

Evaluation Report – Year 3 – Mathematically-Connected Communities

The following is an evaluation report from the last year of the Mathematically-Connected Communities (MC²) Math Science Partnership MSP Grant funded by the New Mexico Public Education Department with flow-through monies from the United States Department of Education Federal MSP program. The report describes our findings from the last year of the initial three-year MSP grant. The time period for this grant corresponded with the funding period we received from the Public Education Department which ran from May 2004 to May 2007.

Evaluation and research were not initially a focus of this grant, nor was much funding provided for evaluation, however, by end of this last year of the grant we had formed an evaluation team and designed an evaluation plan for MC². This report contains data collected as part of this plan which began during the 2006-2007 school year. One of the MSP P.I.s, K. Wiburg, as well as an independent evaluator, K. Korn, planned for and gathered data related to the impact of MC² on its partner districts and schools beginning in fall 2006. Additional evaluation was also provided by a central state-wide evaluation team during the second and third year of the first round of MSPs. Thus the evaluation model used was a combination of a local and state-wide evaluation. The state evaluation was conducted by:

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Additional information related to the evaluation of all MSP state grants is available from the state evaluator.

Mathematically-Connected Communities (MC²) was designed to improve mathematics achievement by building a strong partnership between mathematics educators, mathematicians, and district leaders who provided summer academies and continuous professional development during the school year. We were interested in the effect of the MC² partnership program on teacher learning and student achievement. As our work evolved we became increasingly interested in how a district as a system needed to change in order to build capacity for mathematics achievement for its students. The research design is described in the following section.

Research Design

We were interested in finding answers to the following research questions that were developed in conjunction with the project P.I.s, field specialists and mathematicians. Each question is followed by a description of the data that we planned to collect and analyze.

Research Questions and Plan for Data Gathering:

1. What is the effect of MC² on Student Achievement including the effect on English Language Learners?

Does the MC² partnership program affect student achievement in mathematics as measured on the state standards-based assessment?

When you disaggregate achievement data, what effect does MC² have on the achievement of ELL students?

We planned to collect student achievement scores on the state-required Standards-based assessment by districts, schools and teachers. We attempted to collect data by teacher and school and sent multiple requests to district administrators, but even when the district sent data disks to our internal evaluator, Ken Korn, he was not able to find clear data by teacher or school for the 2006 or 2007 data. We are currently working with the new state researcher in the Math and Science Bureau at the Public Education Department, Pascal Busar, to be able to collect scores by teacher for deeper analysis of the relationship between the professional development provided by the project and the success of students in mathematics. In the next cycle of the project which began June 1, 2007 we will work to get this additional data and use a mixed effects hierarchical model to begin to explore relationship between achievement, teacher growth in content knowledge, and professional development of teachers.

Because of the lack of data available by teacher and student, the findings below related to student achievement are reported by our partner districts. In addition, the student achievement data for districts was also disaggregated from the standards-based assessment to include gains in achievement made by English Language Learners (ELLs). Many of our districts had high percentages of English Language Learners and achievement in mathematics for ELLs remains a significant problem.

No. 2 – Professional Development

2a. What type of professional development did teachers participate in during the school year?

- a) How many people participated in professional development?
- b) In what type of participation were participants involved?
- c) How many hours of professional development was provided and of what type?

We asked the MC² field specialists who worked with the teachers in our partner schools to collect data related to the professional development workshops and consultations offered in their districts. They used professional development logs to code the type of professional development offered (see Table VI in this report), the date and time of the professional development and a listing of the attendees.

2b. Did teachers increase their pedagogical content knowledge in mathematics?

Data was collected in terms of the professional development of teachers, student achievement scores in partner districts, and teacher pedagogical content knowledge gained during the summer academies. Teachers in summer academies also produced lesson plans for implementing the new standards-based curricula in their schools and engaged in solving and writing up mathematics problems.

No. 3 – What seems to be the effect of district administration leadership on the effective implementation of a new mathematics program?

This became an important question during the third year of our MSP grant. During the first two years we focused on serving mathematics teachers regardless of which district they

came from. However, we had discovered through an NSF-funded project that focused on facilitating whole district improvement in mathematics achievement, that consistent whole-district leadership made a difference in closing the achievement gap for all students. We can hypothesize from the comparison of gains of students in this district with our other partner districts and with gains state-wide, that consistent district leadership, curriculum, and professional development seemed to have a significant effect on both closing the achievement gap and raising achievement for all students. As of May of 2007 we have comparison data from this district with average state data for mathematics achievement. While this is only one district, the findings for district-wide programs and professional development seemed promising. As a result of this work we revised our MSP project in year 3 and decided we would only work with whole districts. During the final year of our project we developed memorandums of agreements with partner districts that would adopt a district-wide standards-based curriculum, provide time for teachers to collaborate on teaching the curriculum, and contribute to the cost of coaching and/or materials for their teachers.

Table 1 below shows the differences in average student proficiency scores between the Gadsden Unified School District, a 95% Hispanic district in a low-income border community and the state average for student proficiency in mathematics. Table 2 shows the gains made by English Language Learners (ELLs) in the district as compared to all ELL students in the state.

Table I -GISD Mathematics Test Data 2005-2006

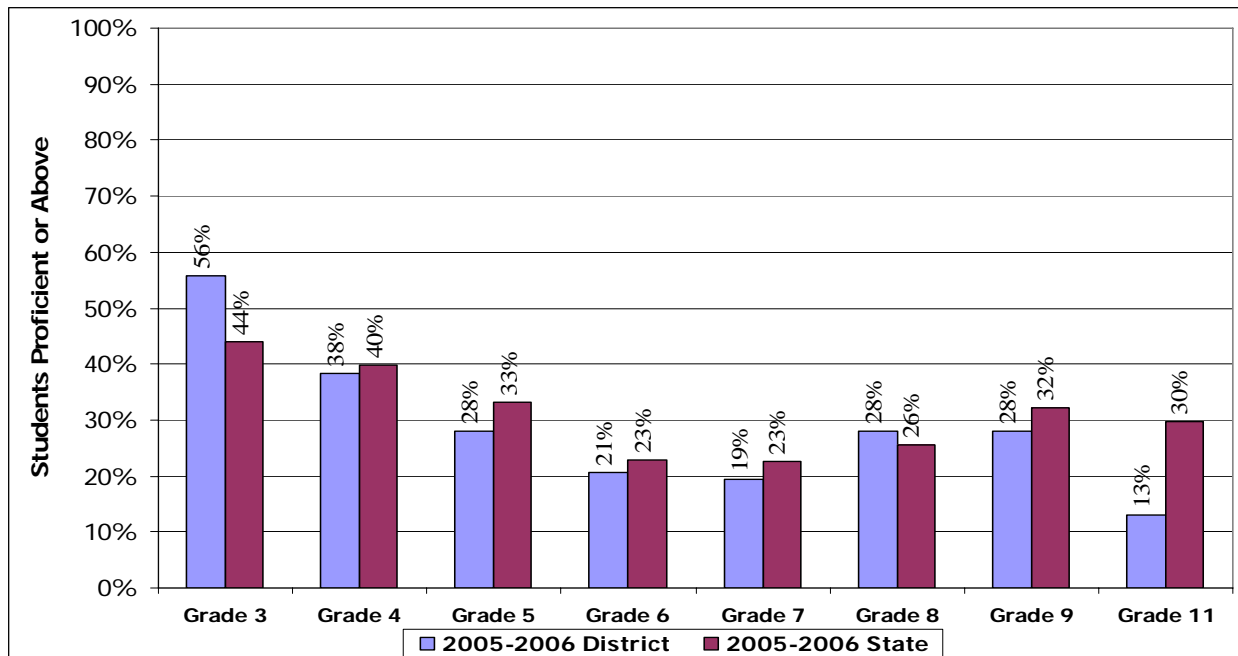
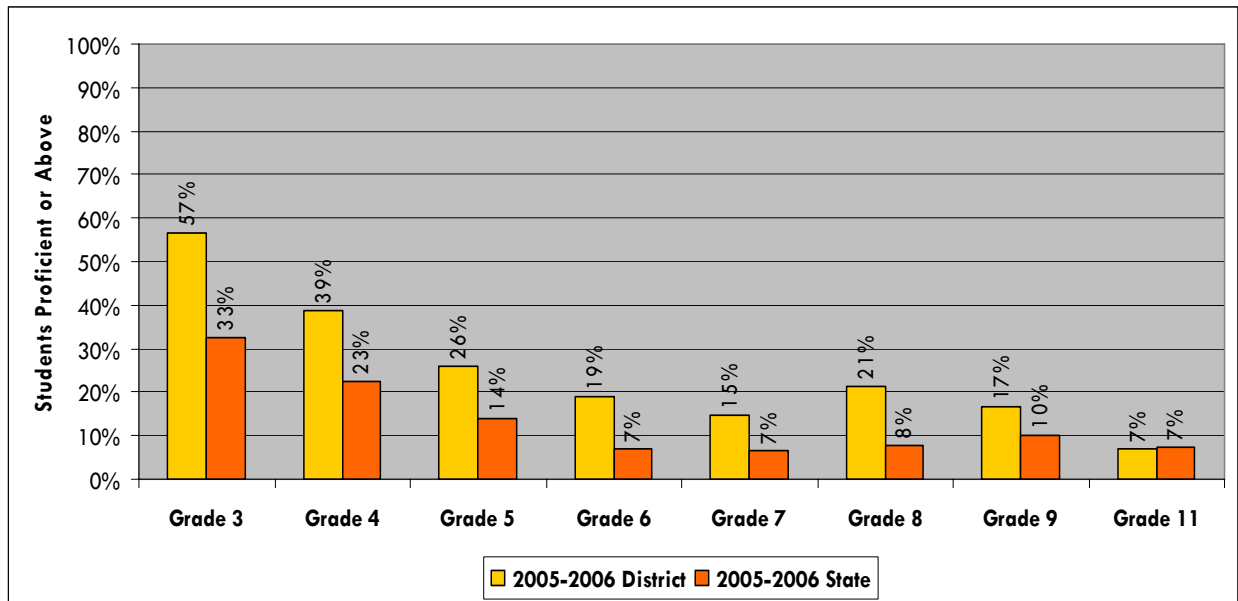


Table II- GISD Mathematics Test Data 2005-2006 ELL



We are currently in the first year of a new MSP that has continued this focus on the whole district as a unit of analysis and will be gathering additional data during the 2007-2008 school year. We have been working with others in the state to develop tools for measuring district effectiveness in terms of leadership, curriculum and professional development and together with the Public Education Department developed a tool called the Quality Mathematics Education Matrix (QMEM) that can be used by districts to evaluate their capacity for building mathematics achievement.

Findings

Student Achievement

As mentioned earlier we made multiple attempts to receive data from partner districts by schools and by teachers and were not able to do so although we expect to be able to have this data next year. However, we do have data related to gains in the districts that partnered with MC² last year as shown below in Table III on the next page. It is promising that all partner districts except one made gains in student achievement on the New Mexico Standards Based Assessment (SBA).

The MC² project directors and staff were also very interested in helping to close the achievement gap for the many English Language Learners who make up a large percentage of the partner districts served. Table IV on the next page shows the gains for ELL students from 2005-2006. We can not provide data yet for 2007 since this data is only now becoming available.

**Table III - NMPED District Accountability Report
 AYP Grade Span Summary
 Grades 6, 7, and 8
 Percent Proficient (or Above) in Math for Districts Served by MC²**

ALL Students			
Districts	2005	<i>Gain/Loss</i>	2006
ALAMOGORDO	27.59%	+8.55	36.14%
CARLSBAD	23.30%	+7.75	31.05%
CARRIZOZO	11.32%	+13.68	25.00%
CORONA	18.75%	+2.30	21.05%
GADSDEN	18.68%	+4.53	23.21%
HOBBS	18.31%	+5.66	23.97%
LAS CRUCES	22.28%	+4.13	26.41%
LOVING	8.21%	+6.79	15.00%
LOVINGTON	22.39%	-0.84	21.55%
MORIARTY	24.08%	+3.54	27.62%
RATON	18.03%	+1.34	19.37%
RUIDOSO	26.20%	+3.38	29.58%
WAGON MOUND	<2%	+8.70	8.7%
WEST LAS VEGAS	8.74%	+1.60	10.34%

2005-2006 Comparison
mean gain/loss +5.08
median gain/loss +4.32
districts with gains 13 (93%)
range of gains +1.34 to +13.68
districts with losses 1 (7%)
range of losses -0.84

While in many parts of the state and the nation the achievement gap in mathematics between mainstream white students and English Language Learners persists, in the case of districts who partnered with MC² over the last year, this did not seem to be the case. All districts except one have shown growth and the one district that had a very small loss is expected to have a large gain in 2007-2008 based on informal reports. Please see Table IV on the next page.

**Table IV - NMPED District Accountability Report
 AYP Grade Span Summary
 Grades 6, 7, and 8
 Percent Proficient (or Above) in Math**

ELL Students			
School	2005	<i>Gain/Loss</i>	2006
ALAMOGORDO	<2%	<i>+7.14</i>	7.14%
CARLSBAD	n/a	--	7.50%
CARRIZOZO	n/a	--	n/a
CORONA	n/a	--	n/a
GADSDEN	15.97%	<i>+2.28</i>	18.25%
HOBBS	3.14%	<i>+5.73</i>	8.87%
LAS CRUCES	12.73%	<i>+10.00</i>	22.73%
LOVING	<2%	<i>+10.29</i>	10.29%
LOVINGTON	5.32%	<i>+2.29</i>	7.61%
MORIARTY	3.64%	<i>+1.81</i>	5.45%
RATON	n/a	--	5.88%
RUIDOSO	18.45%	<i>+10.66</i>	29.11%
WAGON MOUND	<2%	<i>+7.14</i>	7.14%
WEST LAS VEGAS	6.33%	<i>-0.41</i>	5.92%

2005-2006 Comparison
mean gain/loss <i>+5.69</i>
median gain/loss <i>+6.44</i>
districts with gains 9 (90%)
range of gains <i>+1.81 to +10.66</i>
districts with losses (or no gains) 1 (10%)
range of losses <i>-0.41</i>

Professional Development

Summer Academies 2006

All teachers completed a demographic survey during the Summer Academies in 2006. The demographic form used in Summer 2006 was designed by the state evaluator and data on demographics was sent to our state evaluator. Detailed information on summer academy participants for New Mexico is available from the state-wide evaluation.

The following table describes the number of teacher participants in our MC² summer academies in summer 2006. This report covers the period from June 1, 2006 to May 31st, 2007. Information on the Summer academies conducted in summer 2007 will be contained in next year's report.

Table V- MC² Summer 2006 Mathematics Academies			
Academy Sites	# of Participants	# of Schools Represented	# of Districts Represented
Alamogordo	36	16	3
Carlsbad	38	22	5
El Rito	24	11	9
Las Cruces 1	61	13	2
Las Cruces 2	54	17	3
Lovington	29	15	3
TOTALS	242	94	25

The MC² project has evolved over the last three years in order to work with whole school districts. This change necessitated a change in the types of summer academies offered since we now expected all teachers in a district to attend an academy. We therefore offered two kinds of academies, a one week introduction to the new standards-based curriculum that would be used by the district and the mathematics learning that would support that implementation. The second kind of academy was an intense two-week academy focused specifically on deeper mathematics learning. This second two week math academy would also provide teachers with the opportunity to earn graduate credit in mathematics education. Teachers were paid \$500/week for attending the academies and participating in completing the assigned work.

Partner districts were asked to send all, or as many as possible, of their teachers to the one-week academy focused on the new standards-based curriculum the teachers would be asked to implement. The mathematicians on the project worked with the math educators to design learning activities where the teachers would also learn about the mathematics behind the units they would be teaching. Teachers engaged in solving mathematical problems and writing about their solutions. They were encouraged to revise their solutions after conversations and feedback from the mathematicians. Papers based on these problems in successive revision were collected and analyzed by the mathematicians and demonstrated growth in pedagogical content knowledge. During the summer academies the teachers designed a unit they would implement in the fall. During the fall, MC² mathematics field specialists worked with groups of teachers in partner schools and districts using a kind of lesson study, as the teachers taught and reflected on the unit. In many cases teachers were able to visit each other's classrooms and provide feedback on what students were learning from the co-developed units. Copies of the units and the learning from the teachers were collected by the professional development field specialists.

All teachers were also given the 2006 state-wide version of the University Of Michigan Survey Of Teacher Pedagogical Content Knowledge at the summer academies. However, a post-test was not given for several reasons, the most important being that the test for 2006 did not follow the guidelines from the University of Michigan and contained both released items and

items that had been changed from their original version. We also found it difficult to gather together the teachers who had attended the Summer Academy in the spring. Since we did not consider the test to be valid for 2006-2007, we did not do a post-test.

Leadership Academies

Because of our new focus on the importance of district administrative leadership in terms of building mathematics learning for students, we held leadership academies in November and December of 2006. These academies were attended by principals, superintendents, heads of curriculum and instruction and other district leaders. The academies provided opportunities for leaders to learn about and share successes in mathematics instruction and to learn more about standards-based mathematics resources. This was very important because 2006-2007 was the year for math textbook adoption in New Mexico. Administrators and later teachers were invited to listen to presentations by publishers of standards-based mathematics textbooks. A rubric for evaluating textbooks was designed by MC² working with state-wide experts to help them evaluate these materials. Three leadership academies were provided. On December 13th, 40 people attended the academy in Alamogordo. On November 6th, 52 administrators attended the leadership academy help in Hobbs for the South Eastern New Mexico administrators. Later in November, 28 leaders attended the Las Cruces Leadership Academy. It is interesting to note that over 60 of the 89 districts in New Mexico adopted one of the NSF-recommended standards-based text-book adoptions. These materials will help to raise the level of mathematics learning in the state.

Professional Development during the School Year

In collaboration with other MSP projects in the state we agreed to collect data about the types of professional development in which teachers and principals participated. Field specialists employed by Mathematically-Connected Community, who were all high-level certified mathematics teachers, worked with their assigned districts during the year to provide professional development. We were interested in both the type and amount of professional development done in partner districts. The following Table shows the types of professional development that were provided by MC². The field specialists kept logs indicated who had received professional development and what type they had received.

Table 6- Types of Professional Development Provided by MC² – 2006-2007
<p>1. MATHEMATICS FOCUS (MF) Professional development that focuses either on learning mathematics or learning the mathematics behind the lessons or units teachers is developing.</p>
<p>2. ASSESSMENT (A) Teachers are involved in designing assessments, analyzing and assessing student work, taking the Teacher Content Knowledge Survey, or using practice items from the Teacher Content Knowledge Survey. These sessions might also involve teachers in analyzing test scores to understand what kinds of learning opportunities students need, and looking at textbooks in terms of alignment with standards and learning needs.</p>
<p>3. LESSON MODELING (LM) A modified version of Lesson Study where an expert models how to teach a math or science lesson, teachers observe the lesson and a discussion is held afterward about how the parts of the lesson interacted with student learning.</p>

Continuation of Table VII – Types of Professional Development	
4. LESSON/UNIT STUDY (LUS)	A process in which teachers collaboratively plan, observe, analyze, and refine classroom lessons called "research lessons."
5. PEDAGOGICAL FOCUS (PF)	Professional development that focuses on teaching including such topics as learning styles, cooperative learning and other types of grouping, reflective practice, questioning, classroom discourse, student presentations, and classroom management for learning.
6. CURRICULUM ALIGNMENT/TEXTBOOK ADOPTION (CAT)	Professional development with teachers, and/or administrators when they are engaged in aligning their teaching and curriculum with standards and the state assessment. Such alignment may be horizontal, among grade levels, or vertical, across grade levels. These sessions might relate to the <u>assessment meetings</u> and extend understandings about student learning needs to <u>textbook selection</u> in terms of alignment with standards and learning needs.
7. PLANNING FOR UNITS OR LESSONS (P)	Professional development for teachers in which they are working on planning instruction which may involve the development of a unit, a lesson, or even a specific learning activity.
8. ADMINISTRATIVE PROFESSIONAL DEVELOPMENT/MEETINGS (ADMIN)	Professional development workshops that are provided for administrators which can be focused on building capacity for achievement in their schools, analyzing test data, aligning curriculum, or selecting textbooks.
9. TECHNOLOGY INTEGRATION (TECH)	Introducing teachers to the use of technology resources such as mathematics web-resources, on-line course resources, Matrix Learning Pods, calculators, or other types of technology to help students learn mathematics (or science).

The following table provides data related to the amount and types of professional development provided to teachers and leaders in partner districts. Some received more than one type.

Table VII – Types and Amount of PD during School Year 2006-2007				
PD Type	Full Name	# of people	Avg Hours per Participant	Total Hours
A	ASSESSMENT	13	2	26
ADMIN	ADMINISTRATIVE PROFESSIONAL DEVELOPMENT/MEETINGS	60	10	600
BOOK	BOOK STUDY WITH PRINCIPALS	3	6	18
CAT	CURRICULUM ALIGNMENT/TEXTBOOK ADOPTION	175	9	1575
LM	LESSON MODELING	26	5	130
LUS	LESSON/UNIT STUDY	215	14	3010
MF	MATHEMATICS FOCUS (Math Workshops)	110	18	418
P	PLANNING FOR UNITS OR LESSONS	27	4	108
PF	PEDAGOGICAL FOCUS	7	2	14
TECH	TECHNOLOGY INTEGRATION	7	2	14
Total Hours of Professional Development				5913

Conclusions

Gathering and compiling accurate data during the third year of the first grant was difficult because no funds had been set aside specifically for evaluation and we did not have an evaluation team. However, one of the Principle Investigators was interested in beginning to do research on the effectiveness of MC² and was able to enlist the help of a very qualified school district evaluator. Funding for evaluation and research was written into the second round of the MSP grant which has been funded and evaluation as well as research on our work is now an important focus of our work.

During the first grant, the field specialists were focused on the huge need of districts for extensive professional development services and were not focused on evaluation. During the last year of the first three year MSP grant we decided to reorganize our project to improve our data gathering, analysis and evaluation. We formed an evaluation team in fall 2006, who would be in charge of collecting all evaluative data from the teacher participants. The team consists of Dr. Karin Wiburg, researcher and P.I. on the MSP grant, Ken Korn, school district evaluator, and Dr. Marta Remmenga, Professor of Statistics at New Mexico State University. The team is assisted by a graduate assistant who does data entry and analysis.

Dr. Remmenga traveled to the University of Michigan in spring 2007 and worked with the team to develop the first valid and complete version of the new Middle School test to participants during summer 2007. All evaluation and data collection in the new summer institutes and during the school year are now done by the evaluation team with the exception of Professional Development logs that are turned in monthly by the field specialists at the project's monthly meetings. The evaluation and research team has worked with the University of Michigan to get the latest and most valid and reliable versions of the Michigan Survey for Teaching Mathematics at the middle school level and will be using this test in 2007-2008 for analysis of teacher growth in content pedagogy. We are also expecting better data from both district partners and the public education department as data and accountability have become a larger focus in the state