Math and Science Academy

Year 4 Evaluation Report

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Math and Science Academy
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MATH AND SCIENCE ACADEMY
YEAR 4 EVALUATION REPORT

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Abstract

This evaluation report summarizes Year 4 of the Math and Science Academy (MSA), an initiative of the Northern New Mexico Council on Excellence in Education (NNMCEE). The report begins with an overview of the project and its objectives, and then outlines the research questions and methods used to carry out the evaluation. Findings from the Year 4 evaluation are presented next; the report concludes with recommendations and refinements for future years of MSA.

MSA Project Goals and Objectives

The Math and Science Academy is an on-going project geared toward the development of quality teaching and learning to support student achievement. It is a collaborative effort, developed jointly by the Northern New Mexico Council on Excellence in Education (NNMCEE) and local school districts (Chama, Española, and Mora), the Northern Network for Rural Education, the University of California and the Department of Energy's Los Alamos National Laboratory (LANL). The program is based on a model of school reform that emphasizes professional collaboration and research-based approaches to teaching and learning, and uses formative evaluation as a guide for on-going program development and refinement. The project was initially introduced at the middle school level, in an effort to provide middle school teachers with opportunities through which to strengthen instructional practices and increase student learning.

MSA's initial 3-year focus on middle school students and their teachers was based on research, longitudinal studies, and statistical analyses of achievement scores, which all indicated the critical need for quality programs and well-prepared teachers to support student learning during the challenging years of early adolescence. For Year 4

of the project, MSA expanded to elementary teachers and students because of an acknowledged need to include the "feeder schools" in the teaching and learning processes developed and implemented at MSA middle schools.

Project Overview

The goals of the project are ambitious and far reaching—student test scores and teacher competency surveys reveal a continuing need for improving student achievement and teacher preparation and education in Northern New Mexico. Additionally, the Los Alamos National Laboratory, a partner in the project, has an on-going interest in providing employment opportunities to the citizens of Northern New Mexico, necessitating the cultivation of a well-educated and well-trained workforce.

Over the past four years, MSA has grown in size and scope: the initial Year 1 cohort involved 3 schools in 3 districts with 4 teachers at each middle school site, and was guided by 2 mentor teachers. Year 4 of the MSA project involved 9 schools in 4 districts, 53 teachers and 3 mentor teachers. As the project has grown, program goals have been refined and more clearly articulated, and MSA members (teachers and mentors) have become more savvy and sophisticated in understanding the ways in which to maximize project impact. Simultaneously, tools and structures have been developed to increase implementation of project goals to support students, teachers, administrators, and schools in the project.

Evaluation and Design Issues

Years 1, 2, and 3 of the UCLA/CRESST evaluation of the MSA project were designed to describe how the program was implemented, to assess program effects and to generate recommendations for the improvement and enhancement of the project. Year 4 of the MSA evaluation paralleled the same research questions as Years 1 - 3 of the project, and was expanded to include a number of different features designed to further strengthen the project and gauge project impact as MSA expanded to elementary schools. The following research issues were examined:

- How did the MSA program evolve?
- What was the effect of MSA on teaching and learning?
- How can the program be refined and sustained?

• How can the program to be refined to better support and enhance teacher professional development, administrative leadership, and student learning and achievement?

Additionally, Year 4 of the project worked to further develop a student database to monitor long term, intended effects of the project—longitudinal records of student achievement data, student absences, participation in special programs, awards received, drop-out rates, and grades. As previous years of the project have shown, these student data provide critical information that allow for a better understanding of the long-term effects of teachers and school participation in a project such as MSA.

The evaluation employed a multi-method approach to understand and assess program implementation and effects. Surveys, interviews, focus groups, and program documents were used as information sources on program implementation and impact. We continued to use a formative approach to our research; that is, we conferred systematically with project participants throughout the year, and provided important information to project members regarding project successes and challenges as issues emerged.

As in previous evaluations, Year 4 research incorporated results and findings from Years 1, 2, and 3 of MSA. The first year of the project evaluation was spent in gaining understanding of the project and its goals, in developing relationships with mentors, project administrators and project members, and helping to the refine the overall program theory of action. The Year 2 evaluation helped project leaders to closely evaluate the programs' impact on teachers' knowledge, understanding and implementation of project goals, and to further implementing the evaluation tools developed during prior years of the program. Year 3 further examined the project's impact on teachers and students as the program expanded and was more widely implemented. The Year 4 evaluation focuses on how MSA has continued to evolve and on documenting the ways in which the project expanded at the elementary school level. Additional data are presented on administrators and their role in the support and development of quality teaching and learning at the MSA sites.

Method

Multiple sources of information were used to understand project implementation and impact. Table 1 displays the various methods used to gather data during Year 4 of MSA.

Table 1
MSA Year 4: Data Sources

Student Data	Classroom Assignments	Surveys	Observations	Interviews
•NRTs Standardized achievement scores (CTB) - language arts - reading - math - science - social studies	• Science lessons • Math lessons • Language arts lessons • Social Studies lessons	• Teachers	• Classrooms • Professional development sessions • Celebration of Learning • Summer Institute (2004)	• Teachers • Principals • Administrators • Project mentors • Focus groups

Instruments. Student achievement data were collected by schools on the norm-referenced assessment, CTB/Terra Nova, published by McGraw Hill. Longitudinal data were analyzed for MSA student performance from the past 2 years (2002–2003 and 2003–2004) where these data were available. Classroom assignments were collected from teachers (and mentors) during the April/May site visit when classroom observations were completed. Assignments represented typical work from all content areas.

Classroom observations gathered data on project goals, including instructional approaches, grouping patterns and practices, assessment strategies and teacher-student interactions. Post-instructional interviews with teachers included specific questions about the lessons observed and general questions about the ways in which MSA objectives were evident or implemented in classrooms.

Surveys were administered at the beginning of the 2004 Summer Institute. The teacher survey queried teachers on the ways in which participation in the Math and Science Academy influenced teachers' instructional practices, their knowledge and understanding of standards-based instruction, use and knowledge of technology, willingness to use a variety of instructional settings, assessment practices, and ratings of program effectiveness. The survey asked both open-ended questions and questions that involved a 5-point rating scale. Most MSA principals were interviewed about the program, and answered questions about project successes and barriers and general impressions regarding MSA's impact on teachers and students. Copies of all instruments developed and used in the evaluation can be found in Appendix A.

Project Findings: Year 4

Findings from Year 4 of MSA are presented in the following sections. Demographic information on teacher participants is presented first, followed by general demographic information on students and schools. Results in the second section are organized around the research questions for Year 4 of MSA. The report concludes with additional information on project implementation and impact and recommendations for future years of MSA.

Participants

MSA Teachers. Table 2 below displays demographic data for the forty-three Year 4 MSA teachers who completed surveys at the conclusion of the 2003-2004 school year. A total of 53 teachers were full participants (defined as participating in the majority of MSA requirements) in Year 4 of MSA. Teachers were from 4 districts (including 4 middle schools and 5 elementary schools) all located in Northern New Mexico. Survey data are available for 43 of 53 teachers who were program participants: data are absent from 10 teachers who left the project on or before the conclusion of the 2003–2004 school year, or who were unable to attend the 2004 Summer Institute. As always, caution should be used in interpreting the survey results due to the incomplete data set.

MSA members who completed the survey included 36 female and 7 male teachers of primarily Hispanic, Latino/a and/or Spanish American ethnicity (84%); the remaining 16% of MSA teachers were white or Native American, or did not specify their ethnicity on the survey. In general, MSA teachers were an experienced group with an average of 10.9 years of teaching (range: 1–31 years). They held multiple credentials—bilingual, single subject, language arts, special education and early childhood education—with the majority of teachers holding an elementary credential. Most MSA teachers have Bachelor's degrees with teaching credentials and units beyond those degrees, and eight teachers have Master's degrees with additional course units of study.

Table 2
Year 4 MSA Teacher Demographic Information

Variable	*Descriptor*	*N = 43*
Sex	Male:	7
	Female:	36
Ethnicity	White:	6
	Hispanic/Latino/a	
	Spanish American:	35
	Native American:	1
	Other:	1
Highest Degree Received	Bachelor's Degree:	9
	Bachelor's + Credential + Units	24
	Beyond:	2
	Master's + Units Beyond:	8
	Doctorate:	0
	Other:	0
Teaching Credential*	General Elementary:	27
	General Secondary:	7
	Special Emergency:	4
	Multiple Subject:	3
	Single Subject:	8
	Bilingual:	15
	Other: (Lang Arts, TESOL):	16
Years of Experience	Average Number:	10.9 years
	Range of Years Teaching:	1 - 31
Previous participation in projects like MSA	Number of teachers: yes	30
Number of Years in Project	1st Year MSA	32
	2nd Year MSA	1
	3rd Year MSA	3
	4th Year MSA	7

*Note: teachers may hold multiple credentials.

As in previous years of MSA, a number of teachers reported teaching outside their content area specialization. This situation represents a continuing and on-going challenge for teachers who instruct in content areas for which they have little formal training or content knowledge. At some sites, MSA teachers teach three different

subjects at three different grade levels. Most teachers (over 60%) reported English as the primary language of instruction, with another 22% reporting the use of both English and Spanish during instruction. Code switching, at culturally appropriate times, was observed in many MSA classrooms. When necessary, MSA teachers often provided additional explanations or instructions to students in Spanish with limited knowledge of English. Of the 43 teachers surveyed, 70% reported previously participating in reform initiatives, including MathStar, Math and Science Reform, and the University of New Mexico Academy.

MSA students. During the fourth year of MSA, approximately 1350 students from 9 different schools participated in the project. They ranged in grades from Kindergarten through 9th grade. In total, approximately 680 elementary students (Grades K–5), 620 sixth- to eighth-grade students and 60 ninth-grade students were participants at schools where teachers were involved with MSA. All 7th grade students participated in MSA at 2 of the project sites. At two schools, all 6th, 7th and 8th grade students participated in MSA. At a fourth school (8th grade only) a subset of students, those who participated in Year 3 MSA for their 7th grade year, continued to be a part of MSA for 8th grade. For the elementary sites, one school had 100% project participation, while the percentage and grade level of MSA involvement and participation varied considerably at the other elementary schools.

Student ethnicity was primarily Hispanic/Latino/a (70%), with roughly 15% Native American and 15% white and/or other ethnicities, although these percentages varied from school to school. More than 80% of the MSA student population qualified for a free/reduced lunch program (an indicator of poverty), while more than 30% of the total population was identified as English Language Learner (ELL). Table 3 displays more specific demographic information about Year 4 MSA students.

Table 3
MSA Year 4: Student Demographics

	School A	School B	School C	School D	School E	School F	School G	School H	School I
School Level	Middle 6th - 8th grade Chama	Middle 6th - 8th grade Mora	Middle 7th grade only Espan 7	Middle 8th & 9th	Elem K - 5 (Chama)	Elem K - 5 (Mora)	Elem K - 6 (Fairview)	Elem K - 6 (San Juan)	Elem K - 6 Pojoaque
Total Number of MSA Students	73	170	170	180	110	46	132	117	277
Grade Level/ MSA Student Count	6th :26 7th :22 8th :25	6th :61 7th :51 8th :58	7th: 170	8th : 120 9th : 60	K 20 1st: 21 2nd: 22 3rd: 12 4th: 16 5th: 19	5th: 46	5th: 60 6th: 72	5th: 56 6th: 61	4th: 23 5th: 56 6th: 198
% Gender	F: 47% M: 53%	F: 48% M: 52%	F: 51% M: 49%	F: 47% M: 53%	F: 48% M: 52%	F: 46% M: 54%	F: 46% M: 54%	F: 52% M: 48%	F: 49% M: 51%
% Ethnicity	Latino: 62% Native American: 0% White: 34% Black: 4% Asian: 0% Other: 0%	Latino: 95% Native American: 0% White: 5% Black: 0% Asian: 0% Other: 0%	Latino: 76% Native American: 6% White: 8% Black: 1% Asian: 0% Other: 8%	Latino: 83% Native American: 5% White: 4% Black: >1% Asian: >1% Other: 6%	Latino: 72% Native American: 0% White: 19% Black: 6% Asian: 3% Other: 0%	Latino: 98% White: 2% Black: 0% Asian: 0% Other: 0%	Latino: 86% Native American: White: Black: 0% Asian: 0% Other: 0%	Latino: 62% Native American: 38% White: 0% Black: 0% Asian: 0% Other: 0%	Latino: 70% Native American: White: Black: 0% Asian: 0% Other: 0%
% ELL	82%	26%	38%	9th: 28%	NA	43%	NA	83%	58%
% Free/ reduced lunch	65%	100%	90%	71%	68%	100%	NA	81%	55%
Other	All Ts are 4- yr. MSA	All Ts are 4- yr. MSA	6/12 Ts are MSA	6/16 8th Gr. MSA 2/16 9th Gr. MSA	All Ts MSA (K-5)	All 5th Gr. Ts MSA			9/12 Ts MSA 5th & 6th

Note: NA refers to incomplete data sets or those data which could not be disaggregated (MSA vs. non-MSA Ss).

MSA mentors. MSA is guided by three mentor teachers, responsible for program development and implementation as well as for managing the logistics of the project, such as stipend payments, travel arrangements, and a host of other tasks. One of the mentors has been a part of the project since its inception; she holds a Master's degree in science education, has extensive curriculum and standards knowledge and expertise, and has been a teacher in Northern New Mexico schools for a number of years. The second MSA mentor joined the project at the beginning of Year 2; she has a Master's degree in education, extensive experience teaching in a local teaching credential program and in Northern New Mexico, and is currently enrolled in a Ph. D. program in education. A third mentor teacher joined the project in April 2003, and brings to the project additional experience and expertise in science and math instruction, technology, a Ph. D. in education, as well as extensive knowledge of and experience with the schools in Northern New Mexico.

During Year 4 of MSA, as in previous years of the project, mentors served as project directors and program planners, and worked to develop and implement the goals and direction of MSA. Mentors worked extensively with teachers to guide their thinking and practices, and provide support to teachers as they implemented new strategies and approaches to teaching and collaboration. Each mentor observed a sub-sample of teachers at MSA sites—both returning teachers and teachers new to the project—an average of 6 times during school year. Each observation, based on a cognitive coaching model, included a pre-conference discussion of the lesson to be observed, the observation itself (during which time mentors compiled notes and used the classroom protocol developed in Year 2 of the project, and a subsequent debriefing session of the lesson. In some instances), this protocol was modified to allow mentors more time to focus on specific elements of the lesson and/or to allow the mentors additional time in specific teaching situations, such as a science lab. Mentors also organized follow-up training sessions, and worked with 1st year MSA teachers more extensively as needed.

During Year 4 of MSA, mentor teachers were also involved in a number of community projects designed to have a long-term positive impact on the program. Involvement in these projects was viewed as important and critical to

the on-going and future success of MSA, but meant that mentors had more limited time and attention to devote to teachers and classroom observations. A fuller discussion of this issue is presented later in the report.

Implementation of MSA Year 4 Project Goals

The following section presents data gathered to answer the four research questions previously stated, with specific examples of how and in what ways teachers implemented various elements of the project. The primary foci of MSA Year 4 were to further refine strategies for instructional excellence, continue to foster and support collaboration amongst and between teachers and schools, more systematically assess student learning, and explore how and in what ways the cognitive coaching model could be expanded to include more teachers in the process of reflecting on their instruction and refining it to better support and promote student learning.

Program Evolution

To examine the multiple ways in which MSA has evolved as a model for professional development, a number of data gathering approaches were used. One such data set was created via monthly phone and e-mail contact with MSA mentors. The general purpose of the conversations was a check on program development and implementation. It also provided mentors time to reflect on the general status of the project, discuss recent research findings that may impact teachers and their practice, and plan for future staff development sessions with teachers based on work and interactions from the field.

Selected MSA classrooms and after-school planning sessions were the focus of a site visit during the 2003–2004 school year. This site visit was designed to systematically collect information on the implementation of project goals. A modified observation protocol was used that expanded on the dimensions implemented by mentor teachers during their classroom observations. A sub-sample of classroom teachers was interviewed, either in-person or by phone, about their general perceptions of MSA progress, implementation of project goals, and specifics from observed lessons. Data collected from these classroom visits was used to further refine the MSA model for professional development, and provide information on how the project evolved.

There were 5 general areas of program evolution during Year 4 of MSA. They included: planning, collaboration, instruction, assessment and classroom management. Each of these areas—its goal, implementation and success—is described below.

Planning. Systematic planning, combined with the identification of learning goals aligned with state content standards, was an area of continued refinement and evolution during Year 4 of MSA. In MSA, teachers work collaboratively to set goals and identify key concepts to teach throughout the year. During a previous Summer Institute, planning tools were introduced to facilitate the identification and implementation of important learning goals. Teachers worked systematically within their teams to develop a set of "key concepts" to teach as a mechanism for focusing student learning during the year. One of the many tools teachers used in developing these goals was an approach called "data not guesswork" (DNG), a system that allows teachers to monitor student progress towards targeted learning goals. Teachers had the opportunity to use a variety of instructional planning tools for Year 4, including the development of DNG questions and common instructional goals and assessments, as they worked to develop year-long instructional plans for their classes.

Results from surveys, interviews, and observations, indicated that overall, most teachers were regularly and consistently planning instructional programs that focused on student learning. Table 4 presents results from the survey.

Table 4
Program Planning: Curriculum and Articulation

	Please respond to the following based on your implementation of MSA ideas.	2003 – 2004 N=43 Mean (SD)
a)	I develop year-long and short-term goals for my students.	3.9 (0.9)
b)	I select content to meet the learning goals of my students.	4.5 (0.6)
c)	I design and adapt curricula to meet the needs of my students.	4.3 (0.7)
d)	I use instructional strategies that develop and promote student understanding.	4.3 (0.8)
e)	I work with my colleagues within disciplines to set goals and standards for learning and achievement.	3.8 (1.2)
f)	I work with my colleagues across disciplines (content areas) to set goals and standards for learning and achievement.	3.7 (0.9)
g)	I developed goals for "data not guesswork" and used them to guide instruction.	3.4 (1.2)

Note. Scale: 1=never, 3= sometimes, 5=always, NA=Not applicable.

As Table 4 indicates, during 2003–2004 in general, teachers reported planning instruction in meaningful ways, including working with colleagues to develop long-term learning goals for students. Disaggregation of the responses revealed that 3rd and 4th year MSA teachers reported engaging in planning activities more frequently than did newer MSA members, suggesting perhaps that establishing goals and planning with colleagues becomes a more regular feature of teachers' approaches to instruction as they gain experience with MSA and its goals. Additionally, most teachers indicated that their instructional planning, articulation, and collaboration with their colleagues had changed "a great deal" on a 5-point rating scale due to their participation in MSA.

MSA teachers made the following comments about the role that instructional planning and articulation of goals and expectations had on teaching and learning in their classrooms:

Teacher 1
This year we met as part of MSA and it helped me to focus on what I needed to do to improve my teaching and to better assist my students with their learning.

Teacher 2
Before MSA I would plan with one or two teachers on occasion. Since being part of MSA I have been part of a school reform toward departmentalization and on a planning team with all 6 sixth grade teachers at my site. This planning has really helped to strengthen my instruction.

Teacher 3
I am using short-term and long-term goals in my teaching and for my students. This has helped me stay focused on what I am teaching. Students are writing and signing mission/vision statements. These ideas help tremendously in class.

Collaboration. A second important feature of MSA that reflects program evolution is the area of professional collaboration. Three general types of professional collaboration are supported by MSA: (a) within-school collaboration, where teachers at the same school meet and collaborate about instruction and MSA during and after school; (b) across school collaboration, where teachers at the same grade level and/or content area collaborate at MSA Summer Institutes and MSA meetings throughout the school year; and (c) general MSA project collaboration, where teams and teachers participate in joint learning experiences and opportunities. Each of these collaborations provides teachers with different kinds of opportunities for professional growth and interaction, with the ultimate goal of increasing student learning.

Interviews, observations, and survey data indicate that increased collaboration of all types was generally a positive experience for MSA teachers. Teachers reported that greater regular collaboration with their peers served to strengthen their sense of belonging to the MSA team at their sites, to build on their sense of membership in the MSA intellectual community, and to deepen their understanding of how to implement MSA tools, strategies, and ideas more

effectively. Comments below from teachers illustrate the general findings about the effects of collaboration on teachers during Year 4 of MSA.

Teacher 1
We have all been working and talking more with each other. This was not happening before MSA. Many of us were divided on our teaching and beliefs, but with MSA we have come to realize we all need each other.

Teacher 35
Before joining MSA, I would close my classroom door and keep everything I did inside. There was never any collaboration between grade level teachers or any other teachers. It is so much nicer and more productive for our students to share ideas and work out problems with colleagues.

Teacher 41
Our level of articulation and collaboration has increased so much because of MSA. Through our conversations we can identify problems w/ teaching strategies and pose probable solutions and alternatives.

Teacher 29
We now work well now as a sole school and also as a group with other districts.

Teacher 8
MSA has provided our staff the time and place to share, plan and collaborate with each other. Spending time together during the summer has also strengthened our bonds in a personal and professional way, which can only improve our working relationships.

Instruction. As the Math and Science Academy has evolved as a program, so too have project members' ideas and understandings of what quality, standards-based instruction means and looks like in the classroom. The MSA model for quality teaching incorporates a wide-variety of research-based approaches to learning and instruction. Central to the project is the notion that teachers move from a didactic, input-only approach to teaching (teacher lectures, students learn) to one that affords students' multiple ways and multiple

opportunities from which to learn concepts, ideas and information. The introduction of "data not guesswork", presented and discussed in detail in later paragraphs, is one instructional approach implemented during Year 4 of MSA. The use of graphic organizers to support student learning is another instructional strategy supported by MSA. Systematically organized, visual representations of concepts are the key elements of the use of graphic organizers.

The first year these strategies were introduced, a number of middle school teachers reported reluctance to use tools they viewed as "too elementary, and too babyish" for their middle school students. The introduction of graphic organizers and "data not guesswork" into elementary classrooms occurred more easily and more seamlessly during Year 4 than in previous years, in part because of the tradition of incorporating art and other whole group record keeping systems into the curriculum at the elementary level. Another factor that helped to increase implementation was support for the ideas from other MSA teachers who had tried the instructional approaches in their classrooms and were successful in their implementation. Across grade levels and content areas—from kindergarten to ninth grade—in math, science, social studies, and language arts, teachers reported a positive experience when new instructional tools were introduced and used, as well as reported increases in student learning and student effort.

A companion element to the instructional strategies advocated and embraced by MSA is the use of a variety of instructional *materials* to support student learning. Table 5 displays information on the nature and types of instructional materials and resources MSA teachers reported using during the 2003 – 2004 school year.

Table 5
Instructional Materials and Resources

	Please respond to the following based on your implementation of MSA ideas.	2003 – 2004 N=43 Mean (SD)
a)	I structure learning time to allow students to engage in projects and/or investigations.	4.0 (0.7)
b)	I create a setting for student work that is flexible and supportive of student learning.	4.3 (0.7)
c)	I ensure a safe learning environment.	4.8 (0.5)
d)	I make available **tools & materials** to students to support learning.	4.4 (0.7)
e)	I make available **print resources** to students to support learning.	4.2 (0.8)
f)	I make available **technological resources** to students to support learning.	3.7 (0.8)
g)	I use graphic organizers to support learning.	4.2 (0.9)
h)	I engage student in designing their learning assignments.	3.2 (0.9)

Note. Scale: 1=never, 3=sometimes, 5=always, NA=Not applicable.

Ensuring a safe learning environment appears to be a frequently reported key element in establishing productive learning situations for MSA teachers. Other tool use is more varied: teachers reported that technology use, in particular at the elementary level, is more limited. As schools in New Mexico move more technology into elementary classrooms and curriculum, it is important for MSA teachers to continue to learn to use technology as a resource to support student learning.

For 3rd and 4th year MSA members, technology use has increased dramatically over the past 3 years. Veteran teachers who initially expressed serious doubt about their capacity to use technology in meaningful ways are now using computers for instructional planning, record keeping, communication with parents and other teachers, and grading. A number of veteran teachers have embraced technology use in their classrooms; students regularly use technology and a variety of programs to support and enhance their learning.

Comments from teachers about changes in their instructional approaches as a result of MSA participation include the following ideas:

Teacher 37
Before MSA, my teaching was textbook guided. Now I use standards to drive my teaching and I have daily learning goals. My students understand standards and learning goals.

Teacher 13
I now have a broader view of the importance of student learning. I also have many tools and guides to use. I know I will reach out and touch more students more positively in the classroom.

Teacher 9
One of the biggest changes in my instruction has come by focusing on student learning and adjusting my teaching to students needs. I've re-visited my cooperative learning strategies and refined them in use. I'm more aware of the standards and benchmarks and the role of teaching about the context.

Assessment. As MSA teachers have worked to implement new and varied instructional strategies, and provide standards-based instruction, a parallel focus has arisen in the area of assessment. Teachers are recognizing the need for common assessments across grade levels and in specific content areas. MSA has addressed teachers' needs with respect to assessment by providing teachers access to various resources, in particular those that focus on the use of rubrics or matrices that specify student performance levels.

Table 6 shows teacher ratings of the frequency with which they use various strategies to assess student learning. Overall, teachers reported using the assessment strategies advocated and supported by MSA "sometimes." Research on teacher assessment practices confirms the difficulty and challenge teachers face in developing and implementing assessment strategies that are feasible and timely, and that provide reliable and accurate information about student learning.

Table 6
Assessing student learning

	Please indicate your observations regarding student learning and achievement this year.	2003 – 2004 N=43 Mean (SD)
a)	I systematically gather data on my students and their learning in my classes.	3.5 (1.0)
b)	I analyze assessment data on a regular and timely basis to inform and guide my teaching.	3.6 (1.0)
c)	I guide my students in self-assessment.	3.2 (0.9)
d)	I use student data, observations of teaching, and interactions with colleagues to reflect on and improve my teaching practices.	3.6 (0.8)
e)	I provide students with information on how their work will be assessed.	3.9 (0.9)
f)	I provide students with examples and models of what represents "good work."	3.7 (0.8)
g)	I use a wide variety of assessments to help me understand students' ideas and learning.	3.7 (0.8)

Note. Scale: 1=never, 3=sometimes, 5=always, NA=Not applicable.

A number of teachers noted the impact that MSA is having on their assessment practices, indicating an increase in their knowledge and understanding of assessment. Teacher comments about assessment included the following:

Teacher 1
I am learning from MSA that assessment is far more than standardized tests. Assessment can be formal and informal. I am also learning how to use rubrics to assess student learning and how to help my students develop portfolios.

Teacher 15
MSA has made me more aware of assessing student work before and after a skill has been taught. It has helped me to know whether or not the students have achieved the learning that was targeted in the instruction.

The assessment lets me know what the end result of the learning looks like.

Teacher 21
I have learned so many different ways that I can use to assess my students work, which will not only benefit my students but also myself. They will have more responsibility for their own learning and assessing themselves as well as help me to keep up with their progress.

Teacher 38
I am much more knowledgeable as to the different types of assessments which can be used. I work hard to determine which instrument will provide me with the data I am seeking. Also, my students are assessed in multiple ways.

A number of teachers did acknowledge however, the important and on-going need for further developing and refining their assessment techniques, strategies and understandings. These views were reflected in informal interviews conducted at the 2004 Summer Institute. There, teachers commented "the more we learn about assessment, the more we understand how much we *don't* know." Additional comments from new MSA members regarding assessment included:

Teacher 17
As a result of my first year in MSA I became more aware of my assessment practices. I know now that I need to improve in this area and intend to make this my focus for the coming year.

Classroom management. The development and delivery of quality instruction, quality assessments, and quality tools used by quality teachers to support and strengthen student learning are the long-term goals of MSA. As MSA teachers and mentors have come to realize however, to increase and maximize student learning, classrooms must have protocols and structures in place that support productive teacher and student interactions. During the Summer Institute of 2003, a number of approaches to classroom management were presented, including strategies from Harry Wong (e.g., Wong & Wong, 1998). The essential message of this approach is that routines and protocols must be established and learned early in the school year, and reinforced throughout

the year, to allow all students the opportunity to develop their ideas and understandings and to learn effectively. Routines help students understand the rules and expectations in a classroom, and allow the teacher to focus on teaching, rather than discipline. MSA mentors selected this research-based approach to classroom management after observations in numerous classrooms revealed the challenges many teachers faced with management issues.

MSA teachers reported great success in learning and implementing classroom management strategies from the resources provided by MSA. It is interesting to note that, even for veteran teachers, the opportunity to learn new classroom management approaches was important and meaningful. Teacher reflections on classroom management approaches are featured below.

> **Teacher 9**
> After last summer and learning Harry Wong – my classroom management was so much smoother. Management strategies learned along the way helped, but those strategies really pulled everything together for me.

> **Teacher 41**
> I have become aware of providing an environment, which promotes self-directedness, as well as a cooperative environment. From Dinah Zikes, I have set up a student work center where students can access graphic organizer materials. I have also implemented Harry Wong's strategies on classroom management. These have proved most effective, in particular the establishment of routines and procedures. These strategies have made me a more effective teacher.

Cognitive Coaching: Development and Implementation

During the past four years of the Math and Science Academy project, a cornerstone of the program has been an approach to implementing instructional change and reform known as "cognitive coaching" (Costa & Garmston, 1998). The research-based theory underlying this approach is the notion that teacher change and development is most likely to occur in the context of guided reflection, where conversations about teaching practices, teacher-student interactions and instructional effectiveness, are continual, on-going and used to modify and improve teaching. MSA mentors have appropriated the cognitive coaching protocol from the cognitive model, and revised it over the past 4 years to more closely reflect MSA goals and objectives. Mentors attribute much of the

MSA project success to the careful and thoughtful interactions that result from the coaching experience.

The cognitive coaching approach is intensive and time-consuming for both participants. Prior to the instructional observation a pre-conference conversation occurs, requiring the teacher and the mentor to focus on the intended goals and objectives for the lesson and the observation. The classroom observation requires a minimum of 45 minutes of time, and often ranges to one and half hours, during which time the coach/observer records careful notes about the lesson to be shared with the teacher regarding the agreed upon area of focus. This is followed by a debriefing/post-instructional conference, which ranges in time from approximately 45 minutes to 3 hours. The purpose of the debrief is to allow the teacher and the observer an opportunity to interact and reflect about the lesson, its successes and challenges. In total, the coaching "package" requires a commitment of approximately 5 total hours of time from each participant. The challenge for MSA during Year 4, a year of expansion and scaling up, was, as one mentor phrased it: "to keep the integrity of the MSA and the coaching sessions, and make it work for 72 teachers at nine different schools!"

To accomplish the scale-up implementation and expansion for Year 4 of MSA, third and fourth year MSA teachers were invited to take on coaching roles and responsibilities. Mentors continued to meet and observe in coaches' classrooms with all of the 1st year participants, as well as to continue more limited observations in veteran MSA classrooms. Mentors worked extensively with teachers at four new elementary schools, those without veteran MSA members. Table 7 below displays the schedule and responsibilities for coaching at each of the sites.

Table 7
Year 4 MSA Cognitive Coaching Schedule

Schools	Coaches	Average Number of Coaching Session	Coaching Description
Middle School A and Elementary School E	• 2 fourth year MSA members • MSA mentors	6 total, 3 per semester	Flexibility in scheduling allowed Cs and Ts to easily observe lessons throughout day. Debriefing occurred at the conclusion of the day.
Middle School B and Elementary School F	• 2 fourth year MSA members • MSA mentors	6 total, 3 per semester	Continued coaching support from MSA mentors. Coaching schedule challenging due to limited release time for Cs, and conflicting after-school meetings.
Middle School C	• MSA mentors	6 total, 3 per semester	Mentor observed in classrooms. Conflicting agendas and school politics made consistent coaching schedule challenging.
Middle School D	• 2 third year mentors	6 total, 3 per semester	Changing staff, new additions to MSA cohort presented challenges to coaching model. Productive after-school meetings.
Elementary School E	See above	See School A above	See above
Elementary School F	See above	See School B above	See above
Elementary School G	• MSA mentors	6 total	Mentor observed in classrooms, provided demonstration lessons. Initially led after-school meetings, responsibility gradually assumed by MSA teachers.
Elementary School H	• MSA mentors	6 total	Mentor observed in classrooms, led demonstration lessons. Mentor participated in after-school meetings.
Elementary School I	• MSA mentors	6 total	Mentor observed in classrooms, led demonstration lessons. Mentor participated in after-school meetings.

Cognitive Coaching Impact on Teachers

MSA teachers were overwhelmingly positive in their reactions to the coaching experience they experienced during the 2003–2004 school year. Teachers reported that coaching functioned in a variety of ways to support their learning and development as instructional leaders. Many teachers, who were initially apprehensive about being "observed" by MSA mentors, reported that they viewed the sessions as non-threatening, productive, and as an important tool to facilitate the reflection process. Teachers reported the coaching experience as productive, interesting, and important in the development of their understandings of how and in what ways to refine their teaching. Comments from teachers regarding the coaching experience are below.

> **Teacher 9**
> The coaching experience helped me to really focus on my processes of teaching. Isolating specifics about lesson goals, reteaching, etc. made me analyze, adjust and better my skills—and I didn't feel threatened by my coaches like I initially thought I would. When my coach and I did our pre and post conferences, I surprised myself that I knew my goals, etc.—my responses were right on. How validating as a teacher to have a real discussion about my teaching!
>
> **Teacher 22**
> The coaching experience allowed me to reflect on my teaching methods. The feedback offered by this experience brought forth images that I wasn't aware existed. For example, I don't always remember to state my goals up front; I need to break up the lessons into digestible pieces.
>
> **Teacher 33**
> Positive feedback and constructive criticism are wonderful for a relatively new teacher like me. I need to know what I'm doing right and where I need to improve.
> Science is my weakest area. The coaches really helped me by giving me a clearer picture of standards and how to deliver them to the students.
>
> **Teacher 18**
> The cognitive coaching sessions were very useful for me in that they made me more conscientious of planning for instruction in an effective manner. I always viewed lesson planning in a traditional "mode," whereas, with

the MSA cognitive coaching, various elements of instructional planning were much more effective in impacting student learning.

In one district, the elementary school was placed on "corrective action" by the state due to declining test scores. As a school and district, the decision was made to include elementary teachers in the 4th year MSA cohort and have the MSA middle school teachers function primarily as their coaches. Initially, there was a great deal of concern about this approach—veteran MSA teachers questioned whether they would be able to implement the processes and procedures critical to the cognitive coaching model. MSA 4-year veterans reported that prior to MSA Year 4, it was easy to "point fingers, and blame elementary school teachers for the ways (or not) in which they were preparing students for middle school." Other concerns focused on the challenges of scheduling observations and debriefs, and they could be arranged in a feasible, workable manner. Elementary teachers too wondered about the nature of the relationship between their teaching staff and the middle school staff.

The result of this decision to include the elementary teachers in the MSA cohort was interesting. Overall, teachers, coaches and administrators were very positive in their response to MSA "scale up implementation" at this site. At an after school meeting in May, the majority of participants reported that: "MSA has made a huge difference in what we think about teaching and learning at our school. We are learning together, trying to do cognitive coaching together and communicating much more effectively as a group, and as a learning community." Participants noted the importance of matching coaches with teachers in terms of background and experience to ensure a common vocabulary and understanding, as well the importance of similar philosophies in terms of the application and implementation of certain instructional approaches with specific sub-populations of students. These concerns were discussed openly, and suggestions and comments on how to solve the situation in future years were elicited.

Additional comments from MSA teachers about the ways in which the coaching experience impacted thinking, teaching, and learning are listed below.

Teacher 27

Specifically, the coaching experience allowed me to identify with some problems I encountered during the lesson & helped me to modify the lesson in order to reach desired outcomes. For example, I used to pose the class w/ a probing question to large groups. Many were not even engaged . . .From this I learned to implement "really round the table," a Kagan structure, in which all students were engaged.

Teacher 1

The pre and post conferences helped me assess with an open mind and the coach helped in being objective. Also, I enjoyed as well as my students the help and involvement of the coaches during their time in the classroom. When my "mentor" came into the classroom while I was presenting a math concept dealing with circumference, radius, and parts of a whole. She was able to demonstrate one of the concepts more clearly than I was able to. I greatly appreciated this help as well as did the students. This approach (coaching) is very useful; most often the principal does not get into the classroom often enough to help give feedback to teachers on how they are doing. This provides a great opportunity for teachers to get that feedback that they need.

MSA Impact on Coaches

Coaches also reported an impact on their thinking and understanding of MSA goals and objectives as a result of participating in the coaching process. Coaches, in general, were experienced teachers with a minimum of 3 years of participation in MSA. As a result, teacher-coaches were in the unique position of having experiencing the coaching protocol from a "coachee" as well as the "coach" role. Coaches found the experience of visiting other classrooms, observing instruction and then discussing the observations, to be important and meaningful in a number of different ways. First, the experience helped many coaches to "stop the blame game," that is, to minimize their perceptions that the reason for poor student performance was because of shortcomings of a previous teacher, grade level, or content area. Coaches experienced first-hand the ways in which student ideas developed (or didn't) throughout the grades. Second, coaches reported that the experience helped them to reflect on their own teaching experience in ways that did not occur in other settings. One coach wrote:

The coaching experience has really brought to light a number of different ideas I have about teaching and learning. I always thought a lesson had to

be structured a certain way to maximize learning, but after visiting other classrooms, I can see the power in other approaches. Something else that really struck me is how interconnected we all are in the learning community. I saw science concepts introduced in 3rd grade that we revisit again in 8th grade science. Coaching has highlighted the importance of clear articulation of learning goals. It has also helped me to develop more sophisticated questioning strategies.

One of the challenges encountered by MSA mentors and coaches was the addition of new teachers at a school site during the middle of the year, due in large part to staffing changes. New teachers represented a welcome addition to the project, but coaches often found it difficult to inculcate teachers to MSA concepts and ideas absent a formal teaching/learning situation such as the Summer Institute. Thus, the notion of a common learning experience, and its importance in developing a common language and set of goals like those provided at the Summer Institute, was highlighted by teacher and coach experiences in Year 4 of MSA.

MSA Impact on Teaching and Learning

Student Achievement

Data presented in this section on project impact on students are culled from a number of different sources: standardized achievement test scores and teacher and administrator reports. As MSA teachers have become more familiar with the project, and have implemented project goals to a greater degree, positive changes in students' performance and achievement have emerged in some MSA classes and schools.

Test data reported here were made available to UCLA/CRESST through a third party research group to ensure student confidentiality. Each student was assigned a unique ID; codes and data for students will be maintained for the duration of the MSA project and then destroyed. Additional tables with more detailed information on student performance can be found in Appendices.

In this evaluation report, test scores are again reported using a scale score (SS). Scale scores are based on a scale of 1 – 1000, with equal intervals between each number on the scale. The scale can be applied to all groups taking a given test, regardless of group characteristics or time of year, making it possible to

compare scores from different groups. Scale scores are used to facilitate appropriate comparisons and analyses for various statistical purposes; for example, scores can be added, subtracted, and averaged across test levels. These computations make direct comparisons among students and their scores possible. Further, scale scores made it possible to compare individual scores to groups, and to compare an individual's pre-test and post-test scores in ways that are statistically valid. These types of comparisons cannot be made with percentile rankings or by using grade-level equivalents. Note: School pseudonyms used below correspond to those listed in Table 3 (page xx).

Standardized test scores. Test scores reported in this section are from the 2003–2004 school year for MSA schools. The CTB, published by McGraw Hill, was administered at the end of March 2004. Below are tables that present information from various sites, for various subjects, along with brief analyses of the scores. For the 2003–2004 academic year, norm-referenced test data were not available for 4th or 8th grade MSA students in New Mexico due to a change in assessments (4th and 8th grade students took a standards-based assessment, also published by McGraw Hill). Those data were not available for this report.

Data tables are presented for some MSA schools as a matched data set, to allow comparisons of students from one year to the next. The range for percentages of matched student scores varies from school to school. At some sites, the matched data set represents approximately 60% of the cohort. At other schools, the percentage of matches is greater (approximately 90%). These matched data sets provide information about MSA's impact from year-to-year on student achievement. Thus, the total number of students in these tables varies from Table 3 (see page 11) due to changes in student populations and availability of data.

Data are also presented in this section for School C; it was not possible to disaggregate the data and examine changes in a cohort's scores. In this case, data are presented for all 7th grade students since the inception of the project. Additional tables of student data from year-to-year scores for a specific grade level can be found in the Appendices. Again, caution should be used in interpreting the scores for these sections, due to small sample size and changes in the student population from year to year.

Table 8: Matched Cohort Data
School A (n=18)

	Reading/ SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
2003 6th grade (MSA)	655	655	650	650	650
2004 7th grade (MSA)	654	661	644	657	663*
Change	-1	+6	-6	+7	+13*

Note: *$p < .05$

Seventh-grade student performance at School A reflects a slight, but not statistically significant, increase in scores in language arts and science. Positive increases in social studies were statistically significant at the $p < .05$ level. Reading and math scores showed a slight, but not statistically significant decrease. At School A, all teachers are MSA teachers, and middle school teachers are 4-year members of MSA. Cohort size at School A is small ($n < 20$ students) and as such, caution should be used to interpret scores.

Table 9: Matched Cohort Data
School B (n=47)

	Reading/ SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
2003 6th grade (MSA)	647	655	646	647	649
2004 7th grade (MSA)	661*	665	662*	664*	663*
Change	+14	+10	+16	+17	+14

Note: *$p < .05$

At School B, 2003–2004 student performance in 7th grade showed improvement in all content areas, with statistically significant changes from the 2002–2003 school year, in reading, math, science and social studies. Language arts scores increased slightly but were not statistically significant. The majority of teachers at School B participate in MSA and are 4-year MSA veterans.

Table 10
School C: All 7th Grade (including non-MSA students)
MSA CTB/Scale Scores

	Reading/SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
Year					
2000	635	637	616	625	631
2001	642	644	635	639	643
2002	648	648	641	642	643
2003	653	651	651	656	650
2004	645	645	644	648	648
Score change '03 – '04	**-8**	**-6**	**-7**	**-8**	**-2**
Score change '00 – '04	**+10**	**+8**	**+28***	**+22***	**+17***

Note: *$p < .05$

At School C, student scores showed a slight decline in all content areas from 2003. Since the inception of MSA in 2000, however, all content area scores have increased; changes in math, science, and social studies are statistically significant at the $p < .05$ level.

It should be noted that at School C, only seven members of the 20-person faculty were MSA participants; one "team" of teachers that includes math, science, language arts and social studies teachers, along with three other teachers. At School C then, the majority of students have classes taught by non-MSA teachers. In Table 8, scale scores reported are for ***all*** students in all subjects at the school, even in cases where students were taught by non-MSA teachers. Because of cohort overlaps (some students had MSA teachers for some but not all subject areas) and varied testing conditions, it was not possible to disaggregate student scores by MSA vs. non-MSA teacher participation. Comparison of project impact on MSA vs. non-MSA teachers is therefore limited.

Table 11 (Española 9)
School D: 9th Grade: MSA CTB/Scale Scores

	Reading/SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
Year					
2003	658	653	662	663	653
2004	665	653	669	674	661
Score change '03 to '04	**+7**	**0**	**+7**	**+11**	**+8**

Note: *$p < .05$

Data for School D are limited in scope: CRTs (criterion referenced tests) were administered to 8th-grade students, thus making comparisons to previous 8th-grade to 8th-grade scores invalid. However, there are promising gains in student scores from the 2003 to the 2004 school year for 9th-grade students, in particular in the areas of reading, math, and science.

Schools E – I

Data for MSA schools E – I are presented in Table 12; this is the first year of MSA at these sites, and data are intended to capture baseline information on student achievement. Previous evaluations have noted the challenge of expectations for score improvement after the a new program or instructional approach is introduced, and this year, modest increases in 1st year scores were observed in some content areas at some schools. Of particular interest are the changes in math and science scores, which remain a focus for MSA, and indeed is where many elementary teachers perceive the greatest need for additional knowledge, strategies, and support in their instruction. Scores are reported for 2003 and 2004 fifth grade students only, due to data availability.

Table 12
Data for MSA Schools E-I

MSA 5th Grade Elem. Schools	Reading/SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
School E 2003/2004	664/659	662/664	638/627	659/646	648/650
Change	**-5**	**+2**	**-9**	**-7**	**+2**
School F 2003/2004	641/637	638/634	631/627	636/636	636/636
Change	**-4**	**-4**	**-4**	**0**	**0**
School G 2003/2004	647/631*	647/638*	628/622	638/636	634/632
Change	**-16***	**-11***	**-6**	**-2**	**-2**
School H 2003/2004	642/640	642/648	623/639*	637/640	630/638
Change	**-2**	**+6**	**+16***	**+3**	**+8**
School I 2003/2004	647/648	652/652	627/636	632/643*	632/639
Change	**+1**	**0**	**+9**	**+11***	**+7**

Note: *$p < .05$

Results at the elementary school were varied. At some sites, scores showed modest but generally not statistically significant improvement. At other sites, scores remained the same or decreased slightly. As noted in previous evaluation reports, it is challenging for teachers to implement new ideas and approaches consistently when they are learning new approaches.

Additional data were available for elementary students at some sites. Below, in Tables 13 and 14 are matched cohort data from 5th grade MSA schools E and F. Statistically significant growth occurred in reading and language arts, while math and social studies showed slight improvements. Science scores at School E declined slightly for the 2003- 2004 school year, but the decrease was not statistically significant.

At School F (Table 14), the matched cohort scores increased in all content areas (reading, language arts, math, science, and social studies). These changes were statistically significant at the $p < .05$ level.

Table 13: Matched Cohort Data
School E (n=18)

	Reading/SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
2003 4th grade (pre-MSA)	638	645	622	648	645
2004 5th grade MSA	658*	665*	627	644	648
Change	**+20***	**+20***	**+5**	**-4**	**+3**

Note: *$p < .05$

Table 14: Matched Cohort Data
School F (n=41)

	Reading/SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
2003 4th grade (pre-MSA)	617	626	604	620	621
2004 5th grade MSA	641*	639*	629*	638*	638*
Change	**+24***	**+13***	**+25***	**+18***	**+17***

Note: *$p < .05$

Teacher Reports of Student Learning

In addition to standardized achievement test scores, teachers were asked about their impressions of project impact on student learning and achievement. Teachers reported overwhelmingly that student learning was positively influenced by their own (teacher) participation in MSA. Fewer teachers reported

a positive impact on students from their use of DNG ("data not guesswork"), perhaps a function of the fact that only 60% of teachers reported implementing the strategy effectively in their classrooms during the 2003–2004 school year. Table 15 below displays teacher ratings of MSA impact on student learning and achievement.

Table 15
Teacher observations of student learning and achievement

	Please indicate your observations regarding student learning and achievement this year.	2003 – 2004 N=43 Mean (SD)
a)	I have observed changes in student learning and achievement this year.	3.8 (0.9)
b)	My participation in MSA had a positive impact on my students' learning and achievement this year.	4.7 (1.2)
c)	MSA helped increase student learning and achievement.	4.2 (0.6)
d)	Students learned more because of cooperative learning opportunities in my classroom.	4.1 (0.9)
e)	Students benefited from the use of DNG in my classroom.	3.6 (1.2)

Note. Scale: 1=disagree, 3=moderately agree, 5=strongly agree, NA=Not applicable.

Observations and interviews also suggest that students benefited from their teachers' participation in MSA. In many MSA classrooms, students appeared to understand learning goals; procedures and protocols were well established and understood, and a wide variety of instructional activities were observed. Many teachers reported their perceptions that careful planning and the more regular use of assessment to check on learning goals also contributed to increases in student learning. Another source of improvement of student achievement reported by teachers was the clear connection to standards, and its influence on providing standards based instruction.

Teacher 1
I saw a lot of growth w/ my students this year, especially in math. I used the concept statement to direct my instruction.

Teacher 2
Cooperative learning, when used properly, is a WONDERFUL thing. DNG has worked wonders in my classroom. My students really benefited.

Teacher 3
One MSA idea that helped increase student learning in my class was the problem of the day. Beginning class using a multiple-choice question to practice test-taking strategies (DNG) helped my students with reading-learning vocabulary, learning to eliminate answers and solving problems.

MSA Impact on Administrators

Another important area of MSA's program impact related to school principals. MSA principals were interviewed to gather information on their understandings and views of the impact of MSA on teachers, students, and the overall learning environment at their schools. Of the nine MSA principals, six were new to their schools and to MSA; the other three principals were familiar with the project and understood MSA goals and objectives.

Overall, MSA principals were positive in their views about the project and its implementation. Administrators were impressed by the increased levels of collaboration observed at their sites, by the evidence of careful instructional planning and implementation of different instructional strategies, and by the consistency in approaches to classroom management. Commented one principal:

> I've seen a lot of different projects in my time as an administrator, but this one (MSA) seems to be different somehow. Teachers are working more together as teams. In fact, their excitement about MSA is influencing other non-MSA teachers. Everyone wants to be part of the project and teach more effectively.

Principals also commented on the power and cohesion of the MSA teams. They saw school-site leadership developing as the school year progressed, and reported that the ideas and reflections on teaching practices, whiled guided by MSA mentors, also illustrated a great deal of teacher ownership. This sense of

ownership helped imbue teachers with a sense of responsibility to the project and to working together as a team.

One principal reflected on the expansion of MSA at his site, from 4 teachers to 12 teachers. He said:

> The introduction of MSA this year has gone really well this year. I'm seeing a big increase in time on task for students, a big increase in time-spent learning. We still need to focus on learning time. Recess, field trips, all of that is important, but it is instructional time that matter most. I'm seeing great progress in all of the classrooms at our school . . . quality classroom management is increasing, and is more effective. Our elementary school has really unified in terms of discipline, in terms of what the expectations are. Those decisions have been made as a group at our Monday meetings. It's an attitude of "let's do this, we think it will improve student learning. . ." That's how I've seen MSA grow and develop at our site this year.

Program Effectiveness

In general, teachers, students, administrators and mentors were positive about Year 4 of MSA. Classroom observations, interviews, and survey results provide data to support these conclusions. Teachers were asked to rate MSA's overall effectiveness in a number of areas. These survey results are displayed in Table 16 below:

Table 16
MSA Program Effectiveness

	How effective was MSA in the following areas?	Overall 2003-2004 N = 43 Mean (SD)
a)	Familiarizing you with standards-based instruction	4.6 (0.6)
b)	Developing your knowledge of state frameworks for content areas	4.4 (0.7)
c)	Helping you develop interdisciplinary curriculum units	3.8 (1.1)
d)	Providing demonstration lessons that were meaningful and relevant to you and your students	3.9 (0.8)
e)	Sharing assessment strategies	4.1 (0.9)
f)	Helping you to develop rubrics to support instruction	3.8 (1.0)
g)	Informing/involving the community about MSA goals and objectives	3.8 (0.9)
h)	Helping you understand how to use technology effectively	4.0 (.9)
i)	Assisting you in implementing cooperative learning activities	4.4 (0.7)

Note: Scale-1=Not effective; 3=Somewhat Effective; 5=Highly Effective.

Teachers were also asked to rate their own knowledge and skills as a result of their participation in MSA. This self-assessment reflects the approaches and strategies most critical to successful MSA implementation. Teacher ratings of their knowledge of content area and standards were strong, as was their rating of content standard knowledge. Teacher confidence in teaching their content area was also strong, although a number of elementary teachers made mention of their need for additional mathematical content knowledge. Teachers rated their knowledge of technology skills, cooperative learning strategies and assessments approaches lower, reflecting perhaps less project attention and focus on these areas, and/or lower levels of initial knowledge of the areas.

Table 17
MSA Teacher Self-Assessment

		2002 – 2003 N=43
	Please rate yourself along the following dimensions as a result of your participation in MSA.	Mean (SD)
a)	Knowledge/ understanding of your **content area** (math, science, language arts, or social studies)	4.3 (0.7)
b)	Knowledge/understanding of your **content standards** (math, science, language arts, or social studies)	4.1 (0.6)
c)	Confidence in teaching content area	4.3 (0.7)
d)	Knowledge of a wide variety of instructional techniques	4.2 (0.7)
e)	Technology skills	3.8 (1.0)
f)	Knowledge and implementation of cooperative learning strategies (i.e., jigsaw, small groups)	3.9 (.9)
g)	Knowledge of various assessment strategies	3.7 (0.8)
h)	Implementation of various assessment strategies	3.6 (0.8)

Note. Scale: 1=weak, 3= moderately strong, 5=very strong, NA=Not applicable.

Teacher comments about the ways in which MSA impacted their knowledge are found below:

Teacher 16

I'm still in the learning & understanding process of standards and benchmarks. I have learned quite a lot of more about them and understand them a whole lot more as an MSA participant.

Teacher 8

As the 4th grade teacher MSA has improved my knowledge of Math & Science standards and of resources to teach math and science.

Teacher 12
I have a better understanding of my content areas and content standards. I now have resources to get to and information to get resources to help me teach my content areas and standards.

Conclusion

Year 4 of MSA was a year of expansion, with respect to the number of teachers, schools and districts involved with the project, and the ways in which the project was implemented. It was also a year of experimentation with cognitive coaching. Veteran MSA teachers took on the task of working with their colleagues in a "coaching setting" to continue the processes critical to on-going professional development. Previous years of MSA have demonstrated the importance of structured, facilitated interactions that focus specifically on teachers' instructional strategies as both a tool for accountability and as a means through which teachers can reflect on the nature and purpose of the approaches they use in classrooms. The refinements and revisions in the MSA model that occurred in previous years have strengthened MSA into a model for on-going professional development. The Math and Science Academy professional development model embodies strategies proven to improve teaching and learning (Darling-Hammond & McLaughlin, 1995). The MSA model continues to be:

- Experiential in nature; teachers are given multiple opportunities to try out new ideas and reflect on those experiences.
- Theoretical, research driven; MSA provides teachers with access to resources and ideas that are research-based, current, and well documented.
- Collaborative: MSA teachers work in teams at their schools, across schools and as a project.
- Oriented towards coaching, mentoring, and problem solving; the cognitive coaching model, with multiple opportunities for reflection continues as centerpiece of MSA.
- Sustained, intensive and on going; each successive year, MSA has developed, grown and changed to meet the needs of participants by incorporating findings from what works and what doesn't in project classrooms.

Year 4 of the Math and Science Academy was a year of challenges and successes, of rethinking, revising and revamping ideas, understandings, and conceptualizations. A powerful model for professional development has emerged, one that encompasses the most important and essential elements of providing quality instruction for students of all ages. MSA continues to provide what research indicates is essential to quality reform to be sustained and to grow; the context, the expectation and the opportunities for teachers to learn what they need to know and practice those skills in a reflective, continually improving manner.

Recommendations

The recommendations that follow are based on project goals for Year 4, on teacher comments, observations and interviews with program participants. The recommendations are organized around project goals, with additional recommendations focused on project logistics.

Planning

Continue to guide teachers and teams at schools in the process of identifying learning goals, aligning those goals with standards, and revisiting those goals throughout the year. Teachers benefit from strategies to develop "living" documents that are easily accessible, easy to use, and meaningful to their instruction. As in previous years, it would be beneficial to include both content specific as well as cross-curricular planning activities. Teachers benefit from extended planning sessions, with specific, measurable outcomes.

Collaboration

Continue to offer teachers multiple opportunities to collaborate in formal and informal settings. "Show and tell," along the lines of "Celebrations of Learning," are powerful settings in which MSA teams, students, administrators, and parents can understand the way/s in which project goals are being implemented and achieved. Collaboration at sites, through regularly scheduled after-school meetings, with teachers taking on increasing responsibility appears to be a promising model for using collaboration as a means to developing site leadership.

Instructional Strategies

It is critically important to continue to help teachers understand, implement, and evaluate a variety of research-based instructional strategies, including technology. MSA provides teachers with important resources to new strategies. Careful reflection and selection of new ideas to incorporate is vital; too many goals and too many approaches can dilute MSA's impact long-term.

The MSA 2004 Summer Institute is one example of supporting the development of teachers' knowledge of mathematics. Continuation and follow-up of the strategies and approaches to teaching standards-based mathematics is important. Without follow-up and additional support for the ideas presented at the Summer Institute, widespread use and implementation of the approaches may be limited. Teachers also requested additional content information in the area of science.

Assessment

MSA mentors and a number of MSA teachers recognize the importance of strengthening their knowledge and understandings of assessment to increase student learning. Absent specific instruction about assessment, it is challenging and almost impossible for teachers to build the kinds of assessment tools they need to more effectively support teaching and learning in their classrooms. A focus on quality assessment systems, and how to develop, implement, and understand student understandings is an important next step in the evolution of MSA.

Classroom Management

Important steps have been made towards strengthening teachers' capacity to successfully implement classroom management strategies. As teachers become more familiar with various approaches to classroom management, it is important to continue to communicate successes and challenges, and to refine classroom strategies to fit a variety of contexts.

Cognitive Coaching Model

During Year 4 of MSA, experienced MSA teachers took on roles and responsibilities in the coaching process at their sites. This step occurred without

formal instruction or direction; teachers, who had been coached previously, implemented the protocol in ways that best fit their particular site and situation. During the 2004 Summer Institute, coaches had the opportunity to learn about the coaching process in-depth, to ask questions about the nature of the reflection, and to refine the coaching protocol. To maximize the power of the coaching model, it is important to "calibrate" observations, that is, to generate more systematic guidelines for how and in what ways the 3-part coaching experience is implemented. Meetings and debriefings can be planned to support coaches in their quest to build their understandings of the coaching process. Mentors too, can benefit from careful articulation of project goals and ideas, as they work with the new coaches and teachers to implement MSA during Year 5 of the project.

MSA Project Logistics

MSA has grown and developed each successive year of the project and, with it, the roles and responsibilities of project leaders. In addition to providing critical support to teachers in the classroom, organizing and conducting Summer Institutes, and sessions during the school year, mentors have assumed numerous additional roles and responsibilities for running the project, in particular with respect to program logistics, such as stipend payment, contracts with districts and the like. Careful consideration of the best and most efficient ways to allocate mentor time and energy is a critical issue for Year 5 of the project. The addition of a 4th mentor will help to ensure that teachers will continue to receive the instructional support they need to implement project goals and objectives, and with planning and delivery of the Summer Institutes, but additional personnel and resources may be necessary for MSA to continue to grow and develop in quality ways.

Implications

During Year 4 of MSA, teachers and mentors continued to refine and develop project goals and objectives. As in previous years, project "success" was most dramatic in classrooms where teachers most fully implemented project goals and strategies. MSA teachers continue to make important strides towards refining their teaching practices and implementing the instructional strategies, methods, and tools to support student learning and achievement.

References

Costa, A. & Garmston, R.J. (1998). Cognitive coaching: A foundation for renaissance schools. Norwood, MA: Christopher-Gordon.

Darling-Hammond, L. & McLaughlin, M.W. (1995). Policies that support professional development in an era of reform. Phi Delta Kappa, 76(8), pp. 597 – 604.

Wong, H. K. & Wong, R. (1998). The first days of school: how to be an effective teacher. Mountainview, CA: Harry K. Wong Publications.

Zikes, Dinah. (1992). Strategies that work. *Big book of books and activities: The big book of projects*. San Antonio, TX: Dinah-Might Adventures, LP

Appendix A

A1. Teacher Survey

A2. Student Achievement Data

A1

UCLA CENTER FOR THE STUDY OF EVALUATION
MATH AND SCIENCE ACADEMY (MSA)
TEACHER SURVEY 2003 - 2004

Please indicate your responses by checking, circling or filling in the blanks.

1. Sex: [ ]M [ ]F

2. Ethnicity [ ] White [ ] Latino/a, Hispanic [ ] Native American
[ ] African American [ ] Asian [ ] Other_____

Academic/Professional Background

3. What is the highest degree you have received?
[ ] Bachelor's + Teaching credential
[ ] Bachelor's + credential + units beyond
[ ] Master's
[ ] Master's + units beyond
[ ] Doctorate
[ ] Other (specify)_____

4. Please indicate which teaching credentials you have and specify the content area of specialization. (Circle **ALL** that apply.)
[ ] General Elementary
[ ] General Secondary
[ ] Special Emergency
[ ] Multiple Subject
[ ] Single Subjects
[ ] Bilingual
[ ] Other_____

5. a. How many years of teaching experience do you have? _____ years

b. How many years have you been a part of MSA?___1 year _____2 years

_____3 years _4 years

6. How many years have you taught bilingual/LEP/bicultural students (including this year)?
_____ years

7. Have you participated in other reform projects like MSA? [ ] Yes [ ] No
If yes, please describe:

8. Please describe MSA classes you worked with this year:

a. Grade/s: _____

b. Subject (if applicable): science_____ math_____

language arts_____ social studies_____

- Language(s) of instruction:

1. Mostly Spanish _____ 2. Both English and Spanish _____

3. Mostly English _____ 4. Other _____

Planning an Effective Program: Curriculum and Articulation

10. Please respond to the following statements based on your implementation of MSA ideas:

		Never		Some-times		Always	N/A
a)	I develop yearlong and short-term goals for my students.	1	2	3	4	5	N/A
b)	I choose content to meet the learning goals of my students.	1	2	3	4	5	N/A
c)	I design and adapt curricula to meet the needs of my students.	1	2	3	4	5	N/A
d)	I use instructional strategies that develop and promote student understanding.	1	2	3	4	5	N/A
e)	I work with my colleagues in my content area/grade level to set goals and standards for learning and achievement.	1	2	3	4	5	N/A
f)	I work with my colleagues across content areas to set goals and standards for learning and achievement.	1	2	3	4	5	N/A
g)	I developed goals for "data not guesswork" performance and used them to guide instruction.	1	2	3	4	5	N/A

11. To what extent has your instructional planning, articulation and collaboration with your colleagues changed as a result of your participation in MSA?

Not at All		Somewhat		A Great Deal
1	2	3	4	5

Please explain.

Guiding and Facilitating Learning

12. Please respond to the following statements based on your implementation of MSA ideas:

		Never		**Some-times**		**Always**	**N/A**
a)	I focus and support inquiry as I interact with my students.	1	2	3	4	5	N/A
b)	I support student discussion of ideas in small and large groups.	1	2	3	4	5	N/A
c)	I model and provide guidelines for positive ways to share ideas and information.	1	2	3	4	5	N/A
d)	I require students to take responsibility for their learning and to work collaboratively.	1	2	3	4	5	N/A
e)	I recognize and respond to student diversity.	1	2	3	4	5	N/A
f)	I expect all students to participate fully in learning.	1	2	3	4	5	N/A

13. To what extent have your approaches to guiding and facilitating student learning changed as a result of your participation in MSA?

Not at All		Somewhat		A Great Deal
1	2	3	4	5

Please explain.

Assessing Student Learning

14. Please respond to the following statements based on your implementation of MSA ideas:

		Never		Some-times		Always	N/A
a)	I systematically gather data on my students and their learning in my classes.	1	2	3	4	5	N/A
b)	I analyze assessment data on a regular and timely basis to inform and guide my teaching.	1	2	3	4	5	N/A
c)	I guide my students in self-assessment.	1	2	3	4	5	N/A
d)	I use student data, observations of teaching, and interactions with colleagues to reflect on and improve my teaching practices.	1	2	3	4	5	N/A
e)	I provide students with information on how their work will be assessed.	1	2	3	4	5	N/A
f)	I provide students with examples and models of what represents "good work".	1	2	3	4	5	N/A
g)	I use a wide variety of assessments to help me understand students' ideas and learning.	1	2	3	4	5	N/A

15. To what extent have your assessment practices for teaching and learning changed as a result of your participation in MSA?

Not at All		Somewhat		A Great Deal
1	2	3	4	5

Please explain.

Instructional Materials and Resources

16. Please respond to the following statements based on your implementation of MSA ideas:

		Never		**Sometimes**		**A Great Deal**	**N/A**
a)	I structure learning time to allow students to engage in projects and/or investigations.	1	2	3	4	5	N/A
b)	I create a setting for student work that is flexible and supportive of student learning.	1	2	3	4	5	N/A
c)	I ensure a safe learning environment.	1	2	3	4	5	N/A
d)	I make **tools & materials** available to students to support learning.	1	2	3	4	5	N/A
e)	I make **print resources** available to students to support learning.	1	2	3	4	5	N/A
f)	I make **technological resources** available to students to support learning.	1	2	3	4	5	N/A
h)	I use graphic organizers to support learning.	1	2	3	4	5	N/A
g)	I engage students in designing their learning assignments.	1	2	3	4	5	N/A

17. To what extent has your design and management of students' learning environment changed as a result of your participation in MSA?

Not at All		Somewhat		A Great Deal
1	2	3	4	5

Please explain.

Building Communities of Learners

18. Please respond to the following statements based on your implementation of MSA ideas:

		Never		**Some-times**		**Always**	**N/A**
a)	I display and encourage respect for the ideas, skills and experiences of my students.	1	2	3	4	5	N/A
b)	I give students a voice in decisions about the content and context of their work.	1	2	3	4	5	N/A
c)	I require students to take responsibility for the learning of all members of their group/class.	1	2	3	4	5	N/A
d)	I support collaboration among my students.	1	2	3	4	5	N/A
e)	I structure and facilitate ongoing formal and informal discussions based on a shared understanding of the rules of classroom discourse.	1	2	3	4	5	N/A
f)	I model and emphasize the skills, attitudes, and values of inquiry.	1	2	3	4	5	N/A

19. To what extent have your ideas and practices relating to the development of learning communities with your students changed as a result of your participation in MSA?

Not at All		Somewhat		A Great Deal
1	2	3	4	5

Please explain.

School & MSA Community

20. Please respond to the following statements based on your implementation of MSA ideas:

		Never		Some-times		Always	N/A
a)	I participate in planning and developing the school program for my content area/grade level.	1	2	3	4	5	N/A
b)	I have a voice in making decisions regarding the allocation of time and other resources at my school.	1	2	3	4	5	N/A
c)	I plan and implement professional growth and development strategies for myself and my colleagues.	1	2	3	4	5	N/A
d)	I communicate with the parents in our community about MSA goals and student progress towards those goals.	1	2	3	4	5	N/A
e)	I meet with my MSA colleagues to discuss student work, teaching and learning on a regular basis.	1	2	3	4	5	N/A

21. To what extent have you changed your involvement and participation in the ongoing planning and development of the school learning plan as a result of your participation in MSA?

Not at All		Somewhat		A Great Deal
1	2	3	4	5

Please explain:

MSA Program Effectiveness

22. How effective was MSA in the following areas:

		Not Effective		Some-what Effective		Highly Effective	N/A
a)	Familiarizing you with standards-based instruction	1	2	3	4	5	N/A
b)	Developing your knowledge of state frameworks for content areas	1	2	3	4	5	N/A
c)	Helping you develop interdisciplinary curriculum units	1	2	3	4	5	N/A
d)	Providing demonstration lessons that were meaningful and relevant	1	2	3	4	5	N/A
e)	Sharing assessment strategies	1	2	3	4	5	N/A
f)	Helping you to develop rubrics to support instruction	1	2	3	4	5	N/A
g)	Informing/involving the community about MSA goals and objectives	1	2	3	4	5	N/A
h)	Helping you understand how to use technology effectively	1	2	3	4	5	N/A
i)	Assisting you in implementing cooperative learning activities	1	2	3	4	5	N/A

Comments:

MSA Impact: Self-Assessment

23. Please rate yourself along the following dimensions as a result of your participation in MSA. If you teach more than one content area, please use the comment area below to indicate your self-assessments of **Question 23a** and **Question 23b.**

		Weak		**Moderately strong**		**Very strong**	**N/A**
a)	Knowledge/understanding of your **content area** (math, science, language arts, or social studies)	1	2	3	4	5	N/A
b)	Knowledge/understanding of your **content standards** (math, science, language arts, or social studies)	1	2	3	4	5	N/A
c)	Confidence in teaching content area	1	2	3	4	5	N/A
d)	Knowledge of a wide variety of instructional techniques	1	2	3	4	5	N/A
e)	Technology skills	1	2	3	4	5	N/A
f)	Knowledge and implementation of cooperative learning strategies (i.e., jigsaw, small groups)	1	2	3	4	5	N/A
g)	Knowledge of various assessment strategies	1	2	3	4	5	N/A
h)	Implementation of various assessment strategies	1	2	3	4	5	N/A

24. Comments:

Student Learning and Achievement

25.Please indicate your observations regarding student learning and achievement this year.

		Disagree		**Moderately strong**		**Strongly Agree**	**N/A**
a)	I have observed changes in student learning and achievement this year.	1	2	3	4	5	N/A
b)	My participation in MSA had a positive impact on my students' learning and achievement this year.	1	2	3	4	5	N/A
c)	MSA ideas helped increase student learning and achievement.	1	2	3	4	5	N/A
d)	Students learned more because of cooperative learning opportunities in my classroom.	1	2	3	4	5	N/A
e)	Students benefited from the use of DNG in my classroom.	1	2	3	4	5	N/A

26. Please explain and provide specific examples.

27. Coaching Experience

Describe how the pre-conference, observation and debriefing experience with coach/es impacted (or not) the teaching, learning and planning in your classroom this year. Please include specific examples if possible.

28. Data Not Guesswork

Describe how and in what ways you used the "data not guesswork" to guide instruction this year (if at all). Please include specific information on the structure you used, types of questions developed, frequency of use and overall reactions to this instructional/assessment approach.

29. Did you respond to the weekly informational e-mail messages?

Not at All		Sometimes		Almost Always
1	2	3	4	5

How useful was the information sent to you as a professional?

Not at all useful		Somewhat useful		Highly useful
1	2	3	4	5

Please provide more information on your response to Question #27:

30. For Site Leaders**: describe your experience working with your team members this year. How (if at all) did your leadership role impact your experience with MSA, your teaching and your relationship with your colleagues?**

31.List three successes in the implementation of MSA at your school site. Please provide details and examples.

1)

2)

3)

32.List three barriers to the implementation of MSA at your school site. Please provide details and examples

1)

2)

3)

33. How could MSA be improved?

Thank you for completing this survey.

Appendix A2
Student Achievement Scores

Table 7
School A: 7th Grade
MSA CTB/Scale Scores

	Reading/SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
Year					
2000	634	634	612	628	636
2001	641	642	621	640	642
2002	648	649	636	645	642
2003	674	672	665	673	666
2004	662	667	658	671	677
Score change '03 to '04	-12	-5	-7	-2	+11

Table X
School B: 7th Grade
MSA CTB/Scale Scores

	Reading/ SS	Language Arts/SS	Math/SS	Science/SS	Social Studies/SS
Year					
2000	631	634	623	629	634
2001	642	642	634	633	638
2002	646	646	642	644	646
2003	658	659	656	664	656
2004	659	663	661	663	662
Score change from 03 - 04	**+1**	**+4**	**+5**	**-1**	**+6**