SCALE

October 2, 2006

System-wide Change for All Learners and Educators

Fourth Annual Progress Report

Submitted to the National Science Foundation

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2006 Fourth Annual Progress Report
System-wide Change for All Learners and Educators

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Management Report

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SCALE Management Report

Management

SCALE was funded during the first round of the MSP awards. It was recognized that the SCALE plan, as proposed, was complex, challenging and creative. The question in the minds of all was "How could an MSP so diverse with regard to types and sizes of school districts, types of IHE entities, geographic spread, and so ambitious in its goals, succeed?" The very first lesson learned was that SCALE required a center for its operations – effectively the heart of the enterprise. The SCALE Administrative Office (SAO) has played this important role by providing the University of Wisconsin- Madison (UW-Madison) and each of the project partners with administrative support. The SAO is located in the Wisconsin Center for Education Research (WCER), where the Principal Investigator/Project Director, the administrative support personnel, the UW-Madison Immersion Team, and the Research and Evaluation Team (RET) are housed.

Leadership

While the SAO acts as the administrative arm, facilitating the partnership's drive towards both SCALE's and NSF's goals and objectives, the leadership is distributed across the partnership. The aim of the SCALE leadership structure—now called the Leadership Team—is to act as an interactive, collegial system that also maintains the clear lines of authority and responsibility necessary to ensure quality, accountability, coherence, direction, and vision.

The goals and challenges of our ambitious project call for a leadership structure that facilitates interaction and productivity, is served by modern communication technologies, and is informed by feedback loops at all levels. A key goal of the Leadership Team is to identify points where the SCALE partners need to communicate more effectively, and to develop processes and procedures to facilitate collaboration among the partners. To achieve this goal, the Leadership Team must address the challenges of supporting SCALE programs and professionals working in different geographic locations, and of managing partnership workflow efficiently. This has been accomplished by managing both the information itself and the flow of that information in order to plan and conduct meetings in ways that optimize use of SCALE participants' time and cognitive capacity, and that allocate sufficient time and resources to meet deadlines. Many of these communication challenges are met through technology, as discussed below in the Knowledge Management Section.

The National Science Foundation allows for one Principal Investigator (PI) and four co-PIs on its awards. This did not fit the "shape" of a partnership such as SCALE, since ideally there would have been a co-PI from each institution in the partnership. The SCALE Partnership corrected the problem by creating the original leadership structure – the Senior Management Team (SMT). Each SCALE partner had at least one member on the SMT. From the end of SCALE Year 2 until the beginning of SCALE Year 4, the lines of evolving work were becoming well defined, and most SCALE leadership activities factored out along the major lines of work. During this time the SMT met primarily to help prepare the Annual Reports and Implementation Plans, and prepare and undertake the annual Site Visits and National Advisory Board meetings.

By the beginning of Year 4, it was apparent that SCALE lines of work had reached a sufficient level of maturity, and that a new leadership team should be established. In particular, while many of the benchmarks of SCALE's Goal 1 had been effectively met, primarily through the work of the Institute for Learning (IFL) (see the section entitled *Activities and Findings* Fourth Annual Progress Report), the partner districts indicated that more intensive effort was needed for both

curricula and professional development needs. For example, LAUSD needed to implement its new Mathematics and Science Instructional Guides, and required extensive professional development to meet this need successfully. At least two of the districts and key SCALE leaders felt that the Professional Development component of Goal 1 was not yet fully explored, developed, or implemented. At the same time, Goal 2 work in science immersion had progressed significantly during Year 4, particularly in the units being developed for LAUSD and MMSD. These units, however, needed to be tested fully in the classroom, requiring substantial attention to training teachers to use the units, support for teachers during initial classroom implementation of the units, and studying the implementation. In addition, in both Los Angeles and Madison, a natural "fusion" of the Goal 1, 2, and 3 lines of work was beginning. The promising SCALE work underway in these two districts was closely watched by the Providence Public School District (PPSD). The PI and a few other key leaders believed that SCALE needed a leadership team that understood and could act effectively on these developments.

In particular, noting that STEM, STEM education faculty, and staff in the local IHEs in Los Angeles and Madison were helping SCALE achieve both its objectives and those of the NSF Five Key Features, they chose to respond to needs expressed by the district partners by directing more SCALE resources towards professional development and classroom implementation. This initiative resulted in a major disagreement among the partner universities over where to focus SCALE work and how to meet the priorities of each partner. At the start of Year 4, the Institute for Learning felt that it had met most of its objectives for Goal 1 in the Professional Development dimension of the Instructional System as articulated in the SCALE proposal. Although the IFL continued some work in professional development, it redirected much of its attention and considerable SCALE resources to other SCALE work it wished to pursue. This redirection did not appear to meet the identified needs of the districts, as judged by the PI and some other members of the leadership team. Moreover, the PI and other SCALE leaders saw little evidence that this redirection of SCALE resources would meet the objectives outlined in NSF's Five Key Features. Extended and intense dialogue failed to resolve this impasse, and the University of Pittsburgh chose to withdraw from SCALE, effective September 30, 2006.

During the spring 2006 discussion, the PI chose to retire the SMT as an organizational structure and to establish the SCALE Leadership Team (SLT). Goals for comprising this team were to ensure that each partner organization, including the IFL(as separate from the University of Pittsburgh), was represented by at least one person, to reflect changes in leadership in two of the SCALE districts, and to reflect the involvement the California State Universities at Dominguez Hills (CSUDH) and Northridge (CSUN) (each of which is represented by its provost).

The SCALE Leadership Team is now comprised of:

SCALE Principal Investigator/Project Director:
Dr. Terrence Millar, Associate Dean of the Physical Sciences of the Graduate School at UW-Madison and Professor of Mathematics

K-12 District Leaders:
Dr. Ronni Ephraim, Chief Instructional Officer (Elementary), LAUSD, SCALE Co-PI
Dr. Jamie Aquino, Chief Academic Officer, DPS
Represented by Cathy Martin, Director of Mathematics and Science, DPS
Dr. Lisa Wachtel, Director of Teaching and Learning, MMSD
Dr. Fran Gallo, District Deputy Superintendent; PPSD
Represented by Mike Lauro, Director of Mathematics and Science, PPSD

University Leaders:
Dr. Allen Mori, Provost, CSU Dominguez Hills, SCALE Co-PI
Dr. Harry Hellenbrand, Provost, CSU Northridge, SCALE Co-PI

Goal Leaders:
Merle Price, Lecturer, CSU Northridge, Goal 1 and Goal 4 Leader
Dan Lauffer, UW-Madison, Goal 2 Leader
Dr. Eunice Krinsky, Mathematics Professor, CSU Dominguez Hills, Goal 3 Leader
Dr. Andrew Porter, Director of the Learning Sciences Institute, Vanderbilt University, SCALE Co-PI and Goal 5 Leader
Sarah Mason, UW-Madison, SCALE Manager and Goal 5 Manager

All the Leadership Team members (or their representatives) either have been actively involved in SCALE from the beginning or shortly thereafter. This Leadership Team is well prepared to continue directing SCALE toward meeting all of its objectives and those of NSF during Year 5. SCALE's Year 5 Implementation Plan has been created and prepared by this newly configured SCALE Leadership Team.

Knowledge Management

With such a geographically dispersed partnership, the SCALE partnership continues to employ innovative technology (and related support) to connect people and enable work. Since Year 1, the SCALE Knowledge Management team is continuing to serve the partnership by providing development, support, and administration of a secure web space for communications and development (SCALEnet). Users include personnel from all partner institutions and at several administrative, research, and instructional levels. SCALEnet is the major communications platform for the partnership and contains email discussion lists, document storage, calendaring, and project management tools. SCALEnet is built upon business enterprise collaboration software from the Vignette Corporation. It continues to be adapted, customized, and developed for use in with educational and research work and workflows.

SCALEnet allows for improved oversight of partnership activities, helps to bring staff together for collaborative work, and supports partner institution activities. This year major projects included a re-organization of all travel, administrative, and financial documentation as well as UW-Madison Immersion Team workspace and workflows. The UW-Madison Immersion Team used the tool to support the planning and execution of the summer science institutes for LAUSD. MMSD made use of this tool to support the Math Masters Project for middle school teachers. From the documentation within the database, services such as a monthly newsletter are generated to inform the partnership about events, news, reports, and scholarly publications. SCALEnet now has more than 800 users and 125,000 objects in its database. In Year 4 there have been approximately 17, 500 sessions and 400,000 page views.

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System-wide Change for All Learners and Educators

Activities and Findings Report

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Activities and Findings Report

Highlights: SCALE Math Science Partnership Five Key Features

The roles of SCALE district and university partners have undergone several transformations since the original SCALE proposal. These transformations reflect an increased level of partnership among STEM and STEM education faculty at IHEs and K-12 school districts and their teachers and teacher-leaders in pre-service content and pedagogical teacher training, and in-service teacher professional learning. These transformations also reflect a greater integration with Goal 2 immersion development and the dimensions of the Goal 1 Instructional System. This integrated work has five main objectives aligned with the NSF Five Key Features for MSP Projects:

- **Partnership-Driven:** Promote coherence between each district and the IHEs that serve the district in ways that are consistent with and support SCALE and NSF objectives.
- **Teacher Quality, Quantity and Diversity:** Involve STEM and STEM education faculty and district math and science personnel in designing and providing quality pre-and in-service professional development opportunities for future and current K-12 teachers.
- **Challenging Courses and Curricula:** Promote STEM and STEM education faculty and district math and science personnel involvement in the development and implementation of challenging courses and curricula to improve the preparation of future STEM teachers.
- **Evidence Based Change:** Use evaluation and research to allow for continuous improvement of SCALE lines of work and to establish a foundation of evidence that informs decisions and use of resources.
- **Institutional Change and Sustainability:** Develop opportunities for local post-secondary institutions to coordinate with the local districts to develop and implement new policies and practices that redirect and increase the resources available in K-20 organizations to incorporate the lessons learned and the evidence-based effective practices.

For the university-based parts of these initiatives, Terry Millar (UW-Madison) and Eunice Krinsky (CSUDH) have taken the lead. Both are mathematicians and university administrators, who together bring to the SCALE Partnership over 50 years of experience to teaching, learning, and administration across the K-20+ educational continuum. They continue to help coordinate and leverage resources from the states, the Department of Education, and NSF to better serve the SCALE goals. As an example of this in promoting both the Partnership-Driven and Evidence Based NSF Key Features, Krinsky, Millar and others in SCALE worked with UW-Madison Professor and WCER Director Adam Gamoran and Dr. Steve Cantrell (then at LAUSD) to write and now implement a successful NSF Teacher Professional Development proposal that will study a random sample of 80 elementary schools over the next five years to help measure the impact of SCALE science immersion professional development and curriculum interventions.

The regional SCALE partnerships in the L.A. basin and in Madison have been blossoming in ways that continue to support all five NSF Key Features. The partnerships have contributed to advances in both the nature and quality of in-service professional development, and also in planning for pre-service STEM content courses and methods courses that will better serve the teachers of each region.

Because of the natural integration of SCALE Goals 1 through 4 in much of this work, reporting separately by these goals has become more difficult. This section will concentrate on STEM faculty and graduate student participation within UW-Madison, CSUDH, and CSUN as institutions of higher education. However, it should be noted that there has been substantial STEM and STEM education faculty involvement in the SCALE science immersion work and also in both math and science teacher professional development.

The University of Wisconsin-Madison

There were several reasons that UW-Madison decided to initiate, pursue, and lead an NSF Math and Science Partnership, and to devote some of the human and financial resources of the University through the Graduate School (that is also the Research Office) to this endeavor. The primary reason was to work with others nationally to explore ways to improve math and science education at all levels through innovative partnerships. This reason flows very naturally from the historic Wisconsin Idea, a tradition first stated by UW President Charles Van Hise in 1904. Van Hise declared that he would "…never be content until the beneficent influence of the university reaches every family in the state." Today that belief permeates the University's work, fostering close working relationships within the state, throughout the country and around the world.

This collaborative work that SCALE has fostered extends the potential broader impact of fundamental research on the UW-Madison campus. SCALE works regularly with UW-Madison and other SCALE university STEM and STEM education faculty to align their broader impact efforts in their research with SCALE needs. For example, in this last year, SCALE has been involved in supporting:

- Professor Steve Ackerman, Director of the large NOAA/NASA Center for Meteorological Satellite Studies. Professor Ackerman has worked with both SCALE and its predecessor at UW-Madison, KTI, the six-year GK-12 program. Professor Ackerman is working with SCALE and the University of Washington's Applied Physics Laboratory to develop, implement and evaluate an inquiry-based distance learning professional development course for high school science teachers – Professor Ackerman has received separate NSF funding for this project.
- SCALE wrote a letter of support for CSUDH Mathematics Chair Dr. George Jennings for a proposal to the NSF Robert Noyce Scholarship Program.
- SCALE wrote a letter of support for a FIPSE proposal submitted by UW-Madison School of Education Associate Dean Ken Zeichner.
- SCALE is working with Biochemistry Professor Brian Fox to find ways to partially integrate his "Decoder Kit to Discover Principles of Biology" project with SCALE science immersion.

UW-Madison Math Liaison Committee

In 2004, MMSD was awarded an MSP Title IIb grant from the Wisconsin Department of Public Instruction. The program was developed jointly by MMSD and SCALE. MMSD and the UW-Madison Mathematics Department, with Title IIb and SCALE support, created and delivered four 1-credit core mathematics concept courses during the summer, fall, and spring, 2004-2006. The mathematics concept courses were delivered in approximately 19 content workshops and four online pedagogy workshops from 2004- 2006. These workshops served more than 154 middle school math teachers (many of whom took multiple courses) from MMSD and other nearby school districts.

SCALE has provided assistance to the campus UW-Madison Mathematics Education Liaison Committee that has been appointed to design a new set of courses for pre-service middle school math teachers. This committee has as member's UW-Madison mathematics and mathematics education faculty, as well as the MMSD Mathematics Coordinator and MMSD mathematics teachers. Currently in Wisconsin, the mathematics requirements for a teacher to be certified for

teaching math at grade levels K-8 is a sequence of three pre-service math courses. The Committee does not believe this is sufficient, and its goal to research, design, test, and implement a new five-course middle school math pre-service sequence. Ultimately, the Committee hopes to share this work with other campuses in the state and then to petition the Wisconsin Department of Public Instruction to change to certification requirements for teaching middle school math.

Several of the members of the Math Masters Team (UW-Madison faculty and MMSD teachers) are on that Committee, and the related diverse sets of experiences are valuable to the Committee for executing its charge. SCALE provided a small amount of salary support to several UW-Madison math/math education faculty, as well as eight math/math education graduate students this summer to research national models of middle school math pre-service course sequences. These graduate students will assist the subcommittees of the Mathematics Education Liaison Committee as they design the courses in the new sequence. In addition, SCALE initiated a visit to the UW-Madison campus by University of Nebraska-Lincoln Mathematics Professor Jim Lewis, because of the important work he has led in elementary and middle school pre-service reform in Lincoln, and also because of his national prominence in mathematics education reform.

The work of the UW-Madison Mathematics Education Liaison Committee will extend over the next two years. A member of the Mathematics Department who has participated in the Math Masters Program and a member of the Mathematics Education Group who are both on the committee are team teaching a mathematics course in the fall academic semester with some SCALE support to explore relevant national resources. More team teaching is being planned between the math and math education faculty to also help inform the committee's work. The larger plan is to design the first two-three courses this coming academic year, and then to implement and evaluate them. The Committee also has discussed models for creating a stable support mechanism for the course sequence, including the concept of building a program that has graduate student professional development embedded in the maintenance of the program.

UW-Madison Science Education Liaison Committee

SCALE also has played a key role in creating a parallel Science Education Liaison Committee to help reform the UW-Madison pre-service science course selection for future middle school science teachers. The SCALE PI has used his connections as the Graduate School Associate Dean for the Physical Sciences to help recruit a group of leading STEM faculty who will support and also be members of this committee. This group of STEM faculty include, for example:

- Atmospheric and Oceanic Professor Steve Ackermann, Director of the Collaborative Institute for Meteorological Satellite Studies;
- Mechanical Engineering Professor Nicola Ferrier – part of the Math Masters Team as well as a former NSF KTI faculty participant;
- Physics Professor Francis Halzen, IceCube PI;
- Chemistry Professor Bob Hamers;
- Computer Sciences Professor Miron Livny, Condor Director;
- Astronomy Professor Robert Mathieu, CIRTL PI;
- Chemistry Professor John Moore, Director of Institute for Chemical Education and Director of the education component of the NSF nano-technology center NSEC;
- Engineering Physics Professor Greg Moses, former NPACI Education Team co-Leader; and
- Biochemistry Professor David Nelson, Director of the Center for Biology Education.

This committee also will have UW-Madison Science Education faculty (including Curriculum and Instruction Professor Jim Stewart, a former member of the National Institute for Science Education) and MMSD science leaders.

SCALE Middle School Math Forum

On December 11-12, 2005, SCALE sponsored a day-long Forum on new ideas for middle school mathematics and algebra at UW-Madison. Representatives of all four SCALE partner school districts (DPS, LAUSD, MMSD, and PPSD) participated along with expert consultants from the university partners (UW-Madison, University of Pittsburgh, and CSUDH). A special presentation was made by Professor Uri Treisman, of the Dana Center at the University of Texas at Austin, who also participated in the sessions, along with Linda Chaput, CEO of Agile Mind. Professor Adam Gamoran of UW-Madison directed questions about needs and goals to the designated representatives of the large districts (Bob Collins and Ronni Ephraim of LAUSD) and small districts (Art Rainwater and Mary Ramberg of the MMSD). There were also breakout "design" sessions on curriculum, professional development, and monitoring and assessment.

The California State Universities

The role of CSUDH in SCALE was originally designed to be modest. The SCALE proposal indicated that CSUDH was an example of a local university that would consider, through its SCALE association, revising its approach to the preparation of new teachers. However, CSUDH has come to play a seminal, transformation role in SCALE in ways that are directly aligned with all of the NSF Five Key Features of the MSP program.

CSUDH had a long history of close ties with LAUSD – particularly since the University is one of the primary suppliers of new teachers to the District. CSUDH also always has been actively involved in the continued education of LAUSD administration personnel. This association, however, was mostly with the University's College of Education and not through its Arts and Sciences Colleges and departments. Through the SCALE partnership, and especially because of the eventual emergence of an integration of Goal 1-3 with direct participation of STEM faculty, STEM Education faculty, and district science and mathematics experts, the scope of the relationships between CSUDH and LAUSD expanded. It became the rule rather than the exception that both STEM faculty and STEM Education faculty worked with the District.

Science Immersion Work and Professional Development

The Year 1-2 SCALE immersion work in LAUSD involved only LAUSD and UW-Madison. Although this work was initially successful, it was not scalable or sustainable. The SCALE leadership and the SCALE Goal 2 team approached CSUDH in the second year of SCALE and proposed that CSUDH be a platform for further immersion development with LAUSD. During these negotiations it became apparent that further resources were necessary to make this feasible. In October 2004 CSUDH and the LAUSD received a five-year Teacher Quality Enhancement partnership (U.S. Department of Education Title IIb) award of $4.9 million entitled Quality Educator Development (QED). QED's overarching goal, aligned with SCALE lines of work and sharing its theory of action, is to "[i]ncrease the pool of highly qualified mathematics and science teachers who are willing, and more importantly, able to serve the poor, minority and limited English proficient students within LAUSD and other urban schools." One of the primary ways this was accomplished was to use QED and SCALE resources to foster a new genre of partnership among the partners to advance as well as immersion development the professional development for science immersion and its implementation into the classroom. The key to this new genre of partnership has been inter- and intra- organizational collaboration on all aspects of the immersion model. All aspects of immersion, from the development of the units, through the science teacher professional development, through to classroom implementation has been co-constructed by integrated teams of UW-Madison staff, CSUDH STEM and STEM Education faculty, and LAUSD science experts and sciences leaders. In addition, QED has focused on this in-service teacher professional development for its pre-service content and pedagogy courses university policy, social, and curricular changes.

During the time period June 2005 – August 2006, CSUDH organized and facilitated 23 one-week science institutes (9 during summer 2005 and 14 during summer 2006 on three CSU campuses) – each focused on the introduction and preparation for implementation of a science immersion unit – grades 4 through 8. To document the collaborative work that was the foundation of these institutes and their impact, UW-Madison staff teamed up with a CSUDH Education faculty member to produce three videos documenting three phases of the science immersion work: co-design and co-development, co-delivery. In science nearly 500 teachers have participated in the intensive institutes.

Mathematics Immersion Development and Professional Development

During Year 4 of SCALE LAUSD determined that those students entering 8th grade who did not appear to be prepared for Algebra I would be enrolled in a new Algebra Readiness course. There are many difficult issues associated with students' lack of success in Algebra. As LAUSD grappled with these challenges it became obvious enhancing mathematical content knowledge was one of the areas in which the partnership could be of assistance. Accordingly during the summer of 2005 SCALE and QED piloted three 3-week Algebraic Thinking Institutes for 60 LAUSD middle school teachers. This work expanded to CSUN during the summer of 2006 which hosted two such mathematics institute modeled after similar institutes being offered again at CSUDH (approximately 90 teachers attended in total). Additionally, the teachers in each institute worked together to co-develop with the university faculty two-three week teaching units following the direction suggested in the district's Mathematical Instructional Guide and the district's selected mathematics textbooks. One such "Math Immersion Unit" has been posted on SCALEnet. Nearly 200 mathematics teachers have been involved over the past two summers. QED evaluation surveys have indicated the participants were very satisfied as indicted by a 1.4 rating on a five-point scale where 1 = very satisfied. One teacher added that the best part of the institute for her/him was having "…the mathematicians as instructors. They were knowledgeable, listened well, [were] excited about math and [the] teaching of mathematics…" All of the QED evaluator reports, for all the math and science institutes, are available on SCALEnet.

Regional Development Work

QED, working in tandem with SCALE, has provided additional human and capital resources to address some of the most challenging issues in the mathematics and science education in the LAUSD. Many LAUSD teachers and lead teachers have had opportunities to participate in quality professional development experiences. To develop and provide additional human and social resources, the leadership at CSUDH worked with the leadership at CSU, Northridge to bring their STEM and STEM Education faculty into the SCALE and QED professional development work. Simultaneously, CSUN, through its Teachers for a New Era (TNE) initiative is working with SCALE to help identify the most effective methods to institute change. The STEM and STEM Education faculty at CSU, Los Angeles also are beginning to join the efforts begun by SCALE and QED. This work to better aligned the theories of action and the work of the CSUs with LAUSD is potentially transformational. Since just the three CSUs mentioned recommend for licensing nearly 6,000 teachers each year, and because most of those teachers work for LAUSD, the potential impact of a more coherent, integrated K-20 educational system is profound.

SCALE, with additional support from QED and TNE, has developed a regional, collaborative approach that builds professional community among scientists and science educators in districts and local universities. The collaborative approach engages K-20 actors and institutions in common learning about professional development and curriculum design, and distributes necessary knowledge for curriculum design and leadership. SCALE has used this approach to collaboratively develop (co-develop) *immersion* as an instructional approach and *immersion units* as exemplars of immersion.

The progress made in the last year in the Los Angeles Basin has:

- Provided challenging courses and curricula through the development of the immersion units
- Strengthened the partnerships:

    - Between Arts and Sciences and Education colleges
    - Between the Comprehensive Universities (the CSUs) and the Research 1 Universities (UW)
    - Between (perhaps most importantly) the Universities and the District
- Improved the quality, along with the quantity and diversity (QED's pipeline initiatives), of the teacher population; and
- Provided many opportunities to implement known, effective approaches and more areas to study.

As an outgrowth of the Science Immersion professional development work done within the collaborative, LAUSD, CSUDH, CSUN, and CSULA submitted a proposal for an MSP Institute Award in May 2006. If awarded these funds would allow the team to prepare a critical mass of middle school science lead teachers to assist fellow teachers in understanding and implementing the valuable science immersion units. Whether funded or not the work done by the team to develop the proposal helped to refine the desired direction that LAUSD wishes to pursue in science education.

University of Pittsburgh

The IFL brought to the SCALE partnership a set of broad principles of learning an emergent design for secondary curriculum design and professional development (later named Disciplinary Literacy) in math and science, and a framework for district design in support of student achievement[1]

Four dimensions of a system-wide effort to improve mathematics and science learning became the foci for the work that the IFL conducted in addressing the Challenging Courses and Curricula key feature of the MSP program: the *teaching dimension*; the *professional learning dimension*; the *monitoring dimension*; and *accountability dimension*

Questions of district curriculum were front-and-center concerns for each SCALE district in the first two years of the partnership, and so during school years 2003-4 and 2004-5 the IFL concentrated on tool development and district planning for District-Wide Curriculum Guidance. Final products for curriculum guidance were completed in the spring of 2006. During the past school year (2005-06) work has continued in order to complete and field-test an extensive system of rubrics for instructional quality in mathematics. At the same time, in collaboration with the SCALE Goal 4 team University of Pittsburgh has initiated intensive work on differentiated instruction and system designs for equitable mathematics and science instruction.

Three sets of district-wide curriculum planning tools were developed for the Curriculum Guidance aspect of district work and have been updated during the past school year. These planning tools were used with three SCALE districts (LAUSD, DPS and PPSD) as they worked to define their district teaching systems for mathematics and science.

Under SCALE/IFL guidance mathematics and science instructional guides were developed and revised in LAUSD during Year 4 with model conceptual lessons (in mathematics) and accompanying diagnostic, curriculum-related assessments. For high school science a review of specialty programs was commissioned, resulting in an extended paper entitled “Mathematics and Science Specialty High Schools Serving a Diverse Student Body: What’s Different?” (Kaser, 2006) that is now available to SCALE and other interested districts.

A substantial portion of the work with SCALE districts concerned the districts’ plans for and implementation of systems for diagnostic monitoring of student achievement. Like many urban school districts, two of the districts (PPSD and LAUSD) adopted the strategy of administering *interim assessments* in mathematics (and later science) to their students. The intent of these interim assessments was diagnostic and supportive of teachers. As work continued in system planning with LAUSD and PPSD problems were detected with the basic design of the interim assessment system they were using. The SCALE RET is continuing to study this process. SCALE’s members have been asked to organize a special Presidential Roundtable at the 2007 meeting of the American Educational Research Association to share the evidence that there is a growing dilemma in the use of interim assessments that are matched to the coming state tests, but often not to the curriculum.

[1] The complete Goal 1, 2, and 4 reports by the University of Pittsburgh are included in their entirety in the SCALE Research, Reports, and Publications (Year 4) document. The document will be submitted to the NSF on October 2, 2006. The document and the set of materials it contains is also posted on SCALEnet at: https://workspace.wcer.wisc.edu/gm/Year4PublicationsDashboard

To support Science Immersion University of Pittsburgh SCALE members co-developed three units in PPSD, further addressing the key feature of Challenging Courses and Curricula. Meetings with lead teachers and others were used to introduce the overall concept of immersion, identify by discipline the core science concepts that would be the focus of the immersion units, identify difficult concepts in the curriculum, organized Rhode Island state standards into clusters with connections, and identified conceptual building relationships within the curriculum. Concepts for biology, chemistry, and physics were selected that met all three filters: were very difficult, were central in state standards, and were basic building blocks in the curriculum.

Between the second and third meetings, University of Pittsburgh Goal 2 staff, with input from University of Pittsburgh STEM faculty, developed an overall unit storyline and outline of inquiry activities to effectively teach through design-based immersion the identified target concepts. The unit prototypes were a designer bacteria unit for biology, a modified heating and cooling systems unit for chemistry, and a modified lift system unit for physics. Development continued on all three units through September 2006 to produce complete prototypes including student and teacher guides.

In an effort to improve teacher quality (another MSP key feature) a set of Professional Learning Rubrics was developed. The rubrics provide tools for judging the following features of professional development offered in the district:

- Build subject-matter content knowledge
- Engage participants as learners of the content they will teach
- Classroom-based curricular materials and assessments
- Based on the district's reform goals and standards
- Provide opportunities for participants to receive feedback on their practice
- Consistent focus: each session builds on the previous one
- Resourced by district leadership
- Supported by district leadership

Both the general Professional Development Rubric and the Coaching Rubric have been revised over the past year to make them more accessible and useable within districts. The rubrics have been used to guide the development of coaching programs in several SCALE schools. To monitor the effects on classrooms of its district-wide curriculum, professional learning and leadership development programs, districts need a means of assessing the quality of classroom instruction. To gather this evidence an Instructional Quality Assessment (IQA) rubric system to serve this function was constructed.

During the late fall of year two and the first half of year three (2004-2005), district administration were interviewed at MMSD, PPSD, and DPS to determine what districts were already doing with respect to equity and to determine potential issues surrounding equity in their districts[2]. As one might expect, each district revealed similar and overarching pressing issues associated with equity in their districts; however, the causes, potential strategies, and district related barriers for approaching these issues differed substantially from district to district. A goal from these interviews was to establish with each district *one* equity initiative and commence work during the second half of year three. These initial "low hanging fruit" initiatives have provided Goal 4 engagement in the districts, and hence, have helped to build a working

[2] Regrettably, LAUSD has been not included in this gap analysis primarily due to its size.

partnership, trust, and intellectual capacity between the particular districts and the SCALE representatives. In short, the following initiatives took place in the respective districts during the 2005-2006 academic year as a result of this gap analysis:

- MMSD: A yearlong professional development around building equity and excellence in freshman science. This included eight PD sessions with various goals, activities, and speakers.

- DPS: In DPS two initiatives began. First was the development of an equity indicator system with an application towards designing a "data dashboard." With the new administration, this work has been accepted and incorporated into the new Balance Score Card initiative that the district started this past fall. A second initiative was the development of a narratives approach to measuring equity. This work had initial interest from several parties in DPS; however this line of work was eliminated with the new administration.

- PPSD: A clear theme resonated through the interviews with PPSD that the scheduling of classes was neither accessible nor equitable. A team is investigating this issue of how course scheduling is conducted in urban high schools, with the goal of creating a more systemic approach to scheduling that ensures equity and access for all high school students.

K-12 District Partnership Activity and Findings

Denver Public Schools (DPS)

Elementary Mathematics

The district-wide implementation of *Everyday Mathematics* (grades ECE-5) has been in place for three years. To support mathematics learning, DPS began an after-school program, *DPS Success*, in January 2006. *DPS Success* provides students (grades 3-10) with two additional hours per week (over the course of 10 weeks for a total of 20 hours) of mathematics instruction aligned with the grade-level standards. Students targeted in this program are those who are not proficient on grade-level standards. This program will be expanded to 40 hours beginning fall 2006.

Middle School Mathematics

Connected Mathematics has been used in all DPS schools in grades 6-8 since 2003. The district is currently phasing in *Connected Mathematics 2*, beginning with the eighth grade algebra units in fall 2006. To support all middle school students in developing proficiency with grade-level standards, two programs have been instituted. As described above, *DPS Success* provides additional time (after school) for students. In fall 2005 all middle school students who are not on grade level will have a double block of mathematics. This double block is designed to provide additional time for practice and skills called for in *Connected Mathematics*.

High School Mathematics

As called for in The Denver Plan, the strategic plan to guide DPS, a high school graduation workgroup began examining the district's current graduation requirements along with the new Colorado Commission on Higher Education (CCHE) guidelines. Following the recommendations of the graduation workgroup with input from Chief Academic Officer Jaime Aquino, the Board of Education adopted new graduation requirements for students entering high school in 2007-08 and subsequent years. The mathematics requirements call for four years of college-preparatory mathematics including two years of algebra, a year of geometry, and a fourth year from an approved list of courses (in line with CCHE guidelines).

At the same time, high school teachers on the mathematics advisory workgroup began reviewing second-year algebra texts in preparation for redesigning the second-year algebra course. This group recommended a text to field test in the 2006-07 school year. Currently, 28 teachers representing all DPS high schools are engaged in the field test. This group will develop the tools (i.e., assessments and instructional planning guide) to support all teachers in the district-wide implementation of the program.

To further support students' attainment of the new graduation requirements, all ninth grade students who are not on grade level will have a double block of mathematics beginning fall 2006. This double block is designed to support students' development of concepts and skills called for in the ninth grade curriculum (*Cognitive Tutor Algebra* or *Interactive Mathematics*). DPS success further promotes additional items and instructional opportunities for students.

Elementary Science

SCALE had previously supported Denver in selecting the elementary science program: *BSCS Science Tracks: Connecting Science and Literacy* by completing an analysis of Tracks with FOSS. The multi-year roll-out of the NSF-funded *Tracks* elementary science program currently includes over 300 field-test teachers in grades 1-5. The implementation plan for the 2006-07 field-test includes two *Tracks* units per grade in grades 3, 4, and 5 and one Tracks unit per grade in grades 1 and 2. In order to support the new fifth grade science Colorado Student Assessment Program (CSAP), the 2006-07-implementation plan provides all fifth grade students with an inquiry-based science experience through one physical science *Tracks* unit on "Investigating Heat and Changes in Materials."

Middle School Science

The field test of three new middle school science programs was completed in preparation for the district-wide roll-out of these programs in all middle schools during the 2006-07 school year. The new science programs were developed with NSF funding and include: Grade 6 Earth Science (*Investigating Earth Systems* from the American Geological Institute), Grade 7 Life Science (*Science and Life Issues* from the Lawrence Hall of Science), and Grade 8 Physical Science (*InterActions in Physical Science* from San Diego State University). During the field test last year, groups of grade level teacher leaders developed implementation guidelines, big ideas/concepts connected to the activities and embedded formative assessments in each unit. In addition CSAP-like unit assessments were developed by field-test teacher leaders to be used in monitoring student progress on science standards during the district-wide roll-out of these new science programs.

High School Science

In the high school graduation workgroup's review of DPS graduation requirements described above, science requirements were analyzed alongside the new CCHE guidelines. The recommendation put forth by the workgroup with Chief Academic Officer Aquino and subsequently adopted by the Board of Education call for three years of science including a year of Earth Science in grade 9, Biology in grade 10, and Chemistry or Physics in grades 11 or 12.

Denver completed the district-wide implementation of a new Biology program using materials developed with NSF funding by the Biological Sciences Curriculum Study entitled *BSCS Biology: A Human Approach*. The implementation included science kit materials along with the instructional materials for students and teachers. Biology teachers in the district piloted a set of implementation tools and literacy strategies connected to the program along with a set of CSAP-like unit assessments during the roll-out of the new program.

During this same time period, a group of 16 high school science teachers engaged in the Analyzing Instructional Materials (AIM) Process to select an Earth Science program to be field tested in 2006-07. The group of teacher leaders selected an NSF-funded program developed by the American Geological Institute, *EarthComm*, as the instructional program. Currently, 19 teachers from 11 high schools are field-testing the new Earth Science program prior to district-wide implementation of the new 9th grade course in the 2007-08 school year.

Due to the changes in the science graduation requirements, a group of chemistry and physics teacher leaders will apply the AIM Process this school year to select new instructional programs that will support district-wide chemistry and physics programs. The curriculum analysis process and selection of instructional materials will take place during the 2006-2007 school year with a

field test planned for the 2007-2008 school year. The plan is to review a variety of instructional materials that include programs developed with NSF funding.

Benchmark Assessments

In fall 2005, benchmark assessments were instituted district-wide to assess how well students are progressing toward proficiency on state standards in reading, writing, and mathematics. Students in grades 3-10 will be assessed three times a year, with second graders assessed once at the end of the school year. The results from the benchmark assessments will provide detailed information to assist school staffs in meeting the instructional needs of students.

Annual Highlights

DPS showed an increase in student achievement in mathematics and science on the 2005 Colorado Student Assessment Program (CSAP). In mathematics, the percent of students scoring at Proficient or Advanced levels increased in six of the eight grade-level tests. In seven out of the eight tests, DPS met or exceeded the state change. The largest increase in the percent of students at the Proficient or Advanced levels occurred in the eighth and ninth grades.

The on-site support for mathematics and science teachers has increased with the reorganization of the district into Instructional Support Teams with a Math/Science Staff Developer assigned to each team. This Staff Developer will work directly with schools to identify instructional needs and then provide services for those needs. In addition, the number of math/science facilitators (school coaches) grew from 30 in 2005-06 to 60 in 2006-07. This increase is representative of the continued focus on support for mathematics and science teaching and learning in the district.

As called for in the Denver Plan, Instructional Planning Guides have been developed for grades ECE-10 in mathematics. These Guides are designed to serve as teacher instructional planning tools, to provide consistency in pacing across the district (given the mobility rate of students), and to set target dates that will support teachers in providing students with all key mathematical experiences at each grade level. These Guides further serve to support schools in developing common expectations for students across the city. An integral part of the guide is a focus on differentiation, including specific strategies for English Language Learners and students with special needs.

Challenges

A challenge that DPS continues to face is securing highly-qualified mathematics and science teachers. With the increase in graduation requirements in both mathematics and science, a greater number of teachers will be needed. In addition, the double block of mathematics for students in grades 6-9 who are not on grade level necessitates the addition of mathematics teachers to school faculties. As this report is written, a few schools are still in need of teachers. Furthermore, the turnover of middle school mathematics and science teachers is high, creating challenges in strong implementation of the district's mathematics and science programs. These programs require teachers to have strong content and pedagogical-content knowledge, both of which place demands on professional development.

An additional challenge is the need for a science resource center to provide for refurbishment and rotation of science consumable materials (middle school and high school science programs) and refurbishment and rotation of science materials kits (elementary science program).

Los Angeles Unified School District (LAUSD)

The district's goal is for each student to receive a rigorous, comprehensive education with learning opportunities that allow each student to meet or exceed grade-level standards. The district is designing and revising instructional guides and periodic assessments for each core content area. Instructional guides for mathematics and science provide a contextual map for teachers as they engage in work that helps students develop the content knowledge and content-specific methods of reading, writing, thinking, speaking, and problem solving. Periodic assessments support the vision of the teacher as a professional: analysis of assessment data will guide instruction and professional development, as well as support student achievement by providing teachers and students with immediate, useful information on progress toward achievement of standards. Guided by data results and reflection, teachers can make informed decisions about instruction, including extensions and interventions. Overall, the alignment of research-based, culturally relevant and responsive instructional practices with district-adopted materials, assessments, and professional development will provide a coherent structure for teaching and learning in each content area.

Mathematics Activities and Findings

LAUSD provides professional development to coaches and teachers on new mathematics curriculum. The training of Math Coaches residing in schools will remain the same as in the 2005-06 school year, whereas the role of 15 Professional Development Facilitators (PDF) reporting centrally and housed in local districts will expand. PDFs will train coaches and teachers to deepen content knowledge, more specifically by modeling rigorous standards-based pedagogy to strengthen teaching skills. In both elementary and secondary programs, the primary vehicles for professional development are conceptual lessons. Housed in the new Math Instructional Guides, these lessons will be the focus of professional development for all math teachers, during the 2006-07 school year. They will also help deepen practice, change pedagogy, and bring coherence to district math programs across all grade levels. For secondary schools, training will also expand to emphasize algebra support, algebra readiness (a new course option in grade 8), and integrate technology into instructional delivery.

Across all professional development activities for Math Coaches, trainers emphasize facilitation skills and the use of data to improve practice in mathematics and science. Much of the formative assessment described in the differentiated professional development is used to assess this objective as well. Periodic assessment data is analyzed and distributed to all stakeholders to provide benchmarks of progress in mastering the standards throughout the year. Three, half-day professional development session during banked time (one after each periodic assessment) focus on using the data to inform instruction. The analysis of periodic assessment data to inform instruction involves every teacher in every school in the district, grades 4-12. Summer training on leadership, content, and pedagogy also focuses on research-based instructional strategies for coaches.

In the past year, IFL fellows, funded through SCALE, have worked with the LAUSD central staff to support the district's middle school mathematics initiative. IFL has participated in the monthly Superintendents' meetings, has reviewed the mathematics implementation plan, and has worked in all eight local districts supporting the use of the Conceptual Lessons embedded in LAUSD Instructional Guides. A Conceptual Lesson is a mathematics lesson, implemented over 3 or more class periods, that is based on a cognitively demanding task and that has been developed in a way that makes student understanding at various points salient. The primary purpose of the

mathematics Conceptual Lessons is to provide explicit models of rigorous, discipline-specific instructional practice, and to engage teachers in ongoing professional learning.

In addition, IFL introduced the School Leadership Rubrics, designed by Richard Halverson for SCALE (Halverson, 2005), to the eight local superintendents and their staffs. These rubrics were introduced to all the principals in four of the eight local districts in the past year. The principals in the remaining four districts are scheduled to be trained by the end of November 2006. The purpose of introducing these rubrics to the principals is to have them understand their role as instructional leaders in the implementation of the LAUSD mathematics initiative.

In late January and early February 2006, IFL fellows worked with LAUSD secondary mathematics team and teachers and coaches to develop a plan for eighth grade Algebra Readiness. In February, they met with the LAUSD secondary mathematics team for a planning meeting to support the mathematics reform initiative. The same group then trained the district's middle school coaches. They delivered and trained the group on a 6th grade, a 7th grade and an algebra lesson. They also introduced the concept of questioning as a coaching tool to the group and delivered modules to support the coaches' use of questioning. The module included an introduction to questioning using a transcript and video of a lesson; using questioning as a tool to unveil student understanding; using questioning as a tool for promoting discussions; and, using the Thinking Through a Lesson Protocol to analyze a lesson and give feedback (Smith, 2004). In July, they held a two-day retreat with representatives of the LAUSD central team, a group of LAUSD professional development facilitators and teachers to discuss the challenges of algebra, the big ideas of algebra, the alignment of the LAUSD's Instructional Guide to these big ideas, and which conceptual lessons in algebra give the district the most leverage.

Science Activities and Findings

The objectives for LAUSD Science and SCALE science immersion, connected with CSUDH (as well as CSUN and CSULA), in Year 4 were to:

- Continue designing and providing high-quality professional development for science immersion units for teachers in SCALE districts (elementary, middle and high school).
- Produce and implement professional development facilitation guides with identified district leaders, teachers and IHE faculty to mentor district immersion unit professional development facilitators.
- Assess student learning from immersion units.
- Continue to collaborate with districts and local IHEs to identify, develop, field-test and revise immersion units.

These objectives were met and science leadership among both district and university partners was expanded to support teaching and learning in elementary, middle, and high school science. The following sections detail activities and findings at each of these three levels.

Elementary Science

SCALE has had an impact on elementary science primarily through support for district elementary science lead teachers and experts who are developing leadership strategies and professional development opportunities for both science immersion unit implementation and improved science teaching practice writ large. A member of the UW-Madison science immersion team attended monthly elementary science administration meetings and participated in bi-weekly

teleconferences to set goals, plan, and evaluate critical issues and strategies for professional learning. UW-Madison science immersion team members and key LAUSD science leadership co-planned and co–facilitated more than 38 professional development opportunities though weekly meetings and on-going collaboration. In addition throughout 2005/2006 local LAUSD districts conducted 14 two–day Grade 4 Science Immersion Trainings facilitated by science lead teachers and the leadership cohort. A complete list of these Elementary Science Immersion activities and the K-20 educators involved can be found in Appendix 3.

Teachers receiving professional development on science immersion units reported feeling better able to implement improved strategies for teaching science in their own classrooms when they attended one-week institutes. Similarly, the facilitators of one-week institutes who worked in collaboration with California State University faculty and SCALE staff reported that co–facilitation during institutes strengthened the experience for both facilitators and teacher–learners. As a result, the LAUSD elementary science leadership is working with SCALE to explore how to involve elementary science leaders in the same type of leadership study group experience that the secondary science leaders had along with CSU faculty and SCALE facilitators in 2006 (see the *Activities and Findings* section in middle school science for more details). This preparation will support the planned increase in one–week institute offerings for Grades 4 and 5 teachers in 2007 and beyond.

Middle School Science

Middle school science immersion units were developed and introduced in 2005 for grades 6, 7, and 8. In 2006, each of these units were revised, based on collaborative review using Analyzing Instructional Materials (AIM) rubrics and field–test teacher feedback, and a cadre of leaders to support professional development focused on the units was developed. In 2006, LAUSD science leaders used the science immersion unit structure to develop a grade 8 Force and Motion unit that is currently being revised and further developed for implementation in 2007. More than 28 key middle school science professional development opportunities were collaboratively planned by LAUSD, SCALE, and QED educators and were implemented during 2006. A complete list of these Middle School Science Immersion activities and the K-20 educators involved can be found in Appendix 3.

The co–facilitation and cross–institutional collaboration through science immersion that took place in 2006 resulted in strong professional learning experiences for both facilitators and teacher–learners. The success of this model for developing and implementing professional development exceeded the study group's expectations and led to development of a second set of study group sessions for 2007, one focused on grant writing to support the work (ongoing work for cohort 1) and a repeat of the 2006 sessions (for cohort 2 participants). In addition, this work is being planned and will be evaluated and revised to later become a standard course of study for anyone preparing to engage in pre-service or in-service teacher professional development for LAUSD. In this way, the initiative aims to establish throughout the LA Basin a common vision for excellence in science teaching and learning and build the capacity to support that vision for all educators in the region.

High School Science

While LAUSD high school science leadership have been involved in the leadership study group and other SCALE professional development opportunities, before 2006, this group had not yet been involved in developing immersion units. However, SCALE, LAUSD, and CSUDH are currently exploring the possibilities for developing a high school biology immersion unit in

collaboration with the Dana Center, Agile Mind, and BSCS. This pilot collaboration is being initiated with the intention that it may generate a sustainable approach for future development of science immersion–like lessons to be used by all LAUSD high schools. The expectation is to develop and field–test a biology immersion unit through this collaboration for use in the 2007/2008 school year. SCALE and LAUSD leadership continue to plan and employ lessons learned from work at the elementary and middle school levels to build a coherent approach to science teaching and learning through high school, using SCALE resources whenever possible.

Annual Highlights

Armed with what was learned from the initial professional development institutes during the 2005 summer with strong encouragement from the district science teacher/experts to continue building on the cross-institutional collaboration that SCALE began in 2005 with Science Immersion, a series of sessions for a first cadre of lead professional development educators is underway for 2006. A common vision has been developed through the SCALE and QED partnership for what best supports students as learners and teachers as learners to reform science teaching. Working with the faculty, district science branch, and a few select lead teachers as facilitators SCALE and QED have worked to build capacity for providing an adequate number of high quality teacher professional development experiences and sustain focus of effort over time and through partnership.

Developing a cadre of low-to-no cost, local, and high-quality professional development providers is necessary to affect change at such a large scale as that posed by LAUSD. For the modeling and participant experiences to be consistent within and among institutes, it is essential for facilitators to work together to build a common vision and practice of co-facilitation that aligns with shared knowledge and beliefs about teaching and learning. Thus they need a deep understanding of content, teaching, and adult learning theory to be effective. In addition, the facilitator/leadership development series builds a professional learning community among participants that supports the development of a sustainable partnership across institutions. SCALE and QED, in collaboration with WestEd National Academy for Leadership, developed a Leadership Study group series for all immersion professional development providers to develop a consistent approach for professional development across the partner institutions. This Leadership Study group series consists of eight, two-day sessions (four prior to and four following the summer institutes) focusing on the best practices and research in professional development and providing a forum for sharing and building on participants' expertise. This face-to-face working time has been necessary to build the common vision and understanding that is foundational for the work.

In addition, this work is being planned and will be evaluated and revised to later become a standard course of study for anyone preparing to engage in pre-service or in-service teacher professional development for LAUSD. In this way, the initiative aims to establish throughout the LA Basin a common vision for excellence in science teaching and learning and build the capacity to support that vision for all educators in the region.

Session 1: February 2006. Develop a common understanding and vision for inquiry-based science teaching and learning and identify key elements that need to be communicated to teachers attending the Immersion Summer Institutes to support implementation.

Session 2: March 2006. Develop an understanding of and ability to use a professional development framework for planning effective professional development for the summer institutes and beyond, and apply that framework to begin planning the 2006 Institutes.

Session 3: April 2006. Working groups continue to plan summer institutes using the framework learned at the previous meeting, and develop/write both specific agendas and facilitator guides

for the Institute sessions based on the previously agreed upon intended outcomes.

Session 4: June 2006. Practice facilitation of the sessions with technical assistance and feedback provided.

Summer Professional Development Institutes. Nine, five-day secondary science institutes (three each grade level); Five, five-day elementary science institutes (Four grade four and one grade five)

Session 5: September 2006. Reflect on the Summer Institute experiences and review the participants' evaluations. Develop an understanding of the Concerns-Based Adoption Model. Review and adjust Follow-up facilitation guides. Develop a protocol for classroom observations.

Session 6: October 2006. This session will focus on planning the follow–up agendas for the two half–day follow-up sessions being conducted for each summer institute.

Session 7: November 2006. Analyze and discuss feedback from classroom observations and the Institute Follow-up sessions. Transfer lessons learned to an intervention designed to support a different district supported science education innovation than Immersion Units.

Through this Leadership Study group and the 14, one-week institutes, SCALE/QED have had a major impact on professional development models for the LAUSD science branch and the CSU faculty.

In addition, a very strong aspect of our work this past year has been to build the capacity for providing professional development that reflects a common vision for best practices through the eight local districts as well as the central office science staff. Local district science experts, specialists, and advisors either facilitated or participated in the summer institutes in order to support the work on the ground in their local districts. This dramatically increased the level of awareness and support for the work in science.

Challenges

A challenge that LAUSD continues to face is securing highly-qualified science teachers. In our collaboration with SCALE/QED, LAUSD is looking at affecting both the pre-service and in-service teachers. One of the on-going challenges in LAUSD is continuing to build capacity for professional development of teachers in science to affect student achievement in the classroom. The models from SCALE/QED have provided a strong foundation with flexibility to evolve and connect to other initiatives in the district.

Madison Metropolitan School District (MMSD)

MMSD has articulated a long-range strategic plan that has led to the development of organizational policies and processes that are intended to lend coherence to the district systems to assure every student has the knowledge and skills needed for academic achievement. In concert with these efforts, the district is working to improve mathematics and science education at all levels by tightening the alignment between standards, curriculum, instructional practices, assessments, and professional development in order to narrow the achievement gap. The SCALE partnership is contributing to this work through its interactions with the district's Teaching and Learning Department, which has major responsibility for the four main dimensions of Goal 1 (the core teaching system in each subject area; professional development; monitoring; and assessment).

SCALE continues to play a major role in helping systematize the connections between the mathematics and science staff in the district and STEM faculty at the University of Wisconsin-Madison. This level of coordination represents a significant new development in the relationship between these entities. The successful implementation Math Masters 04-05 and Math Masters 05-06 Title IIB project is an excellent example of the strength and depth of the collaboration between MMSD and UW-Madison. SCALE has played a major role in helping the district rollout its 'Math Masters' project, begun in the spring of 2004 and described in more detail in the Madison section of Goal 3 below.

Mathematics Program

Year 4 Mathematics Implementation Plan. In Year 4 MMSD will work directly with classroom teachers, English as a Second Language (ESL) teachers and special education teachers who support students in mathematics to enhance their knowledge of mathematics content and pedagogy. Professional development for elementary teachers will emphasize strategies to accelerate the understanding of numbers by first grade students, and smooth the transition to multi-digit operations, and increase the math content knowledge of intermediate level teachers. Professional development emphasis at middle school will be on enhancing teachers' math content knowledge. At both the middle and high school level, professional development will emphasize pedagogy to challenge all learners in heterogeneous classrooms. MMSD is collaborating with Educational Development Center's Lenses on Learning project to offer elementary and middle school principals the tools to support standards-based mathematics instruction in their schools.

Grades K-5 Mathematics. Elementary Math Resource Teachers worked with the WCER/SCALE staff (specifically Joe Ferrare and Matt Felton) to create an online survey that was administered to 30 participating first grade teachers of the Every Child Counts: First Grade Math Intervention Initiative. WCER staff also facilitated focus groups of participating teachers that met to discuss the effectiveness of the professional development. WCER staff facilitated the rubric design and scoring of the survey results and assisted in preparing a summary description of the teacher professional growth that occurred in year one of the Every Child Counts: First Grade Math Intervention Initiative.

Last school year (2005-06) 20 elementary and middle school principals from MMSD and surrounding areas were provided instruction through *Lenses on Learning* course. MMSD is participating in an NSF study of the program being conducted by Educational Development Center. This large-scale study included designation of a control group and a study group of

approximately 20 principals. Each group was assessed before and after the course. The *Lenses on Learning* course is contained in 10 three-hour sessions with at least 20 additional hours of readings, homework, and observations.

The course has three main strands: Developing an eye for mathematics; rethinking administrators' talk with teachers about mathematics, learning and teaching; and distributed leadership. Scholarly readings, videos from the Annenberg Library, mathematical inquiry, school-based observations and reflective discussion were used to explore the big ideas of the course. Participants were asked to write a reflective piece entitled, "Bridging to Practice" at the end of each session. Twelve of the twenty principals completed the full 30-hour course. This year, (2006-07) twelve principals from the control group of have elected to take the course. SCALE supported this project through the work of Matt Felton and by providing the cost of UW credit and meals for three of the sessions. No money from SCALE will be used this year.

Grades 6-8 Mathematics. In Year 4 the Math Masters Project offered six 40-hour workshops for middle school math teachers on math content and pedagogy. The workshops consisted of 30 hours of face-to-face classes team taught by a UW Mathematics Professor and an Instructional Resource Teacher (IRT) from MMSD and 10 hours of online discussion via SCALEnet. Sixty-four teachers filled 115 seats through the six workshops throughout 2005-06. In all workshops the participants showed statistically significant gains from pre-test scores to post-test scores. The content portion of each workshop was repeated in 20-hour courses over the summer of 2006. Sixty-three teachers filled 172 seats through the six repeat sessions. Anecdotal data was collected as evaluation of the workshops. The feedback was consistently positive, demonstrating growth in the teachers' mathematical and pedagogical knowledge.

Grades 9-12 Mathematics. MMSD continued to work with SCALE's Norman Webb and WCER on the third year of a study looking at the different curriculums used at East High School. Students in Algebra, Geometry, Algebra 2/ Trigonometry, and Integrated 1, 2, and 3 were included in this study. Teachers used preliminary data from the first two years of the study, along with data from the Wisconsin Knowledge and Concepts Examination (WKCE) and Algebra/Geometry passing rates, to begin discussions on what the data was telling them and how this information might influence their teaching practices. Finally, teachers from multiple schools were brought together to explore Lesson Study, a collaborative effort to critique and better teaching techniques. This exploration will continue into the next year.

Science Program

SCALE partners from the UW-Madison participated actively in the district's K-8 science Scope and Sequence Review Committee. SCALE RET members facilitated discussions of WKCE data, the science survey, and promising professional development practices. SCALE staff from the UW Center for Biology Education provided valuable insights into science inquiry and on-going professional development efforts with teachers and schools. This work was finalized in August 2006 with the completion of the K-8 Grade Level Standards. The grade-level specific standards for the K-8 science program align with the Department of Public Instruction Wisconsin Model Academic Standards in Science Grade Level Standards (to be released in 2006-2007). The standards serve as the basis for the elementary standards-based report card and the design of the middle school report card (to be completed in 2006-2007).

The SCALE Immersion Design Team has provided MMSD science staff and teachers with ongoing assistance in the development, field-testing and implementation of immersion units. Key elements of the Immersion Unit's Inquiry Cycle and REAPS Assessment have been integrated into all K-8 science professional development.

A major new initiative begun in science in Year 4 includes the systemic focus on improvement of high school science with the initial focus on 9th grade. The IRTs, Science Coordinator, UW-Madison faculty and staff, and University of Pittsburgh SCALE staff worked together to develop a multi-year plan to strengthen and broaden the pedagogical skills of teachers of freshman science and address the systemic inequities inherent in tracking. The equity component of the initiative is described below.

Year 4 Science Implementation Plan. In Year 4 MMSD science professional developers will continue to work directly with K – 9 science teachers to enhance the implementation of the district's science scope and sequence. In addition to providing teachers with opportunities to learn about the scope and sequence and the materials that support its implementation, the professional development also addresses teachers' content knowledge and issues of equity and access.

Grades K-5 Science. A one-day professional development session was provided to all new elementary teachers to assist in implementation of the scope & sequence. In addition, a minimum of one day professional development was provided to elementary teachers, Special Education and ESL support teachers at each grade level, focusing on pedagogical content knowledge, assessment strategies and the incorporation of science journals. All professional development was co-planned and co-facilitated in collaboration with UW-SCALE faculty and staff.

Grades 6-8 Science. A one-day professional development session was provided to all new elementary teachers to assist in implementation of the scope and sequence. In addition, three days (21 hours) of professional development was provided to 55 middle school teachers, Special Education and ESL support teachers at each grade level, focusing on pedagogical content knowledge, assessment strategies and the incorporation of science journals. All professional development was co-planned and co-facilitated in collaboration with UW-SCALE faculty and staff. Immersion work continued with the development of the Grade 6 Diversity of Life and Grade 7 Plate Tectonics units culminating in a district-wide four-day, 20 hour summer institute. 30 middle school teachers participated in the summer institute.

In response to the continual increase in the percentage of English Language Learner students in MMSD as well as specific needs to accommodate instruction for the needs of heterogeneously grouped classes, efforts continued in Year 4 to provide materials and support for all students. All middle school scope and sequence student materials were translated into Spanish through the use of district resources and placed on the district web site. A collaborative initiate with the Department of Special Education resulted in the pilot of a modified laboratory book for *Grade 7 Chemical Interactions.*

Grades 9-12 Science. MMSD continued to focus on the improvement of rigor, achievement and participation in high school science at the 9th grade level. In collaboration with UW-Madison and University of Pittsburgh SCALE, teams of five freshman science teachers, Special Education and ESL support teachers from each of the four comprehensive high schools participated in seven full day professional seminars (49 hours). Professional development continues in the areas of pedagogical content expertise, assessment and differentiation to meet the needs of all incoming freshman students, regardless of educational background or prior preparation. In addition, MMSD hosted its second annual district-wide high school science in-service session on Equity and Excellence in High School Science.

MMSD Annual Highlights

Professional Development. SCALE has been pivotal to MMSD's science and mathematics professional development program, in terms of both timing and resources. SCALE provided MMSD with the additional resources (human and capital), the research-base, and the leverage at a district level to critically analyze K-8 Science Scope and Sequence as a curricular tool. SCALE also provided support through the collaboration of the UW Mathematics Department and MMSD Resource Teachers to co-plan and implement the Math Masters Project. Through negotiation of the design of immersion units and the supporting professional development, MMSD and UW-SCALE have succeeded in changing the way K-12 and higher education collaborate to improve science and mathematics education for in-service and pre-service teachers.

Professional development, in collaboration with SCALE immersion staff, improved in several significant ways, including:

- Case study analysis of prior work;
- National Research Council-based essential features of classroom inquiry;
- Frayer model-based discussions;
- Intense collaboration and co-planning using detailed facilitator's guides;
- Central design focus on specific pedagogical content knowledge;
- Classroom support and electronic communication between sessions;
- Extended duration of professional development, over weeks and months; and
- Most significantly – the explicit use of "inquiry as an adult learner" in all professional development sessions.

The SCALE professional development planned for 2006-07 will include a focus on building learning communities to increase school-based and district capacity. Academic year professional development is scheduled over the span of weeks or months to allow for classroom instruction between sessions, enhancing the focus on student learning and fidelity of implementation. MMSD and SCALE have institutionalized the Math Masters Project for the 06-08 school years and are proposing to expand the program to grades 3-5 staff through Title IIB funding. The new Science Masters Institute, proposed for Title IIB funding via this grant application, begins with these structures in place and will continue to improve professional development quality and fidelity of classroom implementation at grades 6-8 with the added measures of student achievement connected to professional development.

Resource teachers. MMSD has used SCALE monies to fund the salaries of two IRTs. From the district's perspective, these positions represent perhaps the most significant SCALE impact. One position, a middle school mathematics IRT, doubles the capacity of the district to provide professional development to teachers using the Connected Math Program. The IRT position focuses work with middle schools learning coordinators, teachers, and grade level teams and to customize their support to the particular needs of the school. The second position—a secondary science IRT—will also double the capacity of the science staff to work directly with teachers and principals at the school level to improve science teaching and learning. Here, professional development support has been directed at strengthening the implementation of the MMSD K-8 Science Scope and Sequence curriculum, helping teachers build their science content knowledge, and building the professional learning communities within science departments at the high school level. Together, these SCALE resources are helping the district address the continuing

challenge of providing sustained support to teachers in implementing rigorous inquiry-based curricula.

Equity. As a direct outcome of the SCALE Excellence and Equity work, MMSD has used science as a model to analyze 9th grade student course taking patterns and achievement in all core content areas. In light of the research base indicating the powerful effect of taking rigorous courses on student's academic proficiency, MMSD is working to insure all students are enrolled in core academic courses that keep their options open for future career paths. In 06-07 MMSD will begin a multi-year plan to analyze and bring about improvements at the schools. The numbers of MMSD students that are not enrolled in a grade level core academic course (mathematics, science, social studies, and English) during their freshman year are disproportionately minority and low income. These students miss an entire year of instruction in a particular core subject area, thereby increasing the pressure to pass all required core courses in the remaining years of high school. This trend is directly counter to the research. Both the amount and nature of science course taking is related to the likelihood of gains in science proficiency level – *regardless* of initial achievement level. The *National Center for Educational Statistics* reported that relationship of rigorous course –taking to achievement predicted academic success in science better than 8th grade science tests scores (Madigan, T., 1997).

In response to the student data, MMSD has approved a plan and timeline to insure all 9th grade students will be enrolled in a grade level or higher core course by 2008-2009. This comprehensive multi-year plan includes inter- and intra-departmental collaboration among Teaching and Learning, Student Services and ESL. The plan focuses on professional development to strengthen staff capacity and increase instructional expertise in tandem with a thorough analysis of the current 9th grade curricula in each of the core academic areas.

Providence Public School District (PPSD)

Math/Science Core Program Description

Math Curriculum: (K-12) 2006-2007

- Math Investigations (K-5)
- Connected Math 2 (Grades 6-8) and Mathematicians Notebook Model
- Pre Algebra Math Intervention: Using Connected Math 2 and Mathematicians Notebook Model
- Summer School: Connected Math 2 and Mathematicians Notebook Model
- Pre-Algebra: Grade 9
- Algebra 1 or Algebra 2: Grade 9
- Algebra 2 or Geometry: Grade 10
- Geometry, Advanced Math, or Pre Calculus: Grade 11
- Calculus, Statistics, AP Mathematics: Grade 12
- Scope and Sequence aligned to NECAP/NCTM/AAAS 2061 Benchmarks
- Curriculum Intervention Supports: Thinking Math, Discrete Math, FASTT Math, Math Maters, CMP2
- Professional Development among all Core Programs

Science Curriculum: (K-12) 2006-2007

- FOSS/STC Science KITS (K-8) and Scientists Notebook Model
- Physics: Grade 9 and Scientists Notebook Model
- Chemistry: Grade 10 and Scientists Notebook Model
- Biology: Grade 11 and Scientists Notebook Model
- Advanced Placement/Capstone Applied Learning Courses
- Scope and Sequence aligned to NECAP/AAAS 2061 Benchmarks
- Curriculum Supports: Immersion, Micro Science, NSF SCALE Best Practices
- Professional Development among all Core Programs

Curriculum Descriptions: Mathematics

Elementary Mathematics. Building upon recent district wide improvements among student math scores for Skills, Concepts and Problems Solving, PPSD intends to reinforce and leverage its current math programs already in place. At the elementary level, our programs focus on Math Investigations and Math Matters, including an intervention pilot using FASTT Math, a computer based math fluency program emphasizing math skills practice. These data driven initiatives have made significant in roads toward increasing student proficiency of numbers and operations. To this end, elementary math teachers attend synergistic professional development programs facilitated by a cadre of professionally trained math coaches with an emphasis on best practice models of instruction including daily “head” problems, student hands-on “two-problem” solving activities, and an instructional workshop model for the classroom that empowers teachers to practice Management, Involvement, Focus, and Feedback (MIFF). MIFF training builds on current Disciplinary Literacy and Principles of Learning practices already in place since 2002.

Middle School Mathematics. PPSD’s Middle School Math program is rooted in the nationally acclaimed Connected Math Program and is endorsed by the National Council of Teachers of

Mathematics (NCTM) and the American Association for the Advancement of Science (AAAS). It is a curriculum built around mathematical problems that help students develop proficiency of math concepts including numbers, geometry, measurement, algebra, probability and statistics. The district's Connected Math Program is also supported by district and school level professional development for middle school teachers to develop their expertise of math content knowledge, best practice models of instruction via school-based lab sites. This program has been in place since 2002 and has been expanded as an interventions strategy to support Algebra I proficiency among low performing students.

High School Mathematics. High school mathematics is at the forefront of many of the district wide reform initiatives. To this end, the high school curriculum is focused on Algebra I for all 9th grade students, followed by Geometry, Algebra II, advanced mathematics, as well as capstone opportunities for Calculus and AP Calculus. Much of our professional development for teachers is directed to best practice models of instruction and is aligned to recent Rhode Island Department of Education (RIDE) and the New England Common Assessment Program (NECAP) grade span expectations which support student proficiency in core math content knowledge. Statewide high school reform initiatives as well as Proficiency Based Graduation Requirements (PBGR) requiring four math credits for graduation are providing the district with mandates for the high school curriculum to embrace best practices such as differentiated and integrated instruction with science as a means of providing all our students with classroom math lessons directed to applied learning models in field of mathematics as well school to career choices in science, technology, engineering.

PPSD has also implemented a district wide Grade 9 Intervention program in support of Algebra 1 remediation using a scaffold curriculum framed on Connected Math 2. A pilot version of this scaffold was introduced during the district 2006 summer school session.

Curriculum Descriptions: Science

Elementary and Middle School Science. Our district K-12 science curriculum is rooted in a rich history of best practices and continues to this day. A testimony to this heritage is our elementary and middle school science curriculum which is based on a hands on inquiry centered program developed in conjunction with the East Bay Education Collaborative (EBEC) and our district science faculty.

The Elementary and Middle School Curriculum is currently delivered by EBEC to all students and teachers in grades 3-8 and soon will be offered to grades K-2. The platform for the science content is in the form of a science KIT which provides our teachers with an aligned, sustainable and renewable program that captures the science content that our students need to learn, including FOSS and STC KITS such as Microworlds, Magnetism & Electricity, Earth Materials, Environments, Structures of Life and Wind and Water. The Middle School curriculum for grades 6-8 includes science KIT's for Planetary Science, Weather & Water, Human Brain & Senses, Electronics, Diversity of Life, Thrill Ride, and Sepup Chemistry. Our Science KIT curriculum is a preferred scaffold for science instruction and has propelled proficiency as documented by EBEC's TIMSS Assessment Study, The Urban Institute, as well as being completely aligned to the NECAP grade span expectations, the AAAS 2061 Science Benchmarks, and Disciplinary Literacy.

High School Science. PPSD's high school curriculum is proceeding on a similar path to the math curriculum and is guided by the statewide RIDE high school reform initiatives as well as Federal and State Mandates for STEM initiatives. The district, through its current participation in and

funding from the NSF SCALE grant, has embarked on a robust agenda of science curriculum sequence and rigorous professional development for teachers. The SCALE science mission is accomplished via five goals to transform STEM teaching system-wide for all teachers and learners, develop and implement continuous inquiry based teaching methods hinged upon immersion based/interactive STEM experiences for every student, practice dynamic professional development training in STEM content areas for teachers, provide pathways for encouragement of minority and female students toward high school science and math resulting in more college bound individuals as prospective SCALE teachers, and ensure accountability, best practice and performance that is data driven via continuous research and evaluation.

With the start of the 2006-2007 school year, PPSD has implemented a new high school science course sequence for all students based on the national "Physics First" initiative. A ninth grade physics course for all ninth graders will be followed by a chemistry course in the tenth grade with particular emphasis on the introduction of substantial micro scale chemistry techniques. Biology, with emphasis on the molecular approach, would be in the eleventh grade. This sequence provides for the inclusion of engineering content and activities embedded within the students' science courses. Further, it encourages greater participation of students in advanced science coursework at the twelfth grade level, such as Advanced Placement Physics, Chemistry or Biology, senior research projects, or other science topical capstone courses

Moreover, under the new NCLB mandated state assessments beginning in 2008, eleventh grade students will be required to have substantial science content across all science domains, including a heavy emphasis on Physics. The district's current sequence of science courses does not provide students with the best opportunity to prepare themselves for the needs of the job market. A *Physics First* alignment of science courses, offering *all students* a more appropriately sequenced program of study/curriculum, addresses these issues, and better prepares them for the state testing at eleventh grade. Such a sequence is aligned with and supports Rhode Island's new Science Grade Span Expectations (GSEs) for high school that address Physical Science, Life Science and Earth/Space Science.

Math/Science Core Assessment Programs: Benchmark Assessments

Science: Testing/Assessment (K-12) 2006-2007

- NECAP Pilot Assessment for Grades 4,8 & 11 beginning 5/07
- Force Concept Inventory: (Physics Pre Test) for Grade 8 beginning 5/07
- Force Concept Inventory: (Physics Post Test) for Grade 9 beginning in 5/08
- District Interim Science Tests: Proposed only as Mid/Final Exam options: Development during 06/07
- Mastering Science NECAP: Practice Test Protocol (Grades 2-11): Piloting Glencoe Model: Development during 06/07
- NAEP Science State Wide Testing: c/o RIDE Calendar
- AP Testing c/o College Board

Math: Testing/Assessment (K-12) 2006-2007

- NECAP Math Assessments: Grades 3-8: c/o RIDE Calendar
- District IA's: Grades: K-9: Multiple Choice and Open Ended Model: By Quarter
- Mastering Math NECAP: Practice Test Protocol Grades 2-11): Piloting GLENCOE Model (McGraw/Hill) :
- Development 06/07 (Proposed "Real Time" alternative to manual IA's)

Activities and Findings Report

- NSRE: c/o RIDE Calendar
- SAT Testing: c/o RIDE Calendar
- NAEP Math State Wide Testing: c/o RIDE Calendar
- SAT/AP Testing c/o College Board

Optimized Goal: Math/Science Testing and Assessment (K-12)

1. Standardized NECAP Practice Protocol/Handbook for all grades.
2. NAEP Testing Annually c/o RIDE Calendar
3. Quarterly ("Real Time") Electronic Assessments, teacher derived/implemented at classroom level: Aligned to NECAP Practice Test Protocol
4. Annual Mid Term/Final Exam: Aligned to NECAP Practice Test Protocol

Annual Highlights

A two-year Math/Science Integration/Intervention Initiative recently funded in part by SCALE and NASA directly supports current RIDE/EDC Math Intervention activities as mandated by NCLB and the district's redesign of middle schools and their academic programs. Moreover, the contract aligns district expectations for improving K-12 student achievement in math, literacy, and science content integration and differentiated Instruction while building teacher capacity to support and facilitate grades 5-9 Math Intervention strategies. The contract will also expand professional development for math and science teacher teams, which supports teacher leader capacity, and curriculum improvements for STEM initiatives, all of which directly support of equity and access for all students.

The resulting artifacts from the work will serve as the basis of a district-wide Math Curriculum Intervention scaffold that is based on the district's Connected Math Program as well as the development and use of EBEC's "Mathematicians Notebook Model of Instruction" and "Math SMILES" Mentors program. The contract further supports Math Intervention with scaffolds in support of 9th grade Algebra I Math Skills and Physics First Math/Science Integration, Math Instructional Lesson Modules, and Math Lab Classrooms that are aligned to RI/NECAP Math/Science GLE/GSE's. These intervention initiatives will directly support PBGRs, Applied Learning connections and pathways to the workplace. The work supported by this contract accommodates both NCLB and RIDE directives for the development of highly qualified math teachers and leverages the districts significant investments in best practice Teaching and Learning, Disciplinary Literacy and Principles of Learning Pedagogy.

The two year contract will annually provide up to 60 Math/Science Teachers and Coaches, a total of 32 Professional Development Sessions, all materials and manuals including mathematicians notebooks, support equipment, facilities, alignment of all applicable state and district standards, assessment and testing protocols and rubrics, regular interval program evaluation and audit reports, 1200 Hours of Math SMILES Mentor support in district math classrooms, state-approved Professional Development Credits, and Saturday sessions in support of district administrators and other support staff, all of which is facilitated by the EBEC.

The contract will also provide math curriculum support for the district's 9th grade Math Intervention Teachers and Instructional Math Coaches via professional development training at EBEC. All of these initiatives will build on recent summer school CMP Intervention Math Training and Curriculum Pilot including best practice CMP2 Mathematics Lesson Plans and Rubric's focusing on Basic Skills, Problem Solving Techniques, Integrated Math/Literacy/Science Writing Modules, and a Differentiated Model for CMP Math Instruction.

It is also expected that EBEC will receive follow on funding support for these initiatives via the EDC, NASA and SCALE. The two year contract began July 1, 2006 and ends June 30, 2008.

Challenges

Challenges ahead for PPSD include the following:

- A statewide, aligned PK-16 teacher pre-service program rooted in best practice hands on inquiry/pedagogy framed in the workshop model of instruction.
- Procurement of follow up state and Federal funding in support of math and science initiatives.
- Cohesion and adherence to instructional delivery of core math/science programs by all teachers at all grade levels.
- A renegotiated union teacher contract and teacher hiring practices that assure highly qualified Math/Science teachers in every classroom.
- A Strategic Teaching and Learning Plan that embraces stable and sustainable external partnerships, financial stability, continuous improvement, and long term district health.

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System-wide Change for All Learners and Educators

Appendix 1 (Goal Activity): Implementation Matrix (June 2005 – July 2006)

Activities, progress, and explanations documented in this Implementation Matrix are reported from the partner, as indicated in the Progress to Date column. If no partner is indicated, than the information is general information as applicable to the partnership.

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Appendix 1 (Goal Activity): Implementation Matrix

Goal One: Core Math and Science Instructional Framework

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Goal One: Core Math and Science Instructional Framework
Appendix 1 (Goal Activity): Implementation Matrix

***Activity*:**	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	***Activity Delayed***	***Activity Revised***	***Activity Eliminated***	***New Activity Submitted***	
Curriculum Advisory Group – and creating course sequences	**3**			**DPS**		**DPS**	The scope of the curriculum advisory group changed to focus on identifying mathematics and science specialty schools serving a diverse student body and to document their progress.
Mathematics professional development for ECE-10 teachers mathematics focused on district curricula	**2, 3**					**DPS**	
Science professional development for teachers focused on district science programs	**2, 3**					**DPS**	
Worked with central staff to support the district's middle school mathematics initiative. Participated in monthly superintendent's meetings, reviewed mathematics implementation plan, worked in all eight local districts supporting the use of the conceptual lessons embedded in LAUSD instructional guides.	**1, 3, 4, 5**	**LAUSD**					
IFL two-day treat with LAUSD staff to discuss challenges and bit ideas of algebra, alignment of the district's instructional guides to the big ideas, and which conceptual lessons in algebra give the district the most leverage July 2006	**1, 3, 5**	**LAUSD**					
One-day or more PD in science to elementary teachers, Special Ed, and ESL support teachers at each grade level, focusing on pedagogical content knowledge, assessment strategies and the incorporation of science journals	**2**	**MMSD**					
One-day PD session to all new elementary teachers to assist in implementation of the science scope and sequence. (Oct 2005)	**2, 3**	**MMSD**					

Goal One: Core Math and Science Instructional Framework
Appendix 1 (Goal Activity): Implementation Matrix

***Activity*:**	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	***Activity Delayed***	***Activity Revised***	***Activity Eliminated***	***New Activity Submitted***	
Three days of PD provided to 55 middle school teachers, Special Ed and ESL support teachers at each grade level, focusing on pedagogical content knowledge, assessment strategies and the incorporation of science journals (Nov 2005, Jan & May 2006)	**2**	**MMSD**					
Collecting video	**4**		**PPSD**				Much of the videotaping has up to now focused on video for professional learning purposes. Beginning in Year 3 SCALE/IFL will begin collecting video examples of math and science teaching in SCALE districts. (This was begun with YTD closure at recent IFL retreat)
Incorporate rubrics into districts professional learning systems	**3**	**PPSD**					The extent/penetration at the classroom is on going with the expectation for rubrics as standard practice.
Asked to organize a Presidential Roundtable at 2007 AERA meeting on use of student assessment information for diagnosis and monitoring	**4**	**PPSD**					PPSD has leadership role in piloting the data driven aspects of assessments tied to intervention strategies for math.
Mathematics professional learning services: Planned and provided DL sessions in 4 classrooms after school, 2 evenings per month for 7 months.	**2**			**PPSD**			DL for all content areas among teacher cohort
Math DL sessions for 7 and 8 grade focused on lesson planning	**2**		**PPSD**				Ongoing despite departure of University of Pittsburgh
Developed and led two sessions for secondary principals	**2**	**PPSD**					completed
Principals studied and analyzed Nathanael Greene school case study	**2**	**PPSD**					
Commissioned review of specialty programs, resulting in an extended paper, “Mathematics and Science Specialty High Schools Serving a Diverse Student Body: What’s Different?"	**4**	**IFL**					

Goal One: Core Math and Science Instructional Framework
Appendix 1 (Goal Activity): Implementation Matrix

***Activity*:**	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	***Activity Delayed***	***Activity Revised***	***Activity Eliminated***	***New Activity Submitted***	
DPS: Benchmark assessments in reading, writing and mathematics instituted district-wide for grades 2-10. **PPSD:** for grades 3-9	**3**					**PPSD DPS**	PPSD: developed and implemented K-12 scope & sequence for Math and Science
Developed Instructional Planning Guides for grades ECE-10 in mathematics.	**3**		**PPSD**			**DPS**	PPSD: delay subject to recently implemented differentiated instruction and practicum as professional development
Introduced School Leadership Rubrics to all eight local superintendents and to principals at four of the districts, so that principals understand their role as instructional leaders in the implementation of the district's mathematics initiative.	**1, 5**	**LAUSD**	**PPSD**				PPSD: The leadership rubrics were in progress of development and implementation but full distribution was never completed.
IFL fellows worked with secondary mathematics team, teachers and coaches to develop a plan for Algebra Readiness and trained middle school coaches. Jan-Feb 2006	**1, 3, 5**	**LAUSD**		**PPSD**			PPSD: The extent of this initiative was started at one middle school in math
CSUDH & CSUN SCALE leaders organized the recruitment effort for the TPC Study	**1, 4**					**LAUSD CSUs**	
CSUDH & CSUN SCALE leaders organized the buy-in from LAUSD key leaders for the TPC Study	**1, 4**					**LAUSD CSUs**	
CSUDH Math team met with LAUSD local district #6 to consider math P.D. plans for Summer 2006	**1, 2, 3**					**CSUDH LAUSD**	
Math team met with local district #6 secondary principals to plan and inform about leadershisp role for institutes and follow-up recruitment	**1, 2, 3, 5**					**CSUDH LAUSD**	
Math team met with local district #6 secondary Math teachers to begin process of reflecting on success in algrebra	**1, 2, 3, 5**					**CSUDH LAUSD**	

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Appendix 1 (Goal Activity): Implementation Matrix

Goal Two: STEM Immersion Units

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Goal Two: STEM Immersion Units
Appendix 1 (Goal Activity): Implementation Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Grade 3-10 after-school program, DPS Success, to support mathematics instruction	**2**					**DPS** January 2006	
Require double block of mathematics for students not on grade level	**3**					**DPS** Effective fall 2006	
Adopted new graduation requirements including 4 years of college-prep math and 3 years of science, to be effective with students entering HS in 2007-08	**3**					**DPS**	
Completed field test of three new middle school science programs, incl. development of implementation guidelines, big ideas/concepts connected to activities and embedded formative assessments in each unit. Developed CSAP-like unit assessments to use for monitoring student progress on science standards during district-wide roll-out of the new science programs	**3**					**DPS**	
Completed district-wide implementation of a new biology program, BSCS Biology: A Human Approach. Included science kit materials along with instructional materials for students and teachers. Biology teachers piloted a set of implementation tools and literarcy strategies, along with a set of CSAP-like unit assessments during the roll-out.	**3**					**DPS**	
Selected and began field testing a new second-year algebra program prior to district-wide implementation of the new program in 2007-08	**2, 3**					**DPS**	
Selected and began field testing a new earth science program, EarthComm, prior to district-wide implementation of the new 9th grade course in 2007-08.	**3**					**DPS**	

Goal Two: STEM Immersion Units
Appendix 1 (Goal Activity): Implementation Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
SCALE/QED Leadership Study group series. 2 days in Feb, Mar, April, May, Sept, Oct, Nov, and 3 days in June 2006	**1,3,5**	**LAUSD**					District science leadership and CSU faculty (STEM and science ed) came together monthly to study leadership and PD facilitation in preparation for co-facilitating the summer science institutes as well as to prepare for future LAUSD professional learning opportunities and pre-service education courses. Approximately 20 district science leaders, 6 selected in-service teachers, and 10 CSU faculty prepared to co-facilitate summer institutes and reflected on their strengths and weaknesses as leaders.
Science Leadership teleconferences and meetings. January - December 2006	**1, 4, 5**	**LAUSD**					Working with the science leadership I LAUSD, SCALE was able to outline the next year of immersion unit development and trainings for Grades 4-8. Outcomes of these meetings included scheduling future professional development and trainings for Grades 4-8. Outcomes of these meetings included scheduling future professional development offerings, planning for follow-up professional development opportunities, building awareness about science immersion at the principal and school level, and future science immersion development to be conducted primarily by the district. Approximately 9 elementary and secondary LAUSD science leaders were involved.
Elementary Science Leadership development conferences January – June 2006	**1, 4, 5**	**LAUSD**					SCALE staff worked with the elementary science leadership in LAUSD and the first cohort of Grade 4 science lead teachers selected to support the Grade 4 immersion unit to plan and facilitate two conferences to develop leadership skills for working with LAUSD teachers through a variety of professional development strategies. Approximately 38 elementary teachers and 17 LAUSD science leaders were involved.

Goal Two: STEM Immersion Units
Appendix 1 (Goal Activity): Implementation Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Alarm System PD workshops + classroom implementation	**1,2,3,4**	**MMSD**					
Evaluate impact of Alarm System unit on student understanding of scientific reasoning	**3, 4**	**MMSD**				**MMSD**	Issue that arose in conversation with teachers and districted needed to be addressed empirically
Develop and pilot test high school chemistry unit	**1,3,4**			**PPSD**			Reassessing Wisconsin Immersion model in lieu of Pittsburgh
Develop high school immersion units in physics, chemistry, and biology	**1,3,4,5**			**PPSD**		**PPSD**	Initially planned smaller development plan, but was increased by request from school district. Now subject to revised initiatives via Wisconsin Immersion
Evaluated impact of high school immersion on student conceptual knowledge and design skills	**1,3,4**	**PPSD ongoing**				**PPSD**	
SCALE Immersion Unit Revision Teams.	**1, 3, 4**	**MMSD LAUSD**					Implementing teachers, district science leaders and university faculty reviewed and provided feedback before and during the revision of the Grades 4, 6, 7, and 8 immersion units. Approximately 20 teachers, 20 district reviewers, and 4 university faculty were involved.

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Appendix 1 (Goal Activity): Implementation Matrix

Goal Three: Coherent Teacher Preparation

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Goal Three: Coherent Teacher Preparation
Appendix 1 (Goal Activity): Implementation Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Establishment of Urban-Apprentice Programs in Denver through collaboration with Metro State College	**1,2,3,4,5**					**DPS**	Program focuses on recruiting prospective teachers to Denver Public Schools, especially in the areas of math and science.
Increased on-site support for mathematics and science teachers with reorganization of district into Instructional Support Teams with a Math/Science Developer assigned to each team	**2**					**DPS**	
California MSP 4-day Institutes, held twice (Jan and Mar) – focused on Immersion Units. 2 – Grade 4 2 – Grade 5 1 – Grade 6 1 – Grade 7 1 – Grade 8	**1,2,3,5**	**LAUSD**					These CAMSP institutes changed focus over the last two years to incorporate science immersion units as a resource and provide professional development that was coherent with the other SCALE learning opportunities. Approximately 130 Grade 4, 5, 6, 7 and 8 teachers participated and 10 district science leaders co-facilitated the January institutes with SCALE mentors and/or facilitated the March institutes independently.
Elementary Math Resource Teachers, SCALE and WCER staff created an online survey for 30 first grade math teachers participating in the Every Child Counts: First Grade Math Intervention Initiative. Facilitated focus groups to discuss effectiveness of professional development. Designed rubric and scored survey results and prepard a summary descriptin of the teacher professional growth that occurred in year one of the initiative.	**1, 2, 4**	**MMSD**					
Elementary and middle school principals participated in Lenses on Learning course and six 20 hour In summer on content	**2**	**MMSD**					

Goal Three: Coherent Teacher Preparation
Appendix 1 (Goal Activity): Implementation Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Math Masters Project offered six 40 hour workshops on math content and pedagogy for middle school math teachers.	**2**	**MMSD**					
Continued year 3 of a study looking at the different curriculums used at East High School. Teachers used preliminary data from first two years of study to begin discussions on what the data was telling them and how this information might influence their teaching practice. Teachers from multiple schools brought together to explore Lesson Study, a collaborative effort to critique and better teaching techniques.	**2, 4**	**MMSD**					
Developed Grade 6 Diversity of Life and Grade 7 Plate Tectonics immersion units; provided district-wide 4-day, 20 hour summer institute for 30 middle school teachers Elementary immersion units: Kindergarten: Analyzing Animals	**2, 3** **2, 3**	**MMSD PPSD** **MMSD** Jan, March, & July					PPSD has K-8 program implementing STC/FOSS Kit Science Grade 6: April & July 2006 Grade 7: March & July 2006 Grade 3: Organisms' Responses to their Environment (May & June 2006)
TQE-D and QED kick-off meetings in Denver, Los Angeles and Phoenix (Pittsburgh)	**1,2,3,4,5**	**CSUDH On-going**					SCALE members from UW-Madison, University of Pittsburgh, CSUDH, Denver Public Schools and LAUSD are working in collaboration with these 2 US DOE grants.
As outgrowth of Science Immersion professional development done within the collaborative, submitted proposal for an MSP Institute Award. May 2006.	**1, 2, 3, 5**	**CSUDH**					If awarded, these funds would allow the team to prepare a critical mass of middle school lead teachers to assist fellow teachers in understanding and implementing the valuable science immersion units.

Goal Three: Coherent Teacher Preparation
Appendix 1 (Goal Activity): Implementation Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Coordination of PD for Elementary Immersion	**1,2,3,4,5**	**ongoing UW CSUDH LAUSD**					SCALE Goal 3 and Goal 2 are working in partnership with CSUDH, CSUN, and LAUSD to develop elementary immersion units and provide in-service development and support for immersion implementation in the elementary classroom.
QED/SCALE Summer Math Institutes at CSUDH & CSUN	**1,2,3,4,5**	**CSUs**					The math institutes took place in July, for middle school teachers and were co-faciliated by LAUSD math leaders, CSU faculty.and SCALE staff.
5-day Immersion Unit Professional Development Institutes, plus ½ day follow up sessions. June through December 2006: 5 – Grade 4 1 – Grade 5 3 – Grade 6 3 – Grade 7 3 – Grade 8	**1,2,3,5**	**CSUs LAUSD**					These institutes were co-facilitated by LAUSD science leaders, CSU faculty and SCALE staff. They built on the strengths and challenges experienced in the 2005 institutes, and the number of institutes offered in 2006 was triple what was offered in 2005. Approximately 310 Grade 4, 5, 6, 7 and 8 teachers participated and 76 district science leaders either participated or co-facilitated the institutes with SCALE mentors. Also see Goal 2.
Cohort 6 WestEd National Leadership Academy team comprised of LAUSD, SCALE, and CSU members. 2 – three-day conferences, March and August	**1,3,5**	**CSU**					District science leadership, CSU faculty, and SCALE staff joined the WESTED Leadership Academy to participate in a common learning experience in preparation for future LAUSD professional learning opportunities and pre-service education courses. Involves 6 district science leaders, 1 CSU faculty member and 3 SCALE staff.

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Appendix 1 (Goal Activity): Implementation Matrix

Goal Four: Increased Participation of Students from Groups Underrepresented in Mathematics and Science

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Goal Four: Increased Participation of Students from Groups Underrepresented in Mathematics and Science
Appendix 1 (Goal Activity): Implementation Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Implemented professional development for teams of general education and special education teachers focused on accessibility strategies to support all students in their engagement in standards-based mathematics	**2, 3, 5**					**DPS**	
Hosted second annual district-wide high school science in-service session on Equity and Excellence in High School Science	**2**	**MMSD**					
Translated all middle school science scope and sequence student materials into Spanish and placed on district website.	**3, 5**	**MMSD**					
Piloted a modified laboratory book for Grade 7 Chemical Interactions (collaborative initiative with Dept. of Special Ed)	**1, 3**	**MMSD**					
Used science as a model to analyze 9th grade student course taking patterns and achievement in all core content areas. Approved a plan and timeline to insure all 9th grade students will be enrolled in a grad level or higher core course by 2008-2009.	**3, 4, 5**	**MMSD**				**MMSD**	
Improvement of rigor, achievement and participation in high school science at 9th grade level. Seven full-day PD seminars for teams of freshman science teachers, Special Ed and ESL support teachers from the four comprehensive high schools	**2, 3**	**MMSD**					Oct 05: Excellence and equity Nov 05: Applying research to class structures and instruction, Embedded honors in Freshman science Feb 06: Connections with middle schools Mar 06: Assessment and backwards design & tools: focus on student work; Analyzing student work to reveal understanding Mar 06: Pedagogical content focus: SCALE resources/UW resources April 06: Revisit school plans from Oct & November May 06: Summer planning: school plans & session needs; Evolution – Evo/Devo; Sharing student success stories & celebration

Goal Four: Increased Participation of Students from Groups Underrepresented in Mathematics and Science
Appendix 1 (Goal Activity): Ben Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Developed proposal to conduct a study of the district's master scheduling process	**4**			**PPSD**			This initiative is being revised to reflect best practices beyond University of Pittsburgh model
Implemented district-wide Grade 9 Intervention program in support of Algebra 1 remediation; introduced pilot version of the scaffold curriculum during 2006 summer school session.	**3, 5**	**PPSD**					
Write a summary report on the expected utility of each of the identified district strategies and federally/privately funded initiatives from the perspective of SCALE's goals and the district's capabilities.	**4**	**IFL in-progress**					This activity is being conducted with respect to the needs assessment and individual district mini-retreats/planning sessions.
Conduct a literature survey and review of federal and private foundation supported programs. Determine how these funded programs complement the SCALE initiative.	**4**			**IFL**			This activity is being conducted within the framework of the needs analyses currently underway along with the identification of equity improvement areas.
Conduct a think-tank on equity	**1**		**IFL**				After consideration of current activities in Goal 4, it was felt that this activity would be pre-mature until there was significant progress in each of the districts. This activity will be pursued during the summer of year four.
Determine significant metrics and potential impact on closing the equity gap through analysis of national databases	**4**	**IFL in-progress**					A math model is being developed from the National Education Longitudinal Study of 1988 (NELS:88) to identify strategies and their impact on the math performance of students. The model will be utilized to make suggestions for specific racial and economic groups that may lead to the reduction of the mathematics achievement gap.

Goal Four: Increased Participation of Students from Groups Underrepresented in Mathematics and Science
Appendix 1 (Goal Activity): Ben Matrix

Activity:	***MSP Key Feature:***	***Progress to Date:***					***Brief explanation for changes where an activity has not been carried out as planned:***
		Activity Carried Out as Planned	*Activity Delayed*	*Activity Revised*	*Activity Eliminated*	*New Activity Submitted*	
Determine baseline values for equity benchmarks and specific-district appropriate and approved targets.	**4**	**IFL in-progress**					Two of the four districts have a system for tracking equity benchmarks and have established internal baselines.
Establish a purposeful process for monitoring each benchmark such that equity improvements are properly documented by SCALE and the districts.	**5**	**IFL in-progress**					See above.
Determine across the districts areas for improvement with respect to equity.	**4**	**IFL in-progress**					In three of the four districts extensive interviews and retreats have been conducted. The purpose of the retreats is to establish areas for improvement in each district by identifying successful strategies and how SCALE resources can be properly allocated to the district to implement the targeted strategies.
Working with the Goal 1 team, establish a systems-based approach to equity in the districts.	**3, 5**					**IFL**	See above.
Investigate attitudinal issues related to students entering higher education and their decision to study STEM or non-STEM fields.	**3, 5**					**IFL**	See above.
Work with Norm Webb to determine feasible metrics for monitoring equity benchmarks in the SCALE indicator system.	**1**	**UW in-progress**					During the past winter, a meeting was held with N. Webb to review the indicator system progress and how the district equity benchmarks can be interwoven. As progress continues on the districts' use of the benchmarks these may be integrated into the indicator system.
Investigate active district level equity strategies and determine how these strategies should be incorporated into the other three goals and how best practices may be shared across districts.	**1, 5**	**in-progress DPS MMSD PPSD**					

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System-wide Change for All Learners and Educators

Appendix 2 (Goal Activity): Benchmark Matrix (June 2005 – July 2006)

The Goal Benchmark Matrix is designed to help organize objectives and benchmarks—by project goal—in a consistent manner over the life of the project. Each goal is identified (the same goals used in Appendix 2 for project activities, and are the goals delineated in the Strategic Plan) and the corresponding benchmarks that were to be attained for that goal in the past year. A brief narrative that further describes the status of reaching the benchmark (e.g., evidence that a benchmark was met, year in which the benchmark is expected to be fully achieved) is included

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Appendix 2 (Goal Activity): Benchmark Matrix

Goal One: Core Math and Science Instructional Framework

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Benchmark: *(See details following matrix)*	***Level of Attainment:*** *(Check one; enter date where appropriate)*					***Brief Explanation for Revisions, New Benchmarks, and Target Dates:***
	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
The Teaching Dimension: Defined math and science curricula and tools for monitoring their implementation.						
1a-4 In subsequent years, annual reports on learning policy implementation will be made using these rubrics		DPS PPSD		LAUSD	MMSD	Based upon RET studies, focus has changed to provide new PD tools
1a-7: By December 2005, all districts will have selected a rigorous elementary mathematics program	DPS LAUSD PPSD		MMSD			MMSD: have K-2; in 07-08 will have 3-5
1a-8: By December 2006 a full sequence of high school mathematics requirements will be defined in each district; these requirements will apply to all students	DPS LAUSD PPSD MMSD					
1a-9: By December 2007 each district will have a coherent K-12 mathematics program for all students in place, with an aligned system of professional learning, monitoring and individual student adaptation.	DPS PPSD					MMSD: On course for 2007
The Professional Learning Dimension: Development of coaches and lead teachers in mathematics and science						
2a-2: In each succeeding year each district will report on its progress in meeting its rollout schedule	DPS LAUSD PPSD				MMSD	
The Professional Learning Dimension: Professional learning for principals and supervisors						
2b-3: The tools in Benchmark 2b-2 will be incorporated into district improvement strategies and used in each succeeding year to provide an assessment of the quality of the work of principals and supervisors.	PPSD	DPS LAUSD			MMSD	PPSD: Use of Providence One Plans (a strategic planning tool)
The Professional Learning Dimension: SCALE professional learning programs for science						
2d-3. During the 2005-06 school year, high school literacy will be extended to chemistry and middle school Disciplinary Literacy will be extended to two further topics.						

Goal One: Core Math and Science Instructional Framework
Appendix 2 (Goal Activity): Benchmark Matrix

Benchmark: *(See details following matrix)*	***Level of Attainment:*** *(Check one; enter date where appropriate)*					***Brief Explanation for Revisions, New Benchmarks, and Target Dates:***
	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
2d-4. During the 2006-7 school year the disciplinary literacy professional system will be extended to meet needs identified by the monitoring system.				LAUSD	DPS PPSD MMSD	The professional system has been modified in LAUSD to include QED institutes and central professional development facilitators
The Monitoring Dimension: Interim assessments of student achievement.						
3b-3: By June, 2006 each district will have mounted its interim monitoring system for science K-8.	LAUSD PPSD		DPS MMSD			DPS-September 07 as called for in the Denver Plan MMSD: K-5 in place with Report Card. 6-8 by 2007-08 with Report Card & G-level standards
3b-4: By June 2007, each district will have mounted its interim monitoring system for high school mathematics and science.	LAUSD		PPSD			DPS—on target to be met PPSD: revised to 07/08 for Science
The Monitoring Dimension: School and classroom improvement plans, with personalized, regular review of progress toward plans						
3c-1: By June 2004, each district will have agreed in a consultative process that includes principals and their supervisors upon a school planning document and a regular review process (several times per year) between principal and supervisor.	DPS LAUSD PPSD MMSD					
3c-2: By the end of Year 5, all principals in the district will be participating in this continuous improvement.	LAUSD PPSD MMSD					DPS-On target to be met
3c-3: By June 2006, all districts will have developed—in consultation with teachers—a plan and process for engaging teachers in regular reviews of benchmarks and student progress for personalized regular review of student progress with individual teachers.	DPS PPSD	LAUSD	MMSD			PPSD: Providence One Plan MMSD: K-5 SIMS pilot 06-07 district-wide (SIMS = student interest monitoring system)
3c-4: At least a quarter of teachers in each district will be participating in the review process by the end of the fifth year of the grant (December, 2007).	PPSD	LAUSD	MMSD			DPS-on target to be met PPSD: Scope/sequence review MMSD: by 07-08 for K-5
3c-5: All teachers will be participating by 2010					MMSD	DPS-on target to be met
The Monitoring Dimension: Monitoring teaching quality						
3d-2: We will have field-tested assessments of teaching quality ready for use in all SCALE districts by the end of Year 5.	PPSD (math)	LAUSD	PPSD (science)		MMSD	PPSD: Assessments in dynamic review for math. 07/08 for science.

Benchmark: *(See details following matrix)*	***Level of Attainment:*** *(Check one; enter date where appropriate)*					***Brief Explanation for Revisions, New Benchmarks, and Target Dates:***
	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
3d-3: In Years 6-10, these assessments will come into regular use in all of the districts.	PPSD (math)		PPSD (science)		MMSD	
The Accountability Dimension						
4a: SCALE will prepare an analytic paper on the role of districts in using state accountability systems to improve student achievement in math and science by December 2004		PPSD				
The Accountability Dimension: Student Achievement						
4b-1: K-8 Mathematics: Proportion of students at proficiency levels: 1. 2002-2003 Baseline 2. 2003-2004 target: 5% increase at each proficiency level 3. 2004-2005 target: 5% increase at each proficiency level 4. 2005-2006 target: 5% increase at each proficiency level 5. 2006-2007 target: 5% increase at each proficiency level **High School Mathematics:** 1. 2002-2003 Baseline 2. 2004-2005 target: 5% increase at each proficiency level **3.** 2006-2007 target: 5% increase at each proficiency level		DPS LAUSD PPSD				PPSD: Anticipated upside trend following 06/07 NECAP state testing
The Accountability Dimension: Tests/assessments.						
4c-1: This benchmark will be met by each district no later than December, 2005—the year by which all states are required by NCLB to have implemented their assessment systems. Some districts will be able to meet the requirement earlier. We will report on the status in each district annually	DPS LAUSD PPSD					
The Accountability Dimension: Graduation requirements						

Goal One: Core Math and Science Instructional Framework
Appendix 2 (Goal Activity): Benchmark Matrix

Benchmark: *(See details following matrix)*	***Level of Attainment:*** *(Check one; enter date where appropriate)*					***Brief Explanation for Revisions, New Benchmarks, and Target Dates:***
	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
4d-1: This benchmark will be met by districts in two phases. By the end of year 3 (December, 2005) districts will have adopted their intended high school requirements, with community and school board approval.	LAUSD PPSD		DPS-June 2006			PPSD: As stated in RI PBGR graduation requirements
4d-2: By school year 2007-8), all 9th and 10th grade students will be taking courses in accord with the specified requirements.						DPS-on target to be met LAUSD- on target to be met PPSD – on target to be met
4d-3: By the end of Year 7 (December 2008), graduation will depend upon meeting the adopted requirements, and necessary "catch-up" programs for low-performing students will be in place.						DPS-On target to be met LAUSD- on target to be met
The Accountability Dimension: Weak school identification and support system						
4e-3: By December 2006, it is expected that at least 20% of schools will have received assistance and support under the system	DPS LAUSD PPSD					
4e-4: By December 2008, we expect 10% of schools in each district to have shown substantial improvement (resulting in their removal from the "weak school" category) in students' math and science achievement as a result of the district's weak school identification and support system.		LAUSD				DPS-on target to be met PPSD – on target to be met

Appendix 2 (Goal Activity): Benchmark Matrix

Goal Two: STEM Immersion Units

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Goal Two: STEM Immersion Units
Appendix 2 (Goal Activity): Benchmark Matrix

Benchmark: *(See details following matrix)*	***Level of Attainment:*** *(Check one; enter date where appropriate)*					***Brief Explanation for Revisions, New Benchmarks, and Target Dates:***
	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
Define, Identify and Develop Immersion Unit Resources						
5b-2: Identify, develop, pilot, and evaluate 1-3 new immersion resources at different grade levels for math and science	LAUSD MMSD PPSD			MMSD	DPS	PPSD: Developed units for high school science in biology (designer bacteria unit), chemistry (heating and cooling unit), and physics (projectile unit). Chemistry unit piloted and evaluated in Spring 2006. Biology and Physics units to be piloted and evaluated in Fall 2006 MMSD: two new immersion units are under development and piloted in grades 3 and 6. No math.
Implement and Evaluate Immersion Units						
6a-1: Pilot and evaluate 2 Cohort 1 immersion units in LA; outline recruiting and training plan and 2004 schedule for LA's Cohort 1 immersion units. Pilot Cohort 2 immersion resources in all districts			PPSD	MMSD	DPS	SCALE no longer uses the terminology of Cohort 1 and Cohort 2. LAUSD: recruiting and training for all immersion units at grades 4-8 are completed and are continually updated. MMSD: the recruitment and training are completed and continually updates for grades K, 3, 5, 6 and 7. No math.
6a-2: Produce implementation timeline for Cohort 1 immersion units and coach/lead teacher training in all districts for 2004/05 year	LAUSD MMSD PPSD			MMSD	DPS	DPS: Benchmark not met due to other district priorities MMSD: no math
6a-3: Districts will integrate immersion units into math/science curricula at all grade levels for 70% of students; create library for immersion resources and templates	LAUSD MMSD PPSD			MMSD	DPS	Revised due to DPS. SCALE has developed SCALEnet to support district leadership and teachers in communicating through discussion groups and posting documents for distribution. MMSD: No math
6a-4: Districts will integrate immersion units into math/science curricula at all grade levels for 70% of students; create library for immersion resources and templates	LAUSD MMSD PPSD			X	DPS	Revised due to lack of work in DPS. LAUSD: Testing 3 sequenced sets of immersion units (K, 2, 5) focused on the vertical alignment of the district's curriculum.
6a-5: Districts will implement at least one immersion unit; 2 districts will implement 2 sequenced sets of units	MMSD	LAUSD PPSD			DPS	Only MMSD has sequenced sets of units DPS has not implemented immersion

Goal Two: STEM Immersion Units
Appendix 2 (Goal Activity): Benchmark Matrix

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	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
6a-6: Districts will implement 2 immersion units with 40% of students participating		LAUSD MMSD PPSD	MMSD (kindergarten)		DPS	CDS report: Approximately 40% of 8th grade students in MMSD implemented the Alarm system unit LAUSD & PPSD: have not reached this implementation level at this point MMSD: in kindergarten have 40%, next year will have Grade 7
6a-7: Districts will integrate immersion units into math/science curricula at all grade levels for 70% of students; create library for immersion resources and templates		LAUSD PPSD		MMSD	DPS	MMSD: K, 3, 6, 7, other grade levels incorporate Inquiry Cycle and PD models
Coordinate Professional Learning, Monitoring, and Accountability of Immersion Unit Resources with Other SCALE Goals						
7a-1: By the end of Fall 2004, the IDT will have specified how plans for implementing immersion units are integrated with the teaching, professional learning, monitoring, and accountability systems in the overall framework	LAUSD MMSD	PPSD			DPS	PPSD: not accomplished due to district transition and new review of SCALE/UW immersion initiatives

Appendix 2 (Goal Activity): Benchmark Matrix

Goal Three: Coherent Teacher Preparation

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Goal Three: Coherent Teacher Preparation
Appendix 2 (Goal Activity): Benchmark Matrix

Benchmark: *(See details following matrix)*	***Level of Attainment:*** *(Check one; enter date where appropriate)*					***Brief Explanation for Revisions, New Benchmarks, and Target Dates:***
	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
Track 2: STEM teacher recruitment courses						
9a-3: Develop and test courses in mathematics, physics, chemistry, and biology by the end of Year 3.			X			Revised to June 08
9b-2: Hold annual fall conferences during Years 2–5 for IHEs and district representatives to support Track 1 and Track 2 goals.		X				
As stated in the Year 4 Implementation Plan, an emerging emphasis on STEM and education faculty involvement in our initiatives with SCALE K-12 districts created a need to establish a new set of objectives for Goal 3. Now Goal 3 has four main objectives aligned to four of the NSF Key Features for MSP Projects. The four objectives are described below.						
Partnership-drive: Promote coherence between each district and the IHEs that serve the district in ways that are consistent with and support SCALE and NSF objectives.						
Teacher Quality, Quantity, and Diversity: Involve STEM and education faculty in providing quality and pre-service professional development opportunities for K-12 teachers.						
Challenging courses and curricula: Promote STEM and education faculty involvement in the development and implementation of challenging courses and curricula to improve the preparation of future STEM teachers.						
Evidence-based/institutional change and sustainability: Develop opportunities for local post-secondary institutions to coordinate with the local districts to develop and implement new policies and practices that redirect and increase the resources available in K-20 organizations to incorporate the lessons learned and the evidence-based effective practices.						

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Appendix 2 (Goal Activity): Benchmark Matrix

Goal Four: Increased Participation of Students from Groups Underrepresented in Mathematics and Science

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10a: Up to 6 promising Goal 4 strategies will be identified during summer 2003 by reviewing the literature, consulting our national advisory board members by email, and through interviews with successful minority and female STEM undergraduates. We will conduct a literature survey and write a summary report on the expected utility of each of the identified strategies by early Fall of 2003.				DPS LAUSD MMSD PPSD		
10a-3: By the end of the second year, at least one selected Goal 4 strategy will be implemented at a pilot level in all four districts.	DPS MMSD PPSD	LAUSD				
10a-4: Research on the early effectiveness of these pilot implementation efforts will be completed by the summer of 2005.	DPS MMSD PPSD	LAUSD				
10a-6: Research on the impact of these strategies will be conducted and summarized by the end of the fourth year			X			As some of the individualized initiatives only occurred this past year, it is difficult for this benchmark to be realized in the same year. This should be moved to the fifth year.
10a-7: By the end of the fifth year, the selected strategies will be in some stage of implementation in 50% of each district's schools.		X				This is a benchmark for the fifth year
10b: By the end of the third year, districts that do not currently have a system of equity benchmarks in place will have developed a system alongside the Goal 4 team.	DPS MMSD PPSD	LAUSD				All with the exception of LAUSD. This benchmark focused primarily on Denver. With the inclusion of the equity indicators in the BSC and the alignment of the BSDC and the systems modeling work, this benchmark was met.
10b-2: During the third year, determine across districts areas for improvement with respect to equity as well as identify successful strategies that have been implemented by the districts (to include non-SCALE-related strategies) for minimizing disparity among targeted student populations	DPS MMSD PPSD	LAUSD				

Goal Four: Increased Participation of Students from Groups Underrepresented in Mathematics and Science
Appendix 2 (Goal Activity): Benchmark Matrix

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	Benchmark Met	*Benchmark Not Met*	*Target Year Revised*	*Benchmark Revised*	*No Longer a Project Benchmark*	
10c-1: By the end of the third year, Goal 4 team will have built a systems-based model for equity that is applicable across districts. This will serve as the basis for determining district progress and facilitating talk among districts.	DPS PPSD	LAUSD MMSD				
10c-2: By the end of the third year, Goal 4 team will have worked with each district to understand their specific needs with respect to equity. This will likely include identification of equity issues, goals, strategies, and an understanding of each district's systems.	DPS PPSD	LAUSD MMSD				
10c-3: By the end of the third year, Goal 4 team and districts will have identified barriers within each district that hinder the development of equity-based reforms, particularly as they relate to other SCALE goals.	DPS PPSD	LAUSD MMSD				
10c-4: In the third and fourth years, develop and implement plans to address these barriers in each district.	DPS PPSD	LAUSD MMSD				
10c-5: In year four, conduct an equity think tank with all four SCALE districts and all Goal 4 personnel to share district differences and commonalities that emerge as a result of district-specific work.					X	The Goal 4 group did not believe the nature of this think tank was necessary and was a benchmark left over from previous years.
10d-1: In fall 2005 (end of year 3) hire 2 additional full-time staff to meet the growing needs of Goal 4 work.	X					
10d-2: By end of year 3 create an Equity Advisory Board comprised of experts in the field of equity in K-12 education. Have Goal 4 staff meet quarterly with advisory board for feedback on Goal 4 activities.	X (partial)					Systems modeling work was informed by Ruth Johnson, Co-Director of the Equity Advisory Board. Both Ruth Johnson and Janet Schofield (Co-Directors of the Equity Advisory Board) have reviewed and provided comments to the Goal 4 team.

System-wide Change for All Learners and Educators

Appendix 3: LAUSD Science Immersion Activities

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LAUSD Elementary Science Immersion Activities 2006

	Approx # Educators Involved			
Professional Learning Opportunity or Planning Session	**SCALE Staff**	**In–service teachers**	**LAUSD science leaders**	**CSU faculty**
January				
• 1–week long Grade 6 Science Immersion Institute—California MSP project	**1**	**8**	**2**	**1**
• 1–week long Grade 7 Science Immersion Institute—California MSP project	**1**	**9**	**2**	**1**
• 1–week long Grade 8 Science Immersion Institute—California MSP project	**1**	**12**	**2**	**1**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**2**
February				
• 2–day Leadership Studygroup collaboration meeting o Developing a common understanding and vision for inquiry-based science teaching and learning	**2–3**	**6**	**24**	**13**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1**
March				
• 1–week long Grade 6 Science Immersion Institute—California MSP project		**5**	**2**	**1**
• 1–week long Grade 7 Science Immersion Institute—California MSP project		**7**	**2**	**1**
• 1–week long Grade 8 Science Immersion Institute—California MSP project		**11**	**2**	**1**
• Cohort 6 WestEd National Leadership Academy team comprised of LAUSD, SCALE, and CSU members attends 3–day conference	**3**		**7**	**1**
• 2–day Leadership Study group collaboration meeting o Planning for professional development (guest facilitator: Susan Mundry)	**2–3**	**6**	**24**	**13**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1**
April				
• 2–day Leadership Study group collaboration meeting o Planning for co–facilitating 1–week summer institutes for the grades 6, 7, and 8 science immersion units	**2–3**	**6**	**24**	**13**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1**
May				
• 2–day Leadership Study group collaboration meeting o Developing facilitation guides for the 1–week summer institutes for the grades 6, 7, and 8 science immersion units	**2–3**	**6**	**24**	**14**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1**
June				
• 3–day Leadership Study group collaboration meeting o Practicing co–facilitation	**2–3**	**6**	**24**	**13**
• Three co–facilitated 1–week summer institutes (grades 6, 7, and 8)—QED	**4**	**34**	**20**	**7**

Appendix 3: LAUSD Science Immersion Activities

July				
• Three co–facilitated 1–week summer institutes (grades 6, 7, and 8)—QED	**4**	**67**	**15**	**6**
August				
• Three co–facilitated 1–week summer institutes (grades 6, 7, and 8)—QED	**4**	**66**	**19**	**6**
• Cohort 6 WestEd National Leadership Academy team comprised of LAUSD, SCALE, and CSU members attends 3–day conference	**3**		**7**	**1**
September				
• One ½–day follow–up professional development session for Grades 6, 7, and 8 institute participants		**40**	**6–9**	**3**
• Strategic planning for SCALE year 5	**2**		**2**	**1**
• 2–day Leadership Study group collaboration meeting o Reflection on summer institute evaluations, and planning for follow–up support to increase implementation by institute participants	**2–3**	**6**	**24**	**13**
October – December				
• One ½–day follow–up professional development session for Grades 6, 7, and 8 institute participants	**0**	**40**	**6–9**	**13**
• 2–day Leadership Study group collaboration meeting o Reflection on summer institute evaluations, and planning for follow–up support to increase implementation by institute participants	**2–3**	**6**	**24**	**13**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**2**

LAUSD Middle School Science Immersion Activities 2006

	Approx # Educators Involved			
Professional Learning Opportunity or Planning Session	**SCALE Staff**	**In–service teachers**	**LAUSD science leaders**	**CSU faculty**
January				
• 1–week long Grade 6 Science Immersion Institute—California MSP project	**1**	**8**	**2**	**2**
• 1–week long Grade 7 Science Immersion Institute—California MSP project	**1**	**9**	**2**	**2**
• 1–week long Grade 8 Science Immersion Institute—California MSP project	**1**	**12**	**2**	**2**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1-2**
February				
• 2–day Leadership Studygroup collaboration meeting o Developing a common understanding and vision for inquiry-based science teaching and learning	**2–3**	**6**	**24**	**10**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1-2**
March				
• 1–week long Grade 6 Science Immersion Institute—California MSP project		**5**	**2**	**2**
• 1–week long Grade 7 Science Immersion Institute—California MSP project		**7**	**2**	**2**
• 1–week long Grade 8 Science Immersion Institute—California MSP project		**11**	**2**	**2**
• Cohort 6 WestEd National Leadership Academy team comprised of LAUSD, SCALE, and CSU members attends 3–day conference	**3**		**7**	**2**
• 2–day Leadership Study group collaboration meeting o Planning for professional development (guest facilitator: Susan Mundry)	**2–3**	**6**	**24**	**10**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1-2**
April				
• 2–day Leadership Study group collaboration meeting o Planning for co–facilitating 1–week summer institutes for the grades 6, 7, and 8 science immersion units	**2–3**	**6**	**24**	**10**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1-2**
May				
• 2–day Leadership Study group collaboration meeting o Developing facilitation guides for the 1–week summer institutes for the grades 6, 7, and 8 science immersion units	**2–3**	**6**	**24**	**10**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1-2**
June				
• 3–day Leadership Study group collaboration meeting o Practicing co–facilitation	**2–3**	**6**	**24**	**10**
• Three co–facilitated 1–week summer institutes (grades 6, 7, and 8)—QED	**4**	**34**	**20**	**9**

Appendix 3: LAUSD Science Immersion Activities

July				
• Three co–facilitated 1–week summer institutes (grades 6, 7, and 8)—QED	**4**	**67**	**15**	**9**
August				
• Three co–facilitated 1–week summer institutes (grades 6, 7, and 8)—QED	**4**	**66**	**19**	**9**
• Cohort 6 WestEd National Leadership Academy team comprised of LAUSD, SCALE, and CSU members attends 3–day conference	**3**		**7**	**2**
September				
• One ½–day follow–up professional development session for Grades 6, 7, and 8 institute participants	**0**	**40**	**6–9**	**2**
• Strategic planning for SCALE year 5				**1**
• 2–day Leadership Study group collaboration meeting o Reflection on summer institute evaluations, and planning for follow–up support to increase implementation by institute participants	**2–3**	**6**	**24**	**10**
October – December				
• One ½–day follow–up professional development session for Grades 6, 7, and 8 institute participants	**0**	**40**	**6–9**	**2**
• 2–day Leadership Study group collaboration meeting o Reflection on summer institute evaluations, and planning for follow–up support to increase implementation by institute participants	**2–3**	**6**	**24**	**10**
• Bi–weekly LAUSD/SCALE/QED secondary science leadership teleconference	**1–2**		**3–4**	**1-2**

System-wide Change for All Learners and Educators

Quantitative Report

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Introduction

This report describes the extent of implementation of the SCALE within each partnering district as well as the data systems that have been developed to quantify SCALE's implementation. The SCALE project is designed to improve learning and education for all teachers and students. SCALE districts consist of about 37,000[3] teachers (Table 1) and 700,000* students (Table 2). Since SCALE is still developing and implementing interventions, being able to estimate the degree to which SCALE has impacted teachers and students is of primary concern.

Table 1. Total Number of Teachers in SCALE Partnering Districts.

	School District				
	DPS	LAUSD	MMSD	PPSD	Total
Elementary	2021	17805	Not available	955	20781
Middle	876	5781	533	480	7670
High	745	7701	612	624	9682
Total	3642	31287	1145	2059	38133

Table 2. Total Number of Students in SCALE Partnering Districts (based on data files provided by districts; Kindergarten excluded).

	District				
	DPS	LAUSD	MMSD	PPSD	Total
Grade 1	7775	57255	1853	2163	69046
Grade 2	6688	57969	1826	1949	68432
Grade 3	6579	57799	1774	2003	68155
Grade 4	6197	58799	1746	1913	68655
Grade 5	6490	59945	1669	2120	70224
Grade 6	6148	51048	1756	2018	60970
Grade 7	5946	47573	1713	1973	57205
Grade 8	5872	50603	1819	1955	60249
Grade 9	8222	54685	2178	1725	66810
Grade 10	5098	41751	2126	1522	50497
Grade 11	4428	33125	2083	1189	40825
Grade 12	4329	n/a	1977	1146	7452
Total	73772*	570552*	22520*	21676*	688520*

In general, SCALE has been built upon curricular and professional development interventions that leverage key leadership support and partnerships. Estimating the extent to which SCALE

[3] Totals in Table 1 and Table 2 were computed using data files SCALE received from each district. Totals are lower than those reported on NCES website due to factors such as the exclusion of Kindergarten teachers and students, missing grade 12 enrollment for LAUSD.

has been implemented requires quantification of the SCALE interventions. Curricular-based interventions have broad impacts on teaching and learning and have in some cases, ranged across all grades within a given district (e.g., LAUSD implemented new science instructional guides K-12). Professional development interventions have been more focused and were usually targeted at specific grades and content areas. Table 3 shows the degree to which SCALE has diffused across each district, grade, and content area.

The boundaries of SCALE interventions have been drawn using the SCALE panoramic case studies published during Year 3. For example, MMSD reported interventions in both math and science and for all grades. LAUSD reported coverage of science in all grades, but math only in grades four through eight. DPS interventions in math targeted all grades, but science interventions had not yet been implemented and were therefore not likely to impact teachers or students. PPSD reported improved math and science teaching through concerted professional development efforts.

Table 3. SCALE Intervention Boundaries

	Math	Type	Science	Type
MMSD	K-12	Curriculum & PD	K-12	Curriculum & PD
LAUSD	4-8	Curriculum	K-12	Curriculum
DPS	K-12	Curriculum	none	n/a
PPSD	6-12	PD	6-12	PD

Using the boundaries described above, we provide counts of teachers and students that likely benefited from SCALE interventions. For example, we assume that all LAUSD faculty who taught science would be impacted by LAUSD's redesign of the science instructional guides, whereas only math teachers in grades four through eight would be affected by SCALE. Table 4 reports the upper limit of the number of teachers impacted by SCALE interventions. Similarly, Table 5 indicates the upper bound of the percent of students that were likely impacted by at least one SCALE intervention.

Table 4. Total number of teachers within SCALE intervention boundaries.

School District	DPS	LAUSD	MMSD	PPSD	Total
Elementary	2074	17671	Not Available	0	19745
Middle	235	2210	237	116	2798
High	89	1139	235	91	1554
Total Number of Teachers	2398	21020	472	207	24097

Table 5. Total percentage of students within SCALE intervention boundaries.

School District	DPS	LAUSD	MMSD	PPSD
Elementary	100%	100%	100%	0
Middle	100%	100%	100%	100%
High	100%	100%	100%	100%

Specific interventions for each district included changes in such areas as instructional guidance policies, new curriculum, developing additional curricular resources, and designing and delivering high quality professional development. The major initiatives identified in the SCALE panoramic case studies were:

MMSD:

Scope and Sequence (Foss kit) professional development for primary science
Everyday Math and Connected Math Program curricula for primary and middle school math
Immersion Units for middle and high school science
Math Masters in-service for middle school math teachers
Math training sessions

DPS:

Everyday Math as a primary math curriculum
Connected Math as a middle school math curriculum
Cognitive Tutor for secondary math
Discovering Geometry for secondary math
TRACS for 5th grade math
Biology: A Human Approach for secondary science
IFL Disciplinary Literacy
Traveling Teams

PPSD:

Disciplined Learning for middle school and high school math and science curriculum
Physics First

LAUSD:

Science Instructional Guides for all grades;
Math Instructional Guides revised for K-8 grades 4-8
Math PD (in-service) through 600 math coaches
LUCI professional development; middle school math

It is important to realize that these interventions were identified through research conducted up through year 3 of the SCALE project. Since SCALE is now in year 4, there are additional interventions such as expanded professional development on immersion units in LAUSD for grades 4-8.

In addition to using the panoramic case studies, SCALE has also acquired data from MMSD about the extent to which individual teachers have received SCALE related professional development. Overall, professional development data in MMSD during the 2004-05 school year represented a significant investment in teachers and instructional aides. Professional

development opportunities had an attendance of 732[4] faculty and staff for a combined 12,433 contact hours. Math contact hours outweighed Science contact hours by a ratio of 3:1 for high schools and 2:1 for middle schools. However, for elementary grades almost all professional development was directed at Science. Figures 1 and 2 show the average contact time for each type of professional development opportunity for middle and high schools.

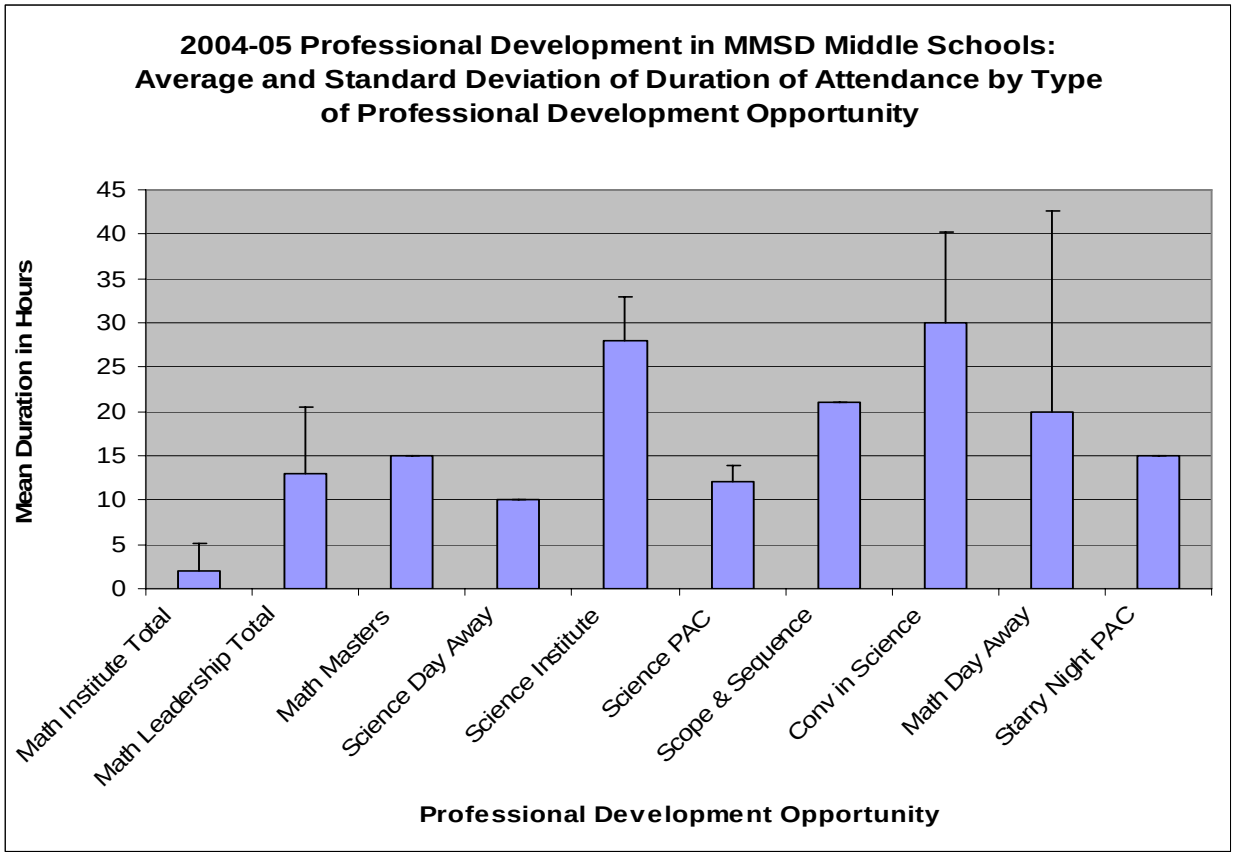

Figure 1. Average contact hours per type of professional development oppurtunity. Participants were counted for each type of session attended.

[4] Individuals were counted once for each type of professional development session attended. If a teacher attended three professional development opportunities, she would be counted three different times.

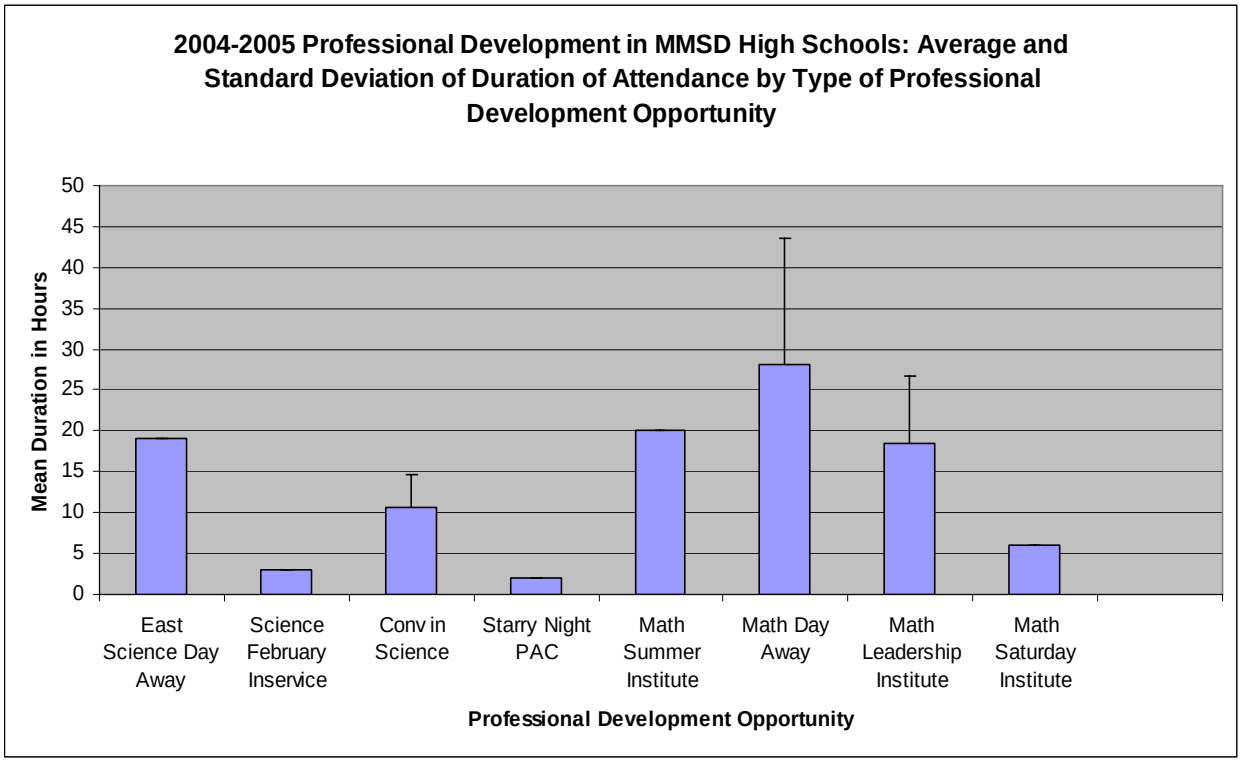

Figure 2. Average contact hours per type of professional development oppurtunity. Participants were counted for each type of session attended.

SCALE Data System

Acquisition of Individual Level Data

Through 2005, SCALE has acquired data from each of the four partnering districts by brokering data release agreements with each district that specifies the scope, format, and grain size of data that will allow SCALE to meet its reporting obligations to the NSF and also achieve research goals under the SQIS. SCALE has acquired individual record data for students and teachers, as well as course enrollment and school level information. In addition, SCALE has utilized state and federal data sources when appropriate (e.g., National Center for Education Statistics Common Core Data).

By consolidating the data needs of both the SQIS system and the NSF MSP-MIS reporting system, SCALE has minimized the amount of burden placed on partnering districts, reducing the district staff time for data acquisition to between 20 and 40 hours. The strategy to build a database using individual level data has allowed SCALE to aggregate as needed and support emerging research efforts as needed.

Data collected includes the following types of information:

- Student demographics
- Student achievement data
- Student course enrollment and outcome data
- Teacher demographics

- Teacher certification and accreditation
- Teacher course assignments
- School information

The above data types have been found in three types of information systems: student achievement databases, human resource systems, and student information systems. In addition, district, state and federal reporting mechanisms have also been used. For example, NCES codes for all schools were extracted from the National Center for Education Statistics' Common Core Data system. Table 6 indicates which type of file was typically used to acquire each type of data mentioned above.

It is important to note that information systems in school districts often have data quality problems. For example, the set of teachers listed in the student information systems usually varies from the set of teachers listed in human resource systems. Depending on the capacity of each district to use unique identity numbers, it may be difficult to completely connect teachers that are actually included in both systems with a high degree of certainty.

Table 6. Source file type for each type of data requested.

	Student Achievement Database	Student Information Systems	Human Resources Systems	District, State and Federal Reports
Student demographics	✓	✓		
Student achievement data	✓			✓
Student course enrollment and outcome data		✓		✓
Teacher demographics			✓	✓
Teacher certification and accreditation			✓	
Teacher course assignments		✓		
School information				✓

The data collected by SCALE includes data about teachers, students, and schools. Teacher data has included demographic variables such as gender, race, and ethnicity, as well as certification and accreditation information. Student data has included NCLB demographic variables including gender, race, ethnicity, special education status, free and reduced lunch status, and English learner status, course enrollment and outcomes, and achievement scores.

One key data source for SCALE has been the student enrollment files. This type of file has provided SCALE with data about student enrollment and completion of courses types. It also has provided SCALE with the potential to link students to SCALE interventions such as curricular design efforts and professional development programs.

Data Management Processes

Once data files are received, we import them into our SQL Server database. Data has been received from districts in a variety of file formats (e.g., Excel, Access, SPSS). Once imported, five intermediate tables were created to consolidate teacher, student, school, course, and achievement data. Most teacher data in the teacher table was acquired from a Human Resource (HR) data file, although if no HR file was received, we created teacher tables from data contained within the enrollment files by pulling out unique teachers and any available demographic data. Teachers that were assigned to courses in grades 6-12 were designated as either a Math or Science (but not both) teacher depending on the content area in which the teacher taught the largest number of students. Student data were generally found in the enrollment file, although some districts may have provided table of strictly student demographic data. School data were acquired from a variety of sources, including enrollment tables, NCES Common Core Data tables, and school tables (if provided). The course table was created by culling course numbers and course titles from the enrollment table(s), and adding a case logic that categorizes specific courses into the NSF's broader categories of Math and Science courses. Finally, the achievement data table was created from data tables that contained student achievement scores. In one case, cut scores were applied to scaled scores to calculate proficiency ranks.

Table 7. Query Logic for NSF MSP-MIS School Level Reports

MSP-MIS Shell Number	Shell Description	Query Logic: Intersection of
Shells 1-2	Teacher Counts by School, School Level, Content Area, and Demographics	Intersection of: Teacher Table and School Table Grouped by School
Shell 3	Student Enrollment by Grade, School, NCLB Demographics	Intersection of: Student Table School Table Grouped by school and grade.
Shells 4-6	Student Enrollment and Completion Counts of Math and Science Courses	Intersection of: Student Table Course Table School Table Grouped by School
Shell 7	Student Achievement, Counts of proficient and non-proficient students by district, grade, school	Intersection of: Student Table Achievement Table School Table Grouped by school and course type.

Once the intermediate tables were built, queries were then constructed to count the number of records that were found in the intersection of two or more tables. For example, counting the number of records that were in both the teacher table and the school table provided the number of teachers for each school and content area (for grades 6-12). Table 7 describes the query logic used for each of the 7 shells of data requested by the NSF MSP-MIS. These shells contain data aggregated at the school and grade level.

Once the data shells were completed, SCALE staff transmitted them to Westat for validation. Westat's validation routines resulted in many errors of three origins:

1) Logical or computational errors
2) Errors in validation logic and underlying data model
3) Limitations in the quality of educational data

While these errors are still being resolved, it is worthwhile describing the process through which we have addressed them. Logical or computational errors were addressed by correcting either the content of the intermediate tables or by correcting the SQL code for querying those tables. An example of this type of error occurred when we did not include all teachers in Denver's intermediate teacher table. This resulted in low counts for the number of teachers for certain schools. In general, these errors were fairly easy to address.

Errors in Westat's validation code were addressed by asking Westat staff to review their code and apply corrections where necessary. An example of this type of error occurred when Westat's validation routines did not use the correct subset codes for determination of which ethnicity categories for which SCALE was reporting on. These errors were a little more onerous to resolve because the process for doing so had two stages. First we would have to identify that in fact an error seemed to exist and secondly, we had to describe the error to Westat and then request that they review their code and apply the appropriate corrections.

Limitations in data have been a source of conflict for all parties involved. For example, we have received data from LAUSD that does not contain teacher information for a small number of schools. Thus, these schools have NULL teacher count values. Interestingly, these same schools also do not have any staff listed through LAUSD's school locator webpage. This suggests that the teacher data provided to SCALE reflects the same level of accuracy as data utilized by the districts technical services. Furthermore, this limitation probably represents a minimal, but measurable, amount of noise that exists in educational data systems.

Another example of how district data systems have had limitations comes from counting the number of students enrolled in certain types of math and science courses. SCALE has identified a relatively small number of schools for which we have zero observations of students enrolled in one or more course types. In general, these courses are upper level courses, and the schools are typically low performing. The absence of observations of enrollment probably means that these schools did not have any students enrolled into these course types. However, the absence of observations may also indicate that these schools simply did not offer any courses that fell into the course type. A third interpretation would be that these schools did offer the course, and students were enrolled into those course(s), but for some reason, these records were not included in the data SCALE received. This type of error reflects the difficulties associated with making the types of inferences that Westat's evaluation survey is trying to make.

Building Capacity

Overall, the SCALE data system successfully meets two needs. First, it provides the infrastructure for quantifying the impact of SCALE on teaching and learning. As such, the SCALE data system supports the acquisition, ingestion, and analysis of data from local (and often disparate) information systems. Integrating data across district applications is in itself a success, but to also be able to use those combined data sets to monitor and track the degree to which SCALE is impacting teaching and learning is a major deliverable. Secondly, the SCALE

data system has allowed SCALE to feed data to the NSF MSP-MIS. This is also a significant achievement, especially when one considers the breadth and depth of data requested and the number of schools, teachers and students that are targeted by the SCALE program.

However, this work has not been without challenges. Data has been sometimes difficult to acquire, and often reflects the difficulty that districts have in acquiring high quality data from its schools. For example, a few schools have appeared to have no teachers, yet do have students enrolled. Since such a scenario is not possible, we conclude that these few cases represent the vagaries of education systems in general. In another example, we have observed schools to have zero teacher and student enrollment, but do have student achievement data attributed to them. Again, this demonstrates that district data is sometimes noisy. Tracking professional development participation has also proven to be difficult for all but MMSD. Integrating across systems adds another level of complexity because the ability to connect records depends on the quality of the identifiers used by each system. We have seen these challenges arise while providing data to the MSP-MIS. Collecting district wide data with perfect accuracy is virtually impossible due to the limits that exist in data quality. However, the only workable strategy to providing district-wide data is to continue to collect and submit data electronically.

Encountering these challenges has helped to build capacity at districts, WCER, and Westat. SCALE staff have acquired new skills in working with large district files that arise from a myriad of applications within each district. Since these staff also work on other projects housed at WCER (such as Adam Gamoran's TCP grant and Robert Meyer's Value-Added projects) there have been clear benefits to other research projects. Likewise, SCALE staff have presented work at the MSP evaluation summits, NCES Summer Conference, and contributed to other efforts such as the Standards Interoperability Framework Association End-User and Developer's Conference. Interactions with district staff have pressed districts to improve their ability to produce large data sets that traditionally are not analyzed due to their size and complexity. For example, tracking professional development participation has been a challenge that MMSD and LAUSD have both addressed. Connecting students to teachers to programming (e.g, professional development) continues to be an area where we can help schools and districts build capacity. Thirdly, our interactions with Westat staff have improved their ability to ingest large amounts of data that was specified in the NSF's MSP evaluation. For example, SCALE staff have helped improve Westat's relational data model by identifying missing identifiers that would have prevented Westat from linking reported data across reporting cycles. Likewise, we have helped trouble shoot incorrect validation logic.