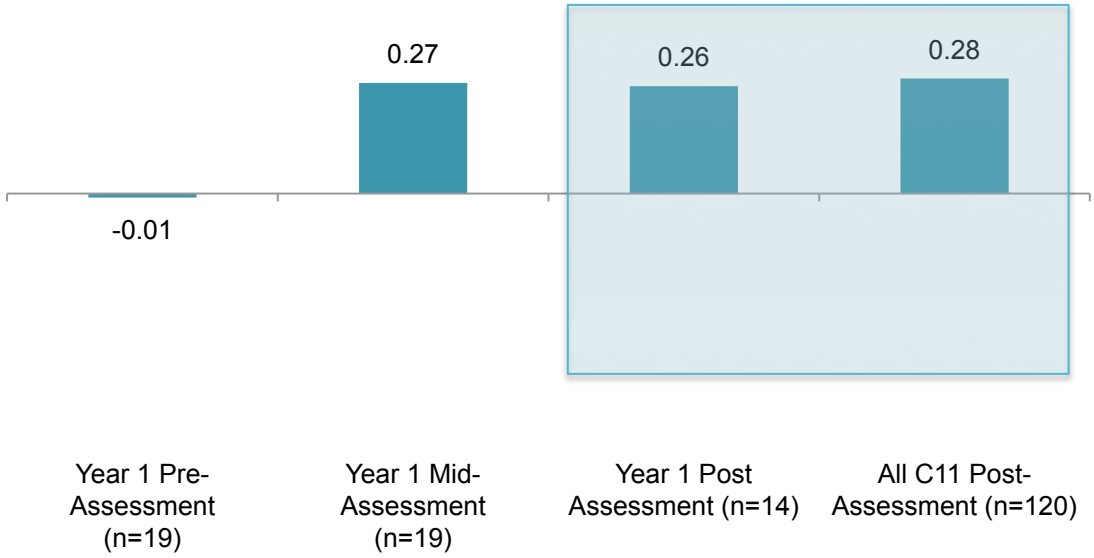
An additional comparison was conducted to determine how teachers in this partnership (n = 33) performed relative to teachers across all Cohort 11 CaMSP partnerships (N = 147). The transparent box around the last two bars in Figures 2.1 and 2.2 provides visual representations of the comparisons. This partnership did not perform as well as all Cohort 11 partnerships overall on both sections of the Year 1 LMT post-assessment. On the Number Concepts and Operations section of the LMT, the average scores of participating teachers gained 0.22 from the national mean while teachers across the Cohort 11 partnerships experienced a gain of 0.37. On the Patterns, Functions, and Algebra section of the LMT, participating teachers in this partnership made gains of 0.09 from the national mean, while teachers across Cohort 11 gained 0.14.

Secondary Teacher Results

The results for the 14 secondary teachers who were administered the Year 1 assessments, indicate the teachers showed a gain from the pre- to post-assessment on the Numbers and Operations section. Figure 2.3 shows that the secondary teachers' Numbers and Operations scores continued to be above the national mean (0.0), with a 0.27 increase on average from the pre- to the post-assessment in Year 1. This difference was statistically significant[6], indicating that there was a measureable change in mathematical content knowledge of participating secondary teachers in Year 1 on the Numbers and Operations portion of the assessment.

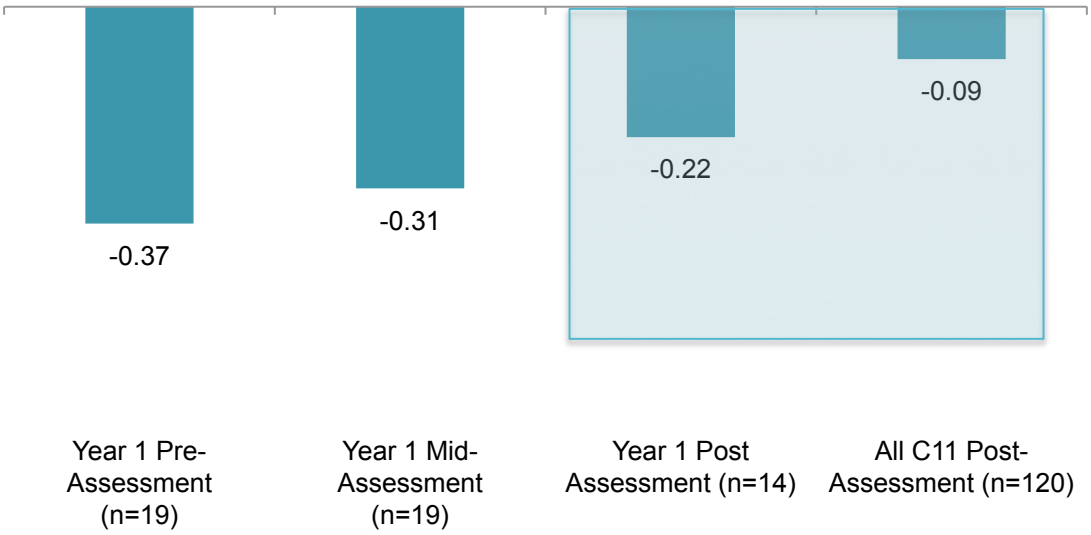
[6] Significance was met by a $p<.05$ on a two-tailed paired t-test between Year 1 pre- and post-assessment average standard deviations from the national mean (0.0).

Figure 2.3: LMT Secondary Numbers and Operations



In Figure 2.4, the participating secondary teacher average scores on Patterns, Functions, and Algebra showed an increase from pre- to post-assessment in Year 1, where scores continued to be below the national mean (0.0). There was a 0.15 increase on average from the pre- to the post-assessment. This was not statistically significant[7], indicating there was no measureable change in mathematical content knowledge of participating secondary teachers in Year 1 on the Algebra portion of the assessment.

Figure 2.4: LMT Secondary Patterns, Functions, and Algebra



[7] Significance was not met by a $p<.05$ on a two-tailed paired t-test between Year 1 pre- and post-assessment average standard deviations from the national mean (0.0).

Partnership Performance on the LMT Relative to Cohort

An additional comparison was conducted to determine how teachers in this partnership (n = 14) performed relative to teachers across all Cohort 11 CaMSP partnerships (N = 120). The transparent box around the last two bars in Figures 2.3 and 2.4 provides visual representations of the comparisons. This partnership did not perform as well as all Cohort 11 partnerships overall on both sections of the Year 1 LMT post-assessment. On the Number Concepts and Operations section of the LMT, the average scores of participating teachers gained 0.26 from the national mean while teachers across the Cohort 11 partnerships experienced a gain of 0.28. On the Patterns, Functions, and Algebra section of the LMT, participating teachers in this partnership were at -0.22 from the national mean, while teachers across Cohort 11 were at -0.09.

Analysis of Project *Make the Way* CaMSP Teacher Survey

In the spring of 2016, Public Works administered the CaMSP Participating Teacher Survey to Cohort 11 partnerships focusing on teacher perspectives about the effectiveness of the partnership to provide support to improve Science, Technology, Engineering and Mathematics (STEM) teaching and learning in the classroom. Project *Make the Way* teachers that participated in at least one hour of professional development during the respective grant year were asked to complete a survey. The majority of the teachers responded to the survey, as shown in Table 2.1, and about three-quarters of responding teachers reported they would return for Year 2 of the project.

Table 2.1. Teacher Survey Response Rates

Grant Year	Number Administered	Responded (n & %)		Returning Next Year (n & % of responses)	
2015 – 16 (Year 1)	70	60	86%	43	72%

Project *Make the Way* teachers were asked about their satisfaction with the overall quality of the professional development. The teacher responses were given on a Likert Scale for 1 "not satisfied" to 4 "very satisfied" with the option of teachers selecting "don't know."[8] Overall, teachers were satisfied with the quality of the professional development. However, teachers were most satisfied with: the quality of the trainers, the overall quality of the summer activities, and the quality of the coaching.

[8] Mean scores do not include "don't know" or "not applicable" responses.

Table 2.2: Satisfaction of the Professional Development Mean Scores by Year

Items	2015 - 16	
	n	Mean
Quality of the trainers	58	3.3
Overall quality of summer activities	58	3.1
Quality of the coaching	56	3.0
Overall rating of professional development	59	2.9
Impact of the training on my own teaching	58	2.9
Focus on aligning teaching with standards	58	2.9
Content of professional development	59	2.9
Pedagogy or instructional methods covered	58	2.8
Overall quality of school year activities	58	2.8

Teachers were also asked about the extent that the training was helping them professionally (Table 2.3). Responses were provided on a Likert Scale from 1 "not at all" to 4 "a lot" with the option for either "don't know" or "not applicable." Teachers reported that the training has helped them some professionally, with most of the items rated on average "somewhat helpful." Teachers reported the professional development helped them the most in: convincing teachers of the importance of hands-on learning; teaching about lesson study; understanding the use of modeling or real world application in teaching; providing instructional strategies, techniques, or pedagogical approaches; and increasing content knowledge. Providing credits to attain a minor or major in math or science, and helping teachers earn a masters degree had low response rates as many teachers selected "don't know" or "not applicable."

Table 2.3: Training Helps Professionally Mean Scores by Year

Items	2015 - 16	
	n	Mean
Convinced me of the importance of hands-on learning	54	3.3
Taught me about lesson study	54	3.2
Helped me understand the use of modeling or real world applications in my teaching	55	3.1
Provided me with instructional strategies, techniques, or pedagogical approaches	59	3.0
Increased my content knowledge	58	3.0
Helped me align instruction to the NGSS	56	2.8
Helped me align instruction to the CA Math Standards or CCSS-M	57	2.7
Helped me align instruction to NGSS Engineering Practices	55	2.7
Helped me re-commit to teaching	53	2.6
Taught me how to implement project based learning	58	2.6
Helped me use electronic resources or technology	56	2.6
Exposed me to STEM careers	52	2.3
Provided me with credits to attain a minor or major in math or science	36	1.6
Helped me earn a masters degree	34	1.2

Table 2.4 below shows items focused on how the professional development training might be helpful to improve student achievement in the STEM areas. Responses were again provided using a Likert Scale from 1 "no help" to 4 "helped a lot" with the option of "don't know" or "doesn't apply." Teachers reported, on average, that the training has helped student achievement some, but more so in: increasing student interest in math or science, and students ability to investigate STEM through real life problems and integrate STEM skills across disciplines. The achievement items had lower response rates and were rated on average lower as compared to previous items, possibly because Cohort 11 projects have not yet seen student outcomes.

Table 2.4: Training Helped Student Achievement Mean Scores by Year

Items	2015 - 16	
	n	Mean
Increase student interest in math or science	57	3.5
Students ability to investigate STEM through real life problems	56	3.1
Ability of students to integrate STEM skills across disciplines	56	3.0
Understanding of CA Math Standards or Common Core State Standards, Mathematics	56	2.9
Understanding of Next Generation Science Standards (NGSS)	56	2.8
Student grades in mathematics/science	54	2.7
Achievement on the CCSS-Mathematics Smarter Balanced Assessment Consortium (SBAC) Assessment	42	2.6
Student interest in STEM for a post secondary degree	33	2.5
Achievement on the Science CST	30	2.3
Experience STEM careers through field trips, mentorships, job shadowing and internships	33	2.2

Lastly, teachers were asked about their opinions related to their efficacy on various aspects of teaching (Table 2.5). Responses were provided on a Likert Scale with 1 "strongly disagree" to 4 "strongly agree." The items that the teachers rated highest on average were: being able to handle most discipline problems that arise in the classroom, the belief that they are making a difference in the students' lives, the ability to effectively teach English Learners in the classroom, confidence in content knowledge to be creative with instructional strategies, the ability to teach all students to high achievement levels, and effectively integrating technology into students' learning experience.

Table 2.5: Teacher Efficacy Mean Scores by Year

Items	2015 - 16	
	n	Mean
I can handle most discipline problems that arise in my classroom	55	3.5
I am making a difference in my students' lives	55	3.5
I am confident in my ability to effectively teach English Learners in my classroom	55	3.5
I am confident in my content knowledge to be creative with my instructional strategies	54	3.4
I have the ability to teach all students to high achievement levels	56	3.3
I can effectively integrate technology into my students' learning experience	56	3.1
I am confident in my ability to integrate curriculum across STEM disciplines	54	2.9
I can integrate Engineering Practices into my classroom	54	2.9
I am confident in my ability to help students understand STEM post secondary and career options	42	2.5
My students' peers influence their motivation and performance more than I do	56	2.5
Most of a student's performance depends on home environment	56	2.4
When my students fail, it is because they do not apply themselves	53	2.1

The CaMSP Teacher Survey will be administered again in spring of 2017, at the end of the second grant year. Average teacher ratings on each item will again be calculated and statistically compared to the ratings reported above to look for change in satisfaction with the project elements, growth in teacher professional outcomes and efficacy, and student achievement due to the professional development.

2015-16 Student Outcome Results

As a US Department of Education initiative funded under the Mathematics and Science Partnership Program of the Elementary and Secondary Education Act (ESEA Title II), the California Mathematics and Science Partnership Program (CaMSP) is required to analyze student content knowledge as a federal priority for this program. Under the program guidelines, Public Works has designed a student outcome study that utilizes statewide assessment results from both mathematics and science tests depending on the discipline focus of the professional development activities of the partnership and the supported grade levels of participating teachers.

The California Assessment of Student Performance and Progress (CAASPP) System was established on January 1, 2014. The CAASPP System replaced the Standardized Testing and Reporting (STAR) Program, which became inoperative on July 1, 2013. All students in California, at specified grade levels, complete the two assessments used in this analysis. The

student content assessments are analyzed for research purposes only and all individual results will be kept confidential by the Public Works state evaluation team. Only pooled results are reported for the purpose of evaluating professional development initiatives, not individual teachers.

This partnership has identified mathematics as a core discipline and student outcomes have been measured using the mathematics Smarter Balanced Assessment Consortium (SBAC) assessment. SBAC is a research consortium funded by the US Department of Education that developed an assessment system based on the new Common Core State Standards (CCSS) in mathematics and English language arts. In California, the SBAC is administered to all students enrolled in 3rd through 8th grades, and in 11th grade and is used to measure standards-aligned mathematics content knowledge. The test items are based on standards for each grade level in elementary and middle school, while the high school test is separated by subject-matter concept (e.g. Number and Quantity, Algebra, Geometry).

For the student outcome study, PW designed a matched comparison student outcome study. Participating teachers who have completed the required 84 grant hours (60 intensive hours and 24 hours of follow-up in Year 1) are referred to as the treatment group. After the treatment group was identified at the conclusion of Year 1 professional development activities, Public Works identified a control group of teachers matched by years of teaching, grade level taught, and educational level within the partnership participating LEAs.[9] PW requested student rosters of the treatment and control teachers and combined this information with student demographic data and either SBAC results for mathematics or the California Standards Test (CST) results for science. Comparisons of mean 2015-16 SBAC or CST scaled scores for students of the treatment and control teacher groups were tested for statistically significant differences using t-tests. To compare performance at each of the achievement or proficiency levels for these tests, statistically significant differences between treatment and control groups were tested using chi-squared tests.

Matching Procedures

Since students from the two groups (treatment and control) varied in terms of several demographic variables that are known to affect academic achievement, PW used a matching procedure called "Coarsened Exact Matching," or CEM, to create analytic sub-samples of treatment and control students from each partnership and at each grade level. These sub-samples were considerably smaller than the entire population because they included only matched control students who were "virtual twins" of treatment students. The sub-samples were matched in terms of:[10]

- Ethnicity,
- Language classification,
- Socioeconomically disadvantaged status,
- Special education designation.

[9] In some partnerships where only a small number of control group teachers were available, additional control teachers were identified and matched from geographically close districts participating within the same cohort of CaMSP partnerships.

[10] Iacus, Stefano M., Gary King and Giuseppe Porro. 2008. "Matching for Causal Inference Without Balance Checking." http://gking.harvard.edu/files/abs/cem-abs.shtml.

- Prior achievement (2014-15 Mathematics SBAC achievement level)

Short of random selection and assignment to treatment and control groups, this matching method is the most robust way to account for group differences associated with achievement levels. The matched samples were used for analysis of differences between treatment and control groups.

About the Partnership - Mathematics

Academic performance and demographic data were collected for students of both treatment and control teachers, producing a database of over 1,100 students before matching. The composition of this student population is shown in Table 2.6, along with the smaller matched subsamples, which were evenly balanced in terms of all of the matching criteria.

- 35 treatment teachers (56 control teachers)
- 1,159 treatment students (2,398 control students)

Table 2.6: Demographic Profile of Treatment Students and Control Students 2015-16

	Before Matching % Students (N=3,557)		**After Matching** % Students (N=1,730)	
	Treatment (n=1,159)	Control (n=2,398)	Treatment (n=865)	Control (n=865)
Male	50	50	49	49
Female	50	50	51	51
Hispanic	74***	47	77	77
African American	2	2	1	1
White	16	38***	18	18
English Only	30	56***	29	29
Limited English Proficient	45***	23	46	46
Special Education	16***	11	12	12
Socioeconomically disadvantaged	81***	51	82	82
2014-15 Mathematics SBAC met or exceeded standards	34***	17	17	17

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Year 1 Student Assessment Results - Mathematics

On average, *Make the Way* elementary and secondary students performed similarly to the matched control students, with similar proportions of students in both groups meeting or exceeding the Common Core State Standards for mathematics. Breaking down performance by grade level makes it clear that treatment students substantially outperformed control students in 4th grade with statistically higher average scaled scores, while a significantly larger proportion of 3rd grade treatment students met or exceeded standards than the control group students (Table 2.7 & Figure 2.5). The treatment and control students groups performed at similar levels in 5th, 7th and 8th grades (Table 2.7 & Figure 2.5 and 2.6), while there were too few 6th grade students (sample size of less than 10 students) to compare.[11]

[11] Note that percentages in tables and figures may be slightly different due to rounding.

Table 2.7: SBAC Mathematics, Matched Treatment to Control, Scaled Scores and Percent Met or Exceeded Standard, 2015-16

		Average Scaled Scores			% At or Exceeded Standards		
Grade Levels	*n* (per group)	Treatment	Control	Difference	Treatment	Control	Difference
3rd	133	2389	2386	2	27%	16%	11%*
4th	101	2413	2395	18*	9%	10%	-1%
5th	108	2437	2425	12	8%	7%	1%
7th	290	2500	2509	-8	26%	30%	-4%
8th	231	2479	2490	-11	16%	22%	-6%

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Figure 2.5: SBAC Mathematics, Elementary Matched Treatment to Control Achievement Levels, 2015-16

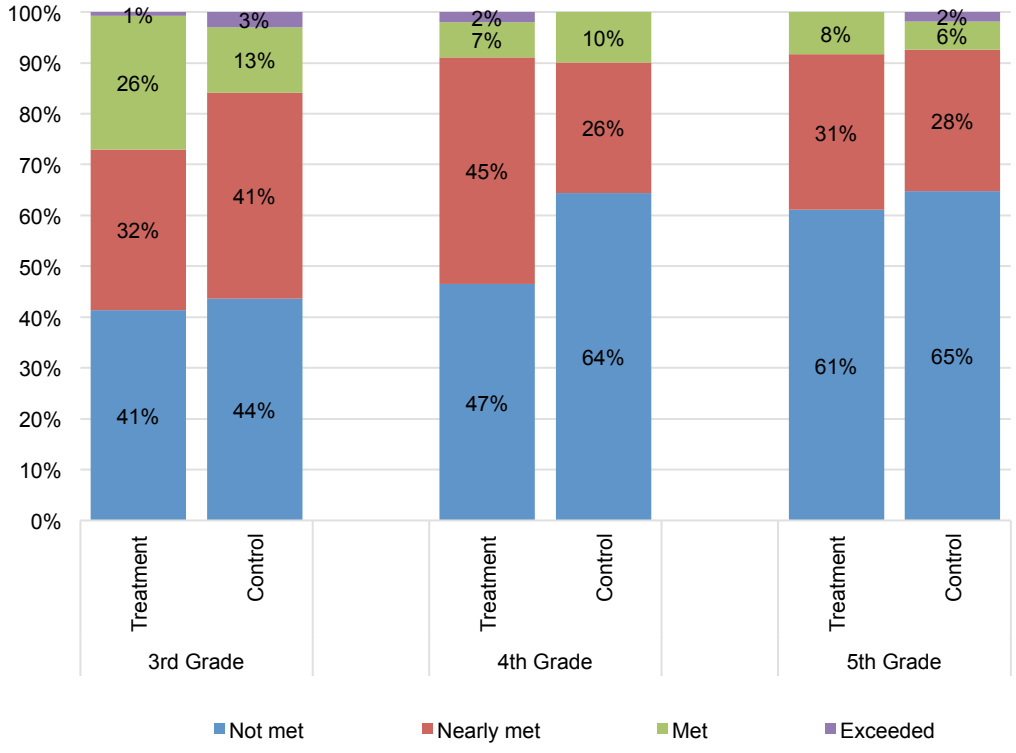
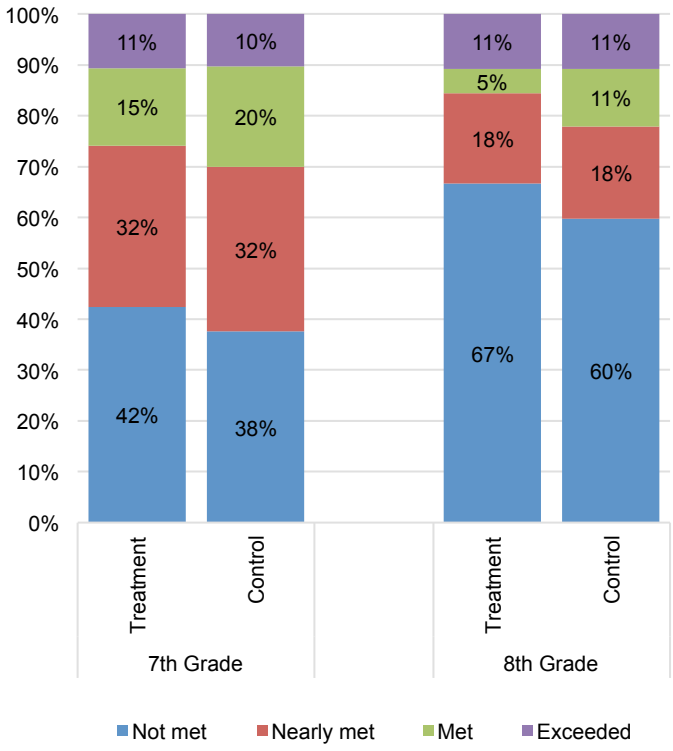


Figure 2.6: SBAC Mathematics, Secondary Matched Treatment to Control Achievement Levels, 2015-16



Section 3: Local Evaluation Data Collection and Analysis

The local evaluation plan includes the instruments listed below for the collection of data, analysis, and reporting during the Year 1 performance cycle (2015-16). A brief description of each instrument is included in the analysis section that describes its development, data collection timeline, status (i.e., pilot, locally designed, research-based), and use within the project's overall evaluation plan. A brief summary of Year 1 findings to date can be found in Section 4 of this report. Next steps for data collection in the evaluation conclude this report.

Project *Make the Way* utilizes Maker Design projects in the classroom as a vehicle for academic achievement and students' mathematical understanding and engagement, dispositions and attitudes towards mathematics and its real-world use. This section of the report will focus on:

- Teacher Pre-Institute Survey
- PW Professional Development Feedback Survey
- Teacher Reflective Feedback from Saturday Intensive Workshops
- Lesson Study and Portfolio Evaluation
- Student Attitudes Towards Mathematics Baseline Survey
- Student Interviews to Assess Changing Attitudes Towards Mathematics after Year 1
- Let's Go Learn Assessments

Teacher Findings

Make the Way Teacher Pre-Institute Survey

In the spring of 2015, the project leadership team created and distributed a survey to 57 teachers participating in Project *Make the Way* to assess teacher confidence in teaching mathematics and their background related to mathematics instruction. Fifty-seven *Make the Way* teachers were surveyed and results were used to inform the Summer Institute development process. In Table 3.1, *Make the Way* teachers were equally distributed across grade levels with 34% K-2, 32% grade 3-5, and 39% grades 6-8 and the majority of *Make the Way* teachers were female (84%).

Table 3.1: Grade Level and Gender (n=57)

Grade Level	%	Gender	%
K-2	34%	Male	16%
3-5	32%	Female	84%
6-8	39%		

In Table 3.2, the majority of *Make the Way* teachers have taught for 6 to 20 years (79%). Fifty-one percent of teachers have taught at the current school for 6 to 20 years and the last time *Make the Way* teachers completed a college level course was more than 11 years ago (63%)

Table 3.2: Years Taught (n=57)

How many years have you taught?	%	How many years taught at current school?	%
First year teaching	5%	First year teaching here	14%
2nd year	7%	2nd year	16%
3-5 years	9%	3-5 years	20%
6-10 years	27%	6-10 years	34%
11-20 years	32%	11-20 years	13%
More than 20 years	20%	More than 20 years	4%

Approximately, how many years ago was the last college level mathematics course you completed?	%
1-2 years	4%
3-5 years	11%
6-8 years	14%
9-10 years	9%
More than 11 years	63%

In Table 3.3, *Make the Way* teachers were asked to rate statements about mathematics, using a Likert scale ranging from 1 ="strongly disagree" to 4 = "strongly agree." Focusing on "strongly disagree" and "disagree," high percentages of teachers *disagreed* with statements that would indicate a more fixed mindset related to mathematical ability such as: you can have a certain amount of math ability, and you really can't do much to change it (99%); you can learn new things, but you can't really change your basic math ability (98%), and your math ability is something about you that you can't change very much (92%).

Table 3.3: Teachers Opinions on Math (% Strongly Disagree and Disagree; n=57)

	%
You have a certain amount of math ability, and you really can't do much to change it.	99%
You can learn new things, but you can't really change your basic math ability.	98%
Your math ability is something about you that you can't change very much.	92%

Make the Way teachers were also asked about statements about mathematical engagement of students using a Likert scale that ranges from "not at all true" to "very true" (Table 3.4). Focusing on "sort of true" and "very true," high percentages of *Make the Way* teachers indicated they believed it was true that: in mathematics you can be creative and discover things by yourself (94%), the math that I teach is thought provoking (88%), and all students can learn mathematics to high levels (88%). Lower proportions of *Make the Way* teachers believed that the following statements were "sort of true" or "very true" indicating some areas to focus in the coming years. For instance, 61% of *Make the Way* teachers reported real math problems can be solved by common sense instead of math rules teachers used in school and 57% percent stated that the math that they teach is just a way of thinking about space, numbers and problems.

Lower, yet still sizable, percentages of *Make the Way* teachers indicated the following statements were true or very true: the math that they teach is mostly facts and procedures (43%), some people are good at math and some just aren't (35%), or in mathematics something is either right or it's wrong (30%). Very small percentages of teachers indicated they believed that the best way to do well in math is to memorize all of the formulas (14%),

everything important about mathematics is already known by mathematicians (11%), to solve math problems you have to be taught the right procedure, or you have to be taught the right procedure, or you can't do anything (11%), and math problems can be done correctly in only one way (5%).

This initial survey indicates that *Make the Way* teachers believe they are providing mathematical instruction that is less procedural, with the belief that everyone can excel in math and that there is variation in mathematics, there is room for expanding one's math content knowledge, and that one can use many representations to solve math problems.

Table 3.4: Professional Outcomes (% Sort of True and Very True; n=57)

Professional Outcomes	**%**
In mathematics you can be creative and discover things by yourself.	94%
The math that I teach is thought provoking	88%
All students can learn mathematics to high levels.	88%
Real math problems can be solved by common sense instead of the math rules we use in school.	61%
The math that I teach is just a way of thinking about space, numbers, and problems.	57%
The math that I teach is mostly facts and procedures	43%
Some people are good at math and some people just aren't.	35%
In mathematics something is either right or it's wrong.	30%
The best way to do well in math is to memorize all of the formulas.	14%
Everything important about mathematics is already known by mathematicians.	11%
To solve math problems you have to be taught the right procedure, or you can't do anything.	11%
Math problems can be done correctly in only one way.	5%

Make the Way teachers were asked about their participation in the CaMSP grant (Table 3.5). Continuing to use the Likert scale "not at all" to "very true," high percentages of teachers indicated being interested in student centered learning (100%), helping teachers develop teaching practices that engages the potential of each student to understand mathematics (99%), helping teachers think more deeply about the mathematics they teach (98%), helping teachers think more deeply about the science that they teach (94%), and interest in understanding the Maker Movement (91%) as important potential professional outcomes from participating in the project.

Table 3.5: Professional Outcomes (% Sort of true and Very True; n=57)

Professional Outcomes	%
Because I am interested in student centered learning	100%
To help me develop teaching practices that engage the potential of each student to understand mathematics.	99%
To help me think more deeply about the mathematics I teach.	98%
To help me think more deeply about the science I teach.	94%
Because I am interested in understanding the Maker movement	91%

Public Works Professional Development Feedback Survey

On the last day of Project *Make the Way's* 2015 summer institute, 66 Santa Rosa City School teachers were administered the CaMSP professional development survey. This survey focused on teachers' opinions about the summer institute activities.

Project *Make the Way* teachers were asked about the activities of the summer institute (Table 3.6). Teachers responses were given on a Likert scale ranging from "strongly disagree" to "strongly agree." Focusing on responses indicating "agree" and "strongly agree," high percentages of teachers agreed: what they learned during this training will shape how hey teach math next year (97%), they intend to implement new strategies learned from this training in their classroom (97%), the materials distributed were relevant and useful (95%), the professional development elevated their enthusiasm for teaching (94%), the training provided them with useful information about teaching math to students with a range of math skills levels (93%), the presentation of math content was effective (91%), and the presentation of teaching pedagogy was effective (90%). Eighty-nine percent of teachers agreed that the professional development met their expectations and increased their interest in establishing a professional learning community at their school.

Table 3.6: Opinions on the Professional Development (% Agree and Strongly Agree; n=66)

	%
What I learned during this training will shape how I teach math next year	97%
I intend to implement new strategies learned from this training in my classroom	97%
The materials distributed were relevant and useful	95%
The Professional Development elevated my enthusiasm for teaching	94%
The training provided me with useful information about teaching math to students with a range of math skill levels	93%
In this training, the presentation of math content was effective	91%
In this training, the presentation of teaching pedagogy was effective	90%
The Professional Development met my expectations	89%
This training increased my interest in establishing a professional learning community at my school	89%

In Table 3.7, Project *Make the Way* teachers were asked to rate the training overall, teachers responses were given on a Likert scale ranging from "poor" to "excellent." Teachers responded with "good" or "excellent" on the following: overall rating of training sessions (95%), pedagogy or instructional methods covered (94%), content of professional development (93%), and quality of the presentations (93%). Eighty-eight percent of teachers found the training relevant to the classroom.

Table 3.7: Opinions on the Training Overall (% Good and Excellent; n=66)

	%
Overall rating of this summer's institute sessions	95%
Pedagogy or instructional methods covered	94%
Content of professional development	93%
Quality of the presentations	93%
Relevance to the classroom	88%

In Table 3.8, teachers were also asked about their preparation at this point in their career, teachers responses were given on a Likert scale ranging from "strongly disagree" to "strongly agree" with the option of selecting "not applicable." Focusing on "agree" and "strongly agree" high percentages of Project *Make the Way* agreed they are prepared to: encourage students discussion around math concepts (100%), align their teaching to California standards in mathematics (98%), deliver math instruction appropriate to English Learners (98%), use student assessment results to modify and shape instruction (98%), understand math concepts addressed in the standards (98%), integrate relevant, real-life examples of mathematics into their teaching (97%), differentiate math instruction based on student learning styles and needs (97%), and teach all students to high achievement levels (95%). Eighty-nine percent of teachers select assessments that measure student understanding of math.

Table 3.8: Teachers Preparation (% Agree and Strongly Agree; n=66)

At this point in my career, I feel that I am prepared to…	%
Encourage student discussion around math concepts.	100%
Align my teaching to California standards in mathematics	98%
Deliver math instruction appropriate to English Learners.	98%
Use student assessment results to modify and shape instruction.	98%
Understand math concepts addressed in the standards.	98%
Integrate relevant, real-life examples of mathematics into my teaching.	97%
Differentiate math instruction based on student learning styles and needs.	97%
Teach all students to high achievement levels.	95%
Select assessments that measure student understanding of math.	89%

Project *Make the Way* teachers responded to a general open-ended question about the benefits of the institute that the presentations encourage learning communities to be a safe environment for teachers and that the activities presented generated interest in using Maker ideas and projects to use in math/science or in the classroom. Teachers also valued hands on learning, collaboration with other teachers, learning and reviewing the "Five Dimensions of the Mathematical Classroom," and discussing leadership and the relationship to agency, authority and identity.

Teacher Reflective Feedback from Saturday Intensive Workshops

During the Saturday Intensive sessions, *Make the Way* teachers were asked to reflect on the session and the ongoing lesson development process. Reflections comprised open-ended responses to the following:

- I learned……
- I valued …….
- I would like more information ……
- Comments:
- What, if anything, have we done to date that has helped to clarify what it means to construct an argument in mathematics? And/or how to support students in doing so?
- Over the past few months have you developed a better understanding of how your students learn math? Explain.
- Do agency, authority and identity play a role in the way your students learn math? Explain.

Collecting feedback from teachers at each of the Saturday Intensive sessions allows the leadership team to obtain useful session-specific comments as well as informing future PD activities and sessions.

Overall, the feedback from the Saturday Intensive sessions was extremely positive, with the majority of teachers reflecting positively on the day. Negative comments were primarily logistical in nature and, although perhaps warranting attention, were not relevant for the evaluation process. Significant themes included the following:

- Useful learning about NGSS
- Useful learning about the Maker Project and Maker activities
- Teachers clearly appreciated that their time was valued and the sessions were well planned and organized.
- Teachers valued time to work within their grade levels and work on their group Maker activities.
- Teachers expressed a desire for more information about the alignment of state standards with Maker activities.
- Comments regarding specific presenters were overwhelmingly positive and enthusiastic.
- "I valued spending time with grade level teachers and having conversations about purpose"
- "I still feel overwhelmed about really revolutionizing my practice to be project based"
- "Some of our poorest performers thrive in the Maker environment, and I love that"

Representative specific comments are presented below:

- "I valued spending time with grade level teachers and having conversations about purpose"
- "I still feel overwhelmed about really revolutionizing my practice to be project based"
- "Some of our poorest performers thrive in the Maker environment, and I love that"

Lesson Study and Portfolio Evaluation

Teachers participating in *Make the Way* created portfolios of artifacts to document their own learning about the Maker mindset, Maker projects, student engagement in Mathematical Practices and students' evolving mathematical agency, authority and identity. Lesson study teams created Power Point presentations to present at a Share Case for the April, 2016 professional development session. Portfolio artifacts were used in these presentations as evidence in order to support claims regarding the lesson study process and implementation of Maker Project activities. Each presentation was asked to address:

- A thesis statement about their lesson study experience
- What do students revise?
- What do teachers revise?
- Evidence of mathematical practices the team saw students utilize while working on a Maker Project.

All 11 lesson study teams gave presentations at the project Share Case; each team had the opportunity to watch and learn from several other teams' experiences. Presentations were archived and also filmed for review by the project director and Public Works staff. Because the lesson study groups covered different grade levels and projects, it is difficult to directly compare the teacher experiences with the lesson study revision process. The following summary addresses broad themes revealed after watching the eleven presentations. Because the *Make the Way* project has a goal of portfolio development, analysis, and evaluation, the project's experience with different portfolio platforms is also summarized in this section.

A summary of the thesis statements of each lesson study group, with group name and grade level, follows:

Reasoners (K)
By adding a discussion about bridges prior to the lesson, we increased students' agency, identity and authority in bridge-building.

Motivators (1st)
Lack of familiarity with the materials was an obstacle to student success in meeting the challenge. Setting the gap ahead of time interfered with successful construction. Student agency, authority and identity was impeded by a lack of tangible success.

Engagers (1st)
Revising student groupings provides opportunities for change in our students' agency, authority, and identity.

Interacters (3rd)

By offering subliminal background knowledge, providing individual think/plan/sketch time, and encouraging group shared planning time, we increase our students' agency, authority, and identity.

Respecters (2nd)

If we group students strategically, then students will develop their agency, authority, and identity. This will allow them to engage in mutual dialogue and engage in mathematical practices.

Questioners (3rd)

Removing time constraints would allow for success in many areas.

Communicators (4th)

Authority is situational and dependent on group dynamics.

Modelers (5th)

Providing students with a model of a marshmallow tower that incorporated triangles and rectangles for stability and strength, would encourage students to utilize the strength building shapes when building their own tower. The model would also challenge them to stretch their thinking and produce a taller structure

Convincers (6th)

Students new to Maker projects need structured time to plan, reflect, revise, and document.

Thinkers (6)

Given smaller groups, more planning time to communicate ideas to team members and prior experience with materials, students will their level of agency, authority and identity.

Perseverers (MS)

With structured time and multiple experiences, more students will tend to increase their level of agency, authority and identity.

All of the lesson teams recognized the value of creating built-in time for students to think about their approach to the challenge before they engage in teamwork. This revision allows the student sufficient time to consider the challenge and to consider a solution to share with the group. When this revision was made between lesson study implementations, the teachers observed more equal engagement among group participants. Most groups also noted that the students are more actively engaged during the project activities than during typical classroom sessions.

The primary focus on the *Make the Way* project during Year 1 was to increase students' mathematical agency, authority and identity. The presentations and ensuing teacher discussions included many statements that agency/authority had increased because of Maker Project activities. These statements were typically accompanied by video clips showing students engaged in group work and tackling a project. However, these opinion claims were typically quite vague and there is no calibration that allows quantitative analysis of an increase in agency and/or authority. Future investigations related to the claim of increased mathematical agency, authority and identity will benefit from evaluation before and after the Maker Project experience and teacher calibration around these observations.

Although lesson study groups were asked to include evidence of mathematical practices in their presentations, few of the groups did so. A few groups included unsubstantiated claims that the activities showed students creating mathematical arguments while showing clips of students engaged in group work. When lesson study groups made statements about lesson

study "success" then tended to focus on creation of successful products. For example, when building towers with marshmallows and toothpicks, a successful project would have each class group producing a standing tower during the class period. One goal of the *Make the Way* project is to change teacher beliefs and attitudes so that the definition of success is expanded to include experiential learning and the ability to use new experiences to leverage the learning of mathematical content.

During the summer institute in 2015, teachers were introduced to the portfolio expectation so that teachers would be mindful about collecting evidence and documenting their lesson study experiences. There was no required format for the portfolio component but many teacher groups utilized Google platforms. In October, 2015 the project gained access to the Loft platform, which is an education-oriented, design-based site that allows for documentation, collaboration, and feedback. The project leadership advocated for use of this site so that teachers, lesson study groups and team leadership would have the ability to work collaboratively within a single platform. Unfortunately, incorporating use of the Loft into the first year of the *Make the Way* project proved frustrating and overwhelming to participating teachers and there was insufficient opportunity for them to become comfortable using this site on their own or in their lesson study groups. The nomenclature, metaphorical names from design thinking, and inability to easily "play around" in the software made the capabilities within this software difficult for teachers to learn.

Project leadership remains optimistic that the Loft will be a powerful tool to help teachers through design thinking and documentation of the lesson study process in the coming year. If implemented correctly, the Loft can be used to capture evidence related to what type of video teachers find interesting to share, what teachers find important to notice when viewing video, and to better understand the quality of their feedback among peer groups. By using the Loft throughout the year, it may become easier to capture formative assessment data related to participant understanding and application of information from the Summer Institute and Saturday sessions. Planning for Year 2 includes creation of a Loft guidebook, development of practice challenges for participating teachers, more extensive use of the Loft during PD activities, and modeling how to use and navigate the features of the platform.

Student Findings

Student Attitudes Towards Mathematics Baseline Survey

In the fall of 2015, Public Works administered a survey to students of teachers participating in Project *Make The Way* focusing on student attitudes towards mathematics. Teachers administered the surveys to their math classes to provide a baseline measure to inform the professional development process about specific strategies and lessons that most resonated with students. Students were then interviewed at the end of the school year to examine any attitude changes towards mathematics after exposure to new strategies. Nearly all of the teachers participating in *Make The Way* administered the survey to their students, for a total of 887 completed student surveys. *Make The Way* includes teachers and students in the K-8 grade range, however students in grades K-2 were not administered a written survey due to the logistics of their readiness for a written survey.

Table 3.9: Student Characteristics (n = 887)

Gender	**N**	**%**
Male	445	52%
Female	418	48%
Grade Level		
3rd	162	19%
4th	181	21%
5th	116	13%
6th	292	33%
7th	88	10%
8th	37	4%

Student characteristics are shown in Table 3.9 as the number and percentages of students who responded by gender and grade level. Slightly more male students responded to the survey than female students (52% and 48%, respectively). The survey was administered to mathematics classes in 3rd – 8th grade. About a third of the respondents were 6th graders, whereas the fewest percentage of students were in the 8th grade.

In Table 3.10 below, students were asked about their attitudes towards, and experiences with, mathematics. Student responses were provided using a Likert scale with the following calibration: 1 "strongly disagree," 2 "disagree," 3 "agree," and 4 "strongly agree." Mean responses were calculated for each question and indicate that there is agreement (mean >3.0) for most of the statements about mathematics. The highest level of agreement was for the statements "It is important that I understand why math works and makes sense" and "We solve problems in more than one way," which both had means of 3.6.

Only three statements had significant levels of disagreement as indicated by mean scores of less than 3.0. These included "Other students respect or value my ideas about math in class," and " I am interested in having a job or career that uses math" indicating some areas for growth for students. "It is important in my class that we find the right answer quickly" also had lower levels of agreement. The last item is a positive finding because finding the right answer quickly is *not* an important goal for teaching mathematics in this project. A substantial number of surveys, especially among the younger students, answered with similar high numbers (3's or 4's) all the way down the series of questions.

Table 3.10: Interest and Attitudes Towards Mathematics (n=887)

	1	2	3	4	Average
It is important that I understand why math works and makes sense.	2%	3%	29%	66%	3.6
We solve problems in more than one way.	1%	4%	30%	65%	3.6
Knowing about mathematics is important to me.	2%	3%	34%	60%	3.5
My teacher gives us time to think to ourselves before we answer.	1%	4%	34%	61%	3.5
Our class learns how math works through projects and other hands-on activities.	3%	10%	41%	45%	3.3
When one student responds to a question, my teacher continues to ask the class for other ideas.	3%	11%	41%	45%	3.3
It is important in my class that I can explain to my classmates how I solve math problems.	3%	9%	41%	47%	3.3
I am actively involved in classroom activities in my math class.	3%	11%	48%	38%	3.2
There are many chances for me to get involved in our math class.	4%	9%	47%	40%	3.2
My teacher asks us to discuss with classmates before we answer.	4%	10%	45%	41%	3.2
I like to work on math problems.	5%	12%	51%	32%	3.1
I have many opportunities to express my ideas, methods, options, and ways to solve problems when we study math.	4%	14%	48%	33%	3.1
A handful of students answer most of the math problems in our class.	5%	18%	48%	28%	3.0
I am comfortable talking about math problems with other students.	7%	17%	47%	29%	3.0
Other students respect or value my ideas about math in class.	7%	18%	50%	24%	2.9
I am interested in having a job or career that uses math.	12%	24%	35%	30%	2.8
It is important in my class that we find the right answer quickly.	16%	36%	31%	18%	2.5

Student Interviews to Assess Changing Attitudes Towards Mathematics

Because the survey to assess student interests and attitudes showed fairly positive opinions towards mathematics and did not allow for significant room for growth, the project team recognized that more relevant information could be obtained in other ways. Interviews with key students were conducted by Brent Jackson, project director, and Joan Easterday, lesson study consultant from the California Math Project. Interview videos and summary responses were analyzed by Public Works staff to identify common themes among the student participants. The interviewers also provided opinions on emergent themes from the student interview process.

Student interviews were conducted on a convenience sample of 44 participating students during the month of May 2016. Students were chosen by their teachers and were selected from the group of the three focus students that each participating teacher identified early in the school year. At the beginning of the school year each teacher identified three focus students who they believed to have low status in the mathematics classroom, or low mathematical agency, authority and identity. At least one student from each grade level at each participating school was interviewed during this process. Interviews lasted approximately 45 minutes.

Each interviewer used a protocol that guided the main questions and then the interviewer asked additional follow-up questions as needed. The questions were developed to understand each student's mathematical identity at this point in time and to better understand his/her beliefs about learning mathematics. The four focusing questions for the interviews were:

1. Think about a student in class that you believe is a good math student. Can you describe what he/she does in math class?
2. How do you know if you've done a good job on a math problem?
3. Do you see math at home or outside of school? Describe/explain.
4. Do you think you are a good math student/math thinker? Why?

Students were also asked about the Maker Project implemented during the school year and to complete a math task related to geometric measurement.

The most common responses expressed related to what makes a "good" math student were related to teacher comments and level indicators such as test performance and seeing students levels in classroom curriculum (Table 3.11). Other common responses were related to classroom behavior and how quickly questions were answered. Infrequently mentioned responses included references to natural ability, perseverance, and concentration.

Table 3.11: Student responses regarding what makes a good math student (n = 44)

Outside agent: explicit teacher feedback, level indicators, test performance	22
Classroom behavior: paying attention, eye contact, asking questions, explaining to other students, following directions, taking careful notes	16
Speed; quick responses, first to raise hand, automaticity with math facts, always having the right answers	13

Representative student comments included:

- "He passes every test. When we are doing a times test- he did them all"
- "She listens really well and understands it really quickly"
- "Our teacher tells us good job you got 100 percent or else that we need to do more"
- "She is amazing at math because she knows things instantly"

Students were asked a series of questions related to their participating in their math classes and how they know if they have done a good job in math. These included the opportunity to share ideas, if they felt their ideas are respected, opportunities to explain to classmates, how they obtain help and how they know if their answers are correct. Students indicated that correctness and teacher feedback are how they know if they have done well when working on math problems. Students indicated that they rely on teacher feedback to know whether or not the answer to a problem is correct, even while working with pairs or in groups. Five students spoke in terms of self-reflection as indicators of mathematics success. These students mentioned trying multiple strategies and persevering through a problem. One student mentioned that he knows he has done a good job when he can convince the class of a solution.

Students were asked, "Is it important that you solve problems quickly'? with the following responses: No = 23 students (52%), Sometimes = 11 students (25%), and Yes = 10 students (23%). Although asked slightly differently, these responses are comparable to what was seen during the fall student attitudes survey described in the previous section. In that survey, students were asked their level of agreement with the statement "It is important in my class that we find the right answer quickly" and responses were as follows: Strongly Disagree = 16%, Disagree = 36%, Agree = 31%, Strongly Agree = 18%. Of the students who replied "no" during the interviews most elaborated on the importance of taking time to avoid computation errors and taking sufficient time to understand what the problem is about and how it might make sense to approach solving the problem. Students with "sometimes" responses also expressed concerns about computational errors, but also described feeling time constraints given by teachers and from other factors (e.g., getting to recess on time).

Approximately one-third of the surveyed students responded that they do not see math outside of school, or that the only math they see outside of school is their homework. Nearly half of the students (21) talked about seeing math used related to money for purchases, coupons, or taxes. Other responses were related to measurement or geometric applications (9 students).

When asked if students thought they were a good math thinker or a good math student, 17 students replied by with positive statements affirming this belief. Indicators mentioned by students included: being correct most of the time, quickly getting answers, abilities to use multiple strategies, and ability to represent problems in different ways. Six students replied no to this question and indicated that they have significant struggles with math. Fifteen students replied with a qualified answer such as "sometimes" and three students indicated that they did not know.

The results from these interviews provide glimpses into students' thoughts about what it means to be successful in mathematics and implications for professional development and training teachers to support student success.

Most students refer to their teachers as the primary source of confirmation about who is a good math student and whether or not they have done well while working on math problems. This finding affirms the idea that students are able to develop and change their beliefs about their own abilities, other students' abilities and their working definition of

mathematics success based on teacher praise, criticism and other feedback. Year 1 of the *Make the Way* project focused on students' mathematical agency, authority and identity with a particular emphasis on students who have low status in math class. In future years Make the Way teachers will be able to focus on their own role in developing student opinions and beliefs about mathematics competence.

Interestingly, a large number of students indicated that they recognized "good" math students as those who did their problems quickly or were the first to raise their hands in class. Yet, when asked if it is important that they solve math problems quickly in their classes, most students responded "no." Combining interview responses with data from the student attitude survey in the fall suggests that there has not been any large shift in student perception of the importance of answering math questions quickly. Participating teachers can play an important role in noticing, praising, and developing other mathematical competencies to help shift these contradictory beliefs about speed.

Students described beliefs that struggle is a hindrance to learning mathematics and that students who struggle with mathematics are not good math students. Focusing on engaging students in productive struggle and the role that struggle plays in the process of learning provide opportunities for the future. The student interviews also revealed an interesting disconnect between student perceptions regarding the value of explaining their answers during their math classes. Although students rely on teacher feedback to know if they have done their math well, they recognize the value of being able to explain math to their classmates. From the interviews it is also clear that students were referring to computational explanations and not conceptual or problem solving in nature. When asked about checking their work, students spoke to the accuracy of the computations and not whether the operation makes sense, whether the answer is reasonable for the context or consider other methods for "checking" their work. These classroom practices all point towards students having procedural orientations towards doing mathematics, which provides important opportunities for teachers to help students see the bigger picture of "non-traditional" mathematical thinking.

Let's Go Learn Assessments

Santa Rosa City Schools utilize the Let's Go Learn (Adaptive Diagnostic Assessment of Mathematics K-7) assessment in their elementary and middle school classes. The mathematics assessment was given two times district-wide during the 2015-2016 school year. This online adaptive test assesses a student's complete mathematical understanding and provides a comprehensive picture of each student's strengths and weaknesses. The test presents students with items across a wide range of constructs within five distinct strands: 1) Numbers and Operations; 2) Algebra; 3) Geometry; 4) Data Analysis; and 5) Measurement. Scores reflect grade level, so the results are most useful when looked at as single grade level results.

Students in participating *Make the Way* teachers' classrooms can be compared to other district student's results. Furthermore, because the first year of the Make the Way Project

focused on measurement related projects, the results from the measurement strand of this assessment may be the most relevant. Results from Grade 8 students are not included because the assessment is optimized for K-7 students.

Let's Go Learn Assessment Data are presented in Table 3.12 and include the following information. Column A indicates the number of students who took the assessment in participating teacher's classrooms and non-participating teacher's classrooms for each grade level. Column B summarizes the overall annual change of those students in the classrooms of participating *Make the Way* teachers across all strands. Column C summarizes the change between the first assessment administration in Fall, 2015 and the second administration in Spring, 2016 and shows the net change between participating students and non-participating students. Columns D and E focus on the measurement strand of the assessment; column D summarizes the annual change between fall and spring assessment administrations for the students in participating classrooms. Column E presents the net change between students in participating classrooms from those in other classrooms between the fall and the spring.

Table 3.12: Let's Go Learn Assessment results for K-7 students in participating Make the Way teachers' classrooms and other teachers in the Santa Rosa City School District.

Column	A	B	C	D	E
				Measurement Strand	
Grade Level	n MtW/ non-MtW	MtW overall annual change over all strands	Net Change: MtW vs. Non MtW annual change across all strands	MtW participants annual change	Net change: MtW vs. non-MtW annual change
Grade K	61/434	0.43	0.06	0.17	-0.05
Grade 1	119/637	0.83	0.13	0.5	0.02
Grade 2	78/644	0.87	0.13	0.87	0.25
Grade 3	127/478	0.68	0.11	0.61	0.61
Grade 4	177/523	0.7	0.14	0.59	-0.02
Grade 5	112/513	0.43	-0.12	0.33	-0.19
Grade 6	299/331	0.51	-0.03	0.48	0.59
Grade 7	271/550	0.21	-0.04	0.17	-0.12

Although LGL is a new assessment for this district, some interesting conclusions can be drawn from these results. Students in classrooms of participating *Make the Way* teachers showed approximately half a year of academic growth in mathematics across all strands across all grade levels. This result is to be expected with a full school year between the fall and the spring assessments.

Students in other classrooms where the teachers are not participating in *Make the Way* also showed growth in all strands across all grade levels (not shown in Table 3.12). When the results of students in participating teachers' classrooms are compared to other students in the district there is a suggestion of greater relative improvement among the younger grade levels. Grades K-4 show greater improvement across all strands in the classrooms of participating teachers, whereas students in grades 5, 6 and 7 showed somewhat greater relative improvement in the classrooms of non-participating teachers.

When isolating the measurement strand of the Let's Go Learn Assessment, students in classrooms of participating *Make the Way* teachers showed growth over the course of the school year ranging from a low of 0.17 grade level (in K and 7th grades) to a high of 0.87 grade level in Grade 2. When students in participating classrooms are compared to other students in the district for the measurement strand only, the results show a wide variation from 0.19 grade level improvement lower among participating students (Grade 5) to 0.61 grade level improvement higher among the Grade 3 students.

Further analysis of these results by the project leadership team and Santa Rosa City School District may be useful when developing future professional development and classroom activities.

Curriculum Products

With a goal of four lesson plans per grade level over nine grades (K-8), Project *Make the Way* had plans to ultimately create 36 Maker Project lessons. The IHE partner (Sonoma State University) will finalize the lesson studies and improve the mathematics integration to the Maker component. Currently, the five lessons written during Year 1 are in the process of being revised. Lessons will be posted online by the IHE for distribution and sharing.

Section 4: Conclusions

The CaMSP grant includes multiple grant cycles and results from the local evaluation will be cumulative. This may result in longer-term outcomes that could become apparent at the conclusion of implementation. The findings in this section resulted from both the Statewide and Local Evaluation Instruments and data collection in the first grant cycles, which concluded in June 2016.

Teacher Findings

Measuring Project Impact on Teachers: Teacher findings included in this section are based on analysis of data collected using several different evaluation tools including an annual survey collected each spring, feedback from the summer professional development, and teacher reflections regarding the lesson study process. In addition, teachers participating in the program were required to complete an assessment of teacher content knowledge that was matched from pre to post.

- *Elementary Teachers LMT Teacher Content Assessment Results:* There was no statistically significant change in Mathematical content knowledge of participating teachers from pre to post in Year 1 on the Number Concepts and Operations portion of the LMT assessment. However, there was a statistically significant change in the Mathematical content knowledge on the Patterns, Functions, and Algebra portion of the LMT assessment.
    - When comparing the participating teachers in this program with all other teachers that took the LMT in CaMSP Cohort 11 partnerships on their Year 1 post-assessment scores, teachers in this program earned scores below the average overall. These results were similar for both portions of the LMT.
- *Secondary Teachers LMT Teacher Content Assessment Results:* There was a statistically significant change in Mathematical content knowledge of participating teachers from pre to post in Year 1 on the Numbers and Operations portion of the LMT assessment. There was no statistically significant change on the Patterns, Functions, and Algebra sections of the LMT assessment.
    - When comparing the participating teachers in this program with all other teachers who took the LMT in CaMSP Cohort 11 partnerships on their Year 1 post-assessment scores, teachers in this partnership performed below the average overall on both sections of the LMT assessment.
- Participating teachers have generally high levels of satisfaction with the professional development experience; in particular they are most satisfied with the quality of the teachers and the overall quality of the summer activities. Teachers expressed high levels of satisfaction with how project activities have helped to convince them of the importance of hands-on learning and taught them about the lesson study process. Increase in student interest in math was particularly noted by teachers, whereas experiencing STEM careers through field trips, mentorships, job shadowing and internships was not indicated by teachers as being an area of improvement.
- *Make the Way* teachers are very experienced mathematics instructors and they are providing mathematical instruction that is creative and less procedural than traditional math education. Teachers expressed the belief that everyone can excel in

math, there is room for expanding one's math content knowledge, and that one can use many representations to solve math problems.

- *Make the Way* teachers expressed satisfaction with most aspects of the professional development activities at the 2015 summer institute with very high response rates for all aspects of the Professional Development experiences, pedagogical and instructional methods covered, and how to encourage student engagement in math concepts.
- Teachers' reflections regarding the Saturday Intensive sessions were overwhelmingly positive. Teachers appreciated the content information delivered and that their time was valued and well-used. Ongoing attention should be paid towards the integration of Maker activities into supporting the implementation of state standards for mathematics and science.
- Lesson study teams recognize the value of creating built-in time for students to think about their approach to mathematical challenges before engaging in group problem-solving activities. Teacher opinions of "successful" projects tend to be focused on traditional definitions of success rather than recognizing the value of problem solving, mathematical fluency, and creative solutions to problems.

Student Findings

Measures Project Impact on Students: The summary of student findings included in this section are based on analysis of statewide assessment data of a treatment and control group of students and data collected through the following locally developed tools including a pre and post attitude and confidence survey, student interviews, and district mathematics assessments.

- For the student outcome study, PW designed a matched comparison student outcome study. Participating teachers who have completed the required 84 grant hours (60 intensive hours and 24 hours of follow-up in Year 1) are referred to as the treatment group. Academic performance and demographic data were collected for students of treatment and control teachers. SBAC mathematics results from 2015 provide a baseline measure for student outcomes from the first year of implementation.
    - For the SBAC, Public Works conducted a matched comparison analysis that included 1,159 students of 35 *Make the Way* teachers compared to nearly 2,400 students of 56 non-participating teachers, with a final matched analysis of 865 students in each group.
    - These results indicate there were no significant differences between the 5th, 7th and 8th grade treatment and control SBAC scores or achievement levels. However, 3rd and 4th grades *Make the Way* students outperformed the control group. There were too few 6th grade students to run a comparison analysis.
- Students in mathematics classes engaged in *Make the Way* activities reported baseline attitudes that indicated fairly positive opinions towards math and their math classes. An area for potential growth surround student interest in having a job or career that uses math.

- Interviews with students in the classrooms of teachers participating in *the Make the Way* project indicated that students develop opinions about their own mathematical ability and success, as well as those of other students, primarily from direct teacher feedback and classroom behaviors. Interviewed students perceive struggling with math problems a negative characteristic of math learning and answering questions as evidence of fellow students' mathematical abilities.
- Student assessment data in mathematics showed improvement across all areas across all grade levels among both students in participating teachers' classrooms and district-wide. Slightly greater net improvements were seen in grades K-4 than in the higher grade. When isolating the measurement subsection of the Let's Go Learn Assessment, there were no consistent differences between participating students and non-participating students.

Lessons Learned

Evaluation of the first year of Project Make the Way revealed several important points related to the evaluation process and possible modification for the second grant cycle.

Most aspects of the evaluation process were relatively straightforward and utilized surveys and feedback forms. Students of participating teachers were surveyed early in the 2015-2016 year in what was intended to be a pre- post-survey to assess changes in student attitudes and behaviors over the year. Although slightly different surveys were given to 3-5 graders from those given to 6-8 graders, teacher feedback indicated that the surveys for the younger grade levels required a deeper level of understanding and reading ability than those students were capable of. Survey results indicated that most students had positive opinions towards most aspects of their mathematics learning. It was determined by project leadership that there was not sufficient room for growth in this area. Furthermore, the focus on Year 1 of this project was on student agency, authority, and identity within mathematics. The survey did not sufficiently get at this aspect of mathematics learning among the students. Thus it was decided that more valuable information could be obtained with student interviews regarding mathematics learning than by administering a dedicated post-survey to students. The student interviews in the spring yielded useful and important information regarding student learning.

Assessment of the lesson study process by using information contained within online teacher portfolios proved more difficult than anticipated. Participating teachers struggled to gain comfort with the online portfolio system and recording the process aspects of their lesson study experience in this way proved cumbersome. Presentation of the lesson studies at the spring showcase and teacher reflection yielded sufficient information regarding the lesson study process for evaluation purposes. The project is eager to incorporate the online portfolio development in Year 2.

Next Steps in the Local Evaluation

For the second grant cycle of implementation of the SRCS Project *Make the Way* through June 30, 2017, PW will collect the following information, which will be included in the Year 2 evaluation reports. Next steps for data collection in the evaluation conclude this report.

- Year 2 LMT results for participating teachers
- Year 2 (2016-17) Student Outcome Study
- Teacher Attitudes and Behavior Surveys
- Teacher Summer Institute Feedback and Reflective Feedback from Saturday Intensive Workshops
- Student Attitudes Towards Mathematics pre- post-Survey
- Student "Tiny Measures" Monthly Assessment of Mathematical Thinking
- Lets go Learn Assessments
- Lesson Study and Portfolio Evaluation