



October 2006

System-wide Change for All Learners and Educators

Year 5 Implementation Plan



System-wide Change for All Learners and Educators

Year 5 Implementation Plan

October 2006

The preparation of this plan was supported by a grant from the National Science Foundation to the University of Wisconsin–Madison (EHR 0227016). At UW–Madison, the SCALE project is housed at the Wisconsin Center for Education Research. The other partners are the University of Pittsburgh, where the SCALE project is housed within the Learning Research and Development Center’s Institute for Learning; California State University Dominguez Hills; Los Angeles Unified School District; Denver Public School District; Providence Public School District; and Madison Metropolitan School District. Any opinions, findings, or conclusions are those of the authors and do not necessarily reflect the views of the supporting agency.

Year 5 Implementation Plan
System-wide Change for All Learners and Educators

Introduction	1
Denver Public Schools (DPS).....	5
Los Angeles Unified School District (LAUSD).....	11
Madison Metropolitan School District (MMSD).....	17
Providence Public School District (PPSD).....	25
California State University Dominguez Hills (CSUDH).....	31
University of Wisconsin – Madison.....	35
Research and Evaluation	45

Introduction

Strategic Modifications for Year 5

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. 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* in the SCALE Fourth Annual Progress Report), the partner districts indicated that more intensive effort was needed for both curricula and professional development needs. At the same time, Goal 2 work in science immersion had progressed significantly during Year 4, particularly in the units being developed for Los Angeles Unified School District (LAUSD) and Madison Metropolitan School District (MMSD). In addition, in both of those districts, a natural "fusion" of the Goal 1, 2, and 3 lines of work was beginning. The PI and a few other key leaders believed that SCALE needed the leadership team to consider strategic changes that took these developments into account, and enabled the leadership team to act on these developments effectively. Giving special attention to the fact that STEM, STEM education faculty, and staff in the local institutions of higher education (IHEs) in Los Angeles [California State University, Dominguez Hills (CSUDH) and California State University, Northridge (CSUN)] and University of Wisconsin-Madison (UW-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.

SCALE Leadership

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.

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, Denver Public Schools (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; Providence Public School District (PPSD)
Represented by Mike Lauro, Director of Mathematics and Science, PPSD

University Leaders:

Dr. Allen Mori, Provost, CSUDH, SCALE Co-PI

Dr. Harry Hellenbrand, Provost, CSUN, SCALE Co-PI

Goal Leaders:

Merle Price, Lecturer, CSUN, Goal 1 and Goal 4 Leader

Dan Lauffer, UW-Madison, Goal 2 Leader

Dr. Eunice Krinsky, Mathematics Professor, CSUDH, 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, which includes district partners as well as IHE partners, 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.

Partnership, Sustainability, and Institutionalization

The 2005 SCALE RET "Case Study Evaluation Design" observes:

The case study design follows the 'theory of action' school of evaluation, which requires a focus on the effects of the real operating design of an intervention (Weiss, 1998). Under this approach, mapping the theory of action is the important first step, but mapping the SCALE Theory of Action proved surprisingly difficult, in essence because it does not fit the model of discrete programs commonly evaluated.

This observation made visible to members of the SCALE Leadership Team an emerging pattern of effective inter- and intra-institutional collaboration that is at the heart of many of SCALE's successes. This required modifications to the original SCALE Theory of Action. Fullan aptly captures eight elements of sustainability in his book on leadership and sustainability.¹ SCALE has integrated these elements and guidelines into its revised theory of action. Fullan believes everything revolves around capacity. The SCALE Partnership believes that capacity has to be developed vertically and horizontally, and it has to have considerable latency in order for the system to be able to sustained continuous, planned change, and avoid discontinuous change, planned or unplanned.

Fullan's perspective is that for complex educational systems to sustain desirable, change, they must develop and sustain a greater number of "systems thinkers in action" who then help move the *modus operandi* from central prescription to distributed professional judgment working through networks of intelligent accountability, big picture alignment, and transparent "contact

¹ See Fullan, M. (2005). Leadership & sustainability: system thinkers in action. Thousand Oaks, CA: Corwin Press.

architecture.”² As Perkins explains, to develop and maintain an effective contact architecture, leaders must work to ensure that interactions up, down and across the systems are as progressive (as opposed to regressive) as possible. The SCALE Partnership has made Perkins’ view that an effective contact architecture is essential a fundamental operating principle. We have tried to make this type of interaction the rule rather than the exception.

SCALE is now in a position to partially answer a question raised by the *RET Building a Partnership Team Formative Feedback #3* that was based on work in 2004:

Is the fact that new partnership working groups are primarily emerging in IHEs an indication that districts already have structural capacity to achieve and sustain SCALE goals, or are new structures needed in the district as well? Or, if districts do not or cannot build this capacity, are the IHEs capable of sustaining SCALE work into the future?

The SCALE Partnership has taken this question to heart, and what has emerged are forms of collaboration that further partnership and the possibility of sustainability and institutionalization. These forms of collaboration are reflected in much of the SCALE work across its partners, as seen in the Year 4 Annual Progress Report. This also will be a fundamental principle for the SCALE Leadership Team as SCALE moves into the fifth year of its exciting and productive existence.

New Year 5 Implementation Plan

Upon reflection on the original SCALE theory of action, goals, and benchmarks (originally set forth in the SCALE Strategic Plan in July 2003), the SCALE leadership decided to make strategic modifications. We provide details of these changes in the Year 5 Implementation Plan. A majority of the benchmarks for Goals 1-4 were met during the first four years of SCALE. Others were revised, retired, or no longer deemed applicable to the work and direction of SCALE. In order to ensure that the benchmarks for Year 5 are aligned with the NSF Five Key Features, the work of the partnership, and the needs of the partners, the SCALE Leadership Team decided to revise the objectives and benchmarks for Year 5. To clearly present these strategic modifications and revised benchmarks, the Year 5 Implementation Plan is organized by partner. Each partner addresses the following:

1. Year 5 Objectives and Benchmarks
2. Strategic Rationale for Institutionalization and Sustainability
3. Plan of Work (Including Timeline and Main Activities)
4. Deliverables and Staffing

The SCALE Research and Evaluation Team presents their Year 5 Scope of Work (organized by research line-of-work) following the partner sections.

² See Perkins, D. N. (2003) *King Arthur’s roundtable: How collaborative conversations create smart organizations*. New York: Wiley.

This page left blank for print format

Denver Public Schools (DPS)

1. Year 5 Objectives and Benchmarks

Mathematics

- Continue professional development support for district-wide implementation of *Everyday Mathematics* (elementary), *Connected Mathematics* (middle school), and high school programs for algebra and geometry; this professional development support includes special educators in all learning opportunities with sessions designed to meet their needs
- Expand the field-test for the redesigned second-year algebra course to include all students enrolled in second-year algebra and all second-year algebra teachers
- Field-test a redesigned probability and statistics (non-Advanced Placement) course in high school
- Develop a professional development leadership cadre of classroom teachers, building math/science facilitators (coaches), and staff developers who will attend a summer institute prior to facilitating summer professional development
- Continue with double block of mathematics for students in grades 6-9 who are not on grade level
- Continue to provide an extended-day tutoring program, *DPS Success*, for students in grades 3-10 who need additional time and instruction in mathematics
- Revise the 2006 Instructional Planning Guides (grades ECE-10) and develop a guide for second-year algebra
- Continue to support collaboration between special education and general education teachers around mathematics instruction
- Provide professional learning opportunities specifically designed to meet the needs of first-year mathematics teachers
- Provide core mathematics instructional materials and professional development for special educators
- Implement district-wide benchmark assessments (fall, winter, and spring) in mathematics for grades 3-10 with a spring test for second grade; assessments are aligned with Colorado Model Content Standards and the district mathematics curricula

Science

- Continue professional development support for district-wide phase-in of elementary science program K-5: *BSCS Science Tracks: Connecting Science and Literacy*
- Continue professional development support for district-wide implementation of inquiry-based secondary science instructional programs: *Investigating Earth Systems* in grade 6, *Science and Life Issues* in grade 7, *InterActions in Physical Science* in grade 8, and *BSCS Biology: A Human Approach* in grade 10
- Expand the field-test to district-wide implementation of the earth science program, *EarthComm*, to include all ninth grade students and their teachers
- Field-test redesigned chemistry and physics courses using inquiry-based instructional materials selected using the *Analyzing Instructional Materials (AIM)* Process and Tools

- Develop a professional development leadership cadre of classroom teachers, building math/science facilitators (coaches), and math/science staff developers who will attend a summer institute prior to facilitating summer professional development
- Develop Instructional Planning Guides for science courses including formative and summative assessments
- Establish a K-12 Science Resource Center to provide for refurbishment of science consumable materials (middle school and high school science programs) and refurbishment and rotation of science materials kits (elementary science program)
- Support collaboration between special education and general education teachers around science instruction
- Provide professional learning opportunities specifically designed to meet the needs of first-year science teachers

2. Strategic Rationale for Institutionalization and Sustainability

One strategy for institutionalization and sustainability of the work in both mathematics and science in Denver Public Schools is the on-going professional development for teachers. The design of professional development in both content areas includes differentiated opportunities for new and experienced teachers intended to deepen their content knowledge, develop their pedagogical content knowledge, increase their ability to implement new instructional programs with fidelity, and strengthen their knowledge of formative and summative assessments. Building-level math/science facilitators (coaches) and math/science staff developers have been deployed to provide additional on-site professional development and technical assistance for teachers. In further support of this, Instructional Planning Guides for math and science courses have been developed for mathematics in grades ECE-10 and will be developed for science in grades K-10. These Guides are intended to support teachers and schools in developing common expectations for students across the city, to guide teachers in making professional decisions about instructional moves with student groups, and to identify strategies for differentiating classroom instruction. The development of common assessments for these courses provides yet another resource for teachers. Thus, this professional development and development of tools (as called for in the strategic plan for the district, The Denver Plan) will help the District sustain and institutionalize the work in mathematics and science.

A second strategy for supporting the institutionalization and sustainability of the work is the development of a professional development leadership cadre in both mathematics and science. This cadre of classroom teachers, building math/science facilitators (coaches), and math/science staff developers will develop their expertise in providing high quality professional development in an effort to build our internal capacity to deliver transformative adult learning experiences that are needed as we go to scale with our redesigned K-12 math and science programs.

A third avenue for supporting this institutionalization and sustainability is through the establishment of a K-12 Science Resource Center. The goal of the Science Resource Center is to support inquiry-based teaching and learning by providing schools with the ongoing materials and tools needed to teach hands-on science. The Science Materials Center will supply, upgrade, refurbish and deliver “ready to teach” instructional kits to support the implementation of the district’s newly adopted elementary science program. These elementary science kits will rotate among classrooms, returning to the Center for refurbishment after each use. At the secondary level, the Center will provide the ongoing consumable refurbishment materials needed to sustain

the inquiry-based programs being implemented district-wide. The Science Materials Center will insure that all science teachers receive the right materials at the right place at the right time to support the teaching and learning of science throughout the district.

A fourth means of sustaining our work is through the partnerships that have been established. Our partnership (Teacher Quality Enhancement) with the Metropolitan State College of Denver has provided us with resources (both financial and personnel) from a local institute of higher education. The partnership with the Urban Mathematics Leadership Network was initiated through SCALE and connects us with mathematics leaders in urban centers throughout the nation with opportunities to collaborate and collectively problem-solve common issues. Furthermore, district and math science leaders actively participate and contribute to state and Front Range networks around mathematics and science teaching and learning for all students [Colorado Math Leaders, Colorado Council of Teachers of Mathematics, Colorado Metro Math Intervention Team, Colorado Association of Science Teachers, Colorado Science Education Network].

3. Plan of Work (Including Timeline and Main Activities)

Professional Development for Current Math and Science Programs. Professional development for teachers in our current district programs will continue throughout spring 2007 with summer 2007 institutes offered for teachers new to the programs (or new to a grade level).

Expand the Field-Test of Second-Year Algebra and Earth Science to All Teachers. In spring 2007, textbooks and instructional materials for the field-tested courses will be ordered for all students and teachers in these courses. Teachers will attend summer professional development prior to teaching the new programs in fall 2007.

Continue Roll-Out of Elementary Science Program. Expand current field-test of *BSCS Science Tracks: Connecting Science and Literacy* to all elementary teachers (Grades K-5) at all schools in Fall 2007. Teachers in Grades 1-5 will receive two science units per grade level and Kindergarten teachers will receive one unit.

Field-Test Redesigned Courses in Probability/Statistics, Chemistry, and Physics. In January 2007, mathematics and science teachers will begin developing the criteria for the analysis and selection of instructional materials for these courses (using the AIM Process and Tools in the selection of science materials). Review of materials will continue through March with selection of materials completed by April 2007. These instructional materials will be purchased with district funds for a representative group of teachers at all schools who will field-test the materials during the 2007-2008 school year.

Professional Development Leadership Cadres for Mathematics and Science. Classroom teachers, building math/science facilitators (coaches), and math/science staff developers who will comprise these cadres will be identified in spring 2007 and attend a Professional Development Leadership Institute in summer 2007 prior to facilitating professional development for Denver teachers in August 2007. The Leadership Cadres will also provide ongoing professional development opportunities throughout the school year to support the implementation of district programs by new and experienced teachers.

Development of Instructional Planning Guides. The current Instructional Planning Guides for ECE-10 Mathematics will be reviewed and revised in spring 2007. In addition, an Instructional Planning Guide for second-year algebra will be developed through the work of field-test teachers and will be available for all second-year algebra teachers in summer 2007. Guides for the district science programs will be developed through the spring and summer of 2007 to be ready for teachers in fall 2007.

Establishment of a K-12 Science Resource Center. This Center will inventory all science materials and kits and provide space for refurbishment and rotation of elementary science kits.

Professional Learning Opportunities for First-Year Mathematics and Science Teachers. Sessions designed to support first-year mathematics and science teachers with incorporating technology in the classroom and designing comprehensive assessments will be offered through the New Teacher Network in spring 2007.

Benchmark Assessments in Mathematics. Complete the cycle of three benchmark assessments in grades 3-10 and end-of-year assessment for second grade in May 2007.

4. Deliverables and Staffing

Staffing

Current Staff

- Tamara Acevedo (100%) is responsible for the coordination and design of professional development in mathematics for elementary teachers. She also works to support math/science staff developers and math/science facilitators.
- Rebecca Sauer (100%) is responsible for the coordination and design of professional development in mathematics for middle schools teachers and works with Cathy Martin, Director of Math and Science, on the professional development for high school teachers. She also supports the work of math/science staff developers and building math/science facilitators and provides on-site support for field-test teachers.
- Jim Short (100%) coordinates and designs the professional development for middle school and high school science teachers. He also works to support the middle and high school staff developers. He has led the use of the AIM Process and Tools for selecting new science programs. In addition, he coordinates the refurbishment of science materials.

Intended Hires

- A high school science staff developer to support the district-wide implementation of earth science and the field-test of chemistry and physics. This person would work directly with teachers in the science classrooms at school sites.
- An elementary science staff developer to support the continued roll-out of the elementary science program and expansion of the program. This person would work directly with teachers in the science classrooms at school sites to model lessons and provide on-site support.
- A project manager for the science resource center. This person would schedule the rotation of elementary science kits and be responsible for the refurbishment of these kits.

Deliverables

- Instructional Planning Guides for Mathematics and Science (Grades K-10)
- Tools to support the strong implementation of district mathematics and science programs, e.g., Big Ideas documents, assessments

This page left blank for print format

Los Angeles Unified School District (LAUSD)

1. Year 5 Objectives and Benchmarks

System

- Implement a rigorous mathematics standards-based curriculum K-12 that is coherent and achievable to develop professional development modules that focus on content knowledge and pedagogical change.
- Prioritize support to the highest need schools and students with a particular focus on the strand of Algebra and Functions that will prepare students for success in Algebra and beyond.
- Continue to develop a cadre of highly qualified professional development facilitators within LAUSD and the CSUs to support rigorous and effective professional learning opportunities that are aligned with best practices (as exemplified in science immersion) for pre- and in-service teachers.
- Implement the collaborative science immersion development model to develop a high school biology immersion unit and select/refine sequences of lessons that can be used in professional development and in the classroom as examples of rigorous, conceptually-based science teaching and learning.
- Continue to build a common vision and goals for K–16 science education among the entire system that supports pre- and in-service teachers through a wide variety of communication and professional learning opportunity strategies to build coherence and high expectations for all learners and educators.

Mathematics

- Create a pilot 4th grade program of professional development that is based upon a combination of the Math Instructional Guide (MIG), the conceptual lessons, and periodic assessment data with math immersion principles and practices to build content knowledge and model new pedagogy
- Create a pilot 5th grade program of professional development that is based upon a combination of the MIG, the conceptual lessons, and periodic assessment data with math immersion principles and practices to build content knowledge and model new pedagogy
- Partner with the CSUs to co-develop SCALE/QED (Please see section about CSUDH for a discussion on QED) math institutes for algebra and algebra readiness.
- Explore creating a pilot trial of Agile Mind for use in algebra.

Science

- Develop, field test and revise Immersion Unit instructional materials and science model lessons in partnership with BSCS
 - Immersion Units – grades K, 4, 5, 6, 7, 8, and high school biology
 - Model lessons – grades 8 and high school biology
 - Explore creating a pilot trial of Agile Mind use in HS biology
- Adoption of elementary science materials from state adopted items
- Professional development for LAUSD teachers
 - Summer 5-day immersion unit institutes for grades K, 4, 5, 6, 7, 8, HS Biology
 - Pilot testing Model Lessons Grades 8 and HS
 - Elementary Science Lead Teacher trainings on inquiry

- Professional development for professional development facilitators
 - K-12 District science leadership institutes
 - Professional development Leadership Study Group preparing for summer teacher professional development opportunities

2. Strategic Rationale for Institutionalization and Sustainability

SCALE Year 5 (2007)

Math

We will encourage the engagement of central professional development facilitators, local district coordinators, and coaches at school sites to participate in the mathematics institutes mentioned above. Central leadership will meet regularly with our SCALE IHE partners in order to assure coherence between district professional development and SCALE/QED professional development modules.

Science

The science strategies for institutionalization and sustainability will focus on building capacity within the LAUSD K-12 science team and the local CSUs to support a shared vision for planning and facilitating coherent, high-quality teacher professional development that builds content and pedagogical knowledge and skills needed to implement high-quality science instruction for all learners. Building this capacity will require a variety of professional development strategies, including support for developing new science leaders in the district.

In-service teacher professional development will include differentiated learning opportunities for new and experienced teachers. This professional development, offered through a variety of venues chosen to reach as many teachers as possible, will focus on deepening science content knowledge, developing pedagogical content knowledge, and strengthening formative and summative assessment use to inform teaching and learning. To support teachers in taking these skills and abilities back to their classrooms and changing practice, the professional development will be grounded in science immersion and model lessons that provide concrete and educative support for best practices. Professional development will be targeted to teachers' needs, including follow-up professional development to support teachers to successfully implement reform-based instructional materials with fidelity.

Post-SCALE (2008 +)

Math and Science

The work will be continued and enhanced beyond SCALE and QED through institutionalized structures as well as future funding opportunities that will be sought and obtained, leveraging and building upon the successes of the SCALE/QED theory of action.

3. Plan of Work (Including Timeline and Main Activities)

Math Timeline January 1, 2007 – December 2007

February	Planning meeting for math institutes with SCALE/QED partners
March	Recruitment for summer institutes begins
April	Planning continues
May	Planning continues
June	Final organizational details
July	Institute visitations by central and local districts math teams
August	Analysis of institute evaluations
September	Analysis CST data to identify priorities for additional professional development
October	Classroom visitations
November	Identify plans for 2008

Math Main Activities

- Math institute co-development with CSU math faculty
- Analysis of pilot effectiveness
- Further planning

Science Timeline January 1, 2007 – December 2007

January	Grade 8 Chemistry Model Lesson field-test professional development HS biology immersion development team meeting Kindergarten immersion development team meeting Planning days for Professional Development Leadership Group LAUSD science partnership conference
February	Grade 8 Astronomy Model Lesson development team meeting K-12 Science Leadership Institute (Session I) Professional Development Leadership Group (Session I)
March	HS biology immersion development team meeting Kindergarten immersion development team meeting Professional Development Leadership Group (Session II) Grade 8 Astronomy Model Lesson field-test professional development Grade 8 Model Lesson professional development for LAUSD teachers (Force and Motion, Chemistry, and Astronomy)
April	Professional Development Leadership Group (Session III)
May	HS biology immersion development team meeting K-12 Science Leadership Institute (Session II)
June	Professional Development Leadership Group (Session III)

- July
 - Five, 5-day Summer Science Immersion Institutes Grades 4, 5, 6, 7, 8
 - Ten, 5-day Summer Science Immersion Institutes Grades 4, 5, 6, 7, 8
 - One, 5-day HS Biology Immersion Unit field-test institute
- August
 - Three, 5-day Summer Science Immersion Institutes Grades 4 and 5
 - One, 4-day Kindergarten Immersion Unit field-test Institute
 - One, 5-day HS Biology Immersion Unit field-test institute
- September
 - Professional Development Leadership Group (Session V)
 - Professional Development Leadership Group (Session III)
- October
 - Professional Development Leadership Group (Session VI)
 - Summer Immersion Institutes teacher follow-up
 - Revisions on Immersion Units
 - Identify plans for 2008
- November
 - Professional Development Leadership Group (Session VII)
 - Revisions on Immersion Units

Science Main Activities

Instructional Materials Selection /Development

Grade 8 and High school “Model Lesson”

One-two week units covering a specific concept or concepts. Instructional design needs to focus on teaching content through inquiry. The goal is to select high quality existing instructional materials through a modified AIM-directed approach facilitated by BSCS staff. The selection team will consist of LAUSD science leadership, teachers, CSU STEM and STEM ED faculty and UW-Madison staff. Two lessons for Grade 8 and three for HS.

Kindergarten and HS Biology Immersion Units

Designed to be educative for both teachers and students to support teaching practice and learning that builds students’ conceptual understanding of key concepts through inquiry. These instructional materials will explicitly incorporate research–based strategies to support ELL students. The development team will employ the immersion collaboration model, building on a partnership consisting of LAUSD science leadership, teachers, CSU STEM and STEM ED faculty, UW-Madison staff and a designated BSCS writer.

The HS Biology Unit

The unit will be developed in parallel to the development of Agile Mind online science instructional materials for the same concepts. The goal of this work is to build a coherent set of both written and online instructional materials that align with the vision for science instruction that is exemplified by science immersion. It will exploit the successes of the Agile Mind math model to develop an Agile Mind science model that is coherent with and further supports the vision and goals for science education in LAUSD that SCALE and QED have helped to develop.

Teacher Professional Development

Elementary: Grades 4 and 5 (current units)

- Three, Rot It Right (RIR) grade 4, level 1 institutes, 5 days each plus follow-up, 2 days
- Four, Weather grade 5 institutes, 5 days each plus follow up, 2 days
- Two, RIR grade 4, level 2 institutes, 4 days each plus follow up, 1 day
- Two, Kindergarten field-test institutes, 4 days each plus follow up, 1 day
- Science Lead Teacher trainings around inquiry

Secondary: Grades 6,7, and 8

- Three, Plate Tectonics grade 6 institutes, 5 days each plus follow up, 2 days
- Three, Variation grade 7 institutes, 5 days each plus follow up, 2 days
- Three, Density and Buoyancy grade 8 institutes, 5 days each plus follow up, 2 days
- Two, HS biology field-test institutes, 5 days each plus follow up, 2 days

Professional Development Leadership Study Group

This group, called the Professional Development Leadership Study Group (LSG), engages in a ten-month long series of sessions designed to grow participants' knowledge and beliefs about science teaching and learning, develop leadership and facilitation skills, and prepare co-facilitators to offer one-week science immersion institutes and follow-up professional development. The LSG is jointly supported by QED and SCALE, and its work is central to building the common vision and understanding that is foundational for building a sustainable and effective cross-institutional partnership. In 2007, a second LSG cadre will be developed while the first cadre continues to be involved. This professional learning community is comprised of members of the CSU faculty, district science branch, and several lead teachers and is designed to build a strong core of leaders with a shared vision for reforming science teaching and learning. (See the UW, Immersion for more information on the LSG)

K-12 District Science Leadership Institutes

LAUSD K-12 science leaders will attend four, two day leadership institutes, facilitated by UW Goal 2 and WestED. This work is directed at setting goals and developing plans for building regional partnerships and growing a cadre of highly qualified professional development facilitators. The focus of this series will be to support district leaders to understand the current research about systemic science reform efforts and apply the research to planning for professional learning opportunities in their own contexts to build capacity for employing a coherent approach to teacher professional development.

4. Deliverables and Staffing

Staffing

- Ronni Ephraim
- Alma Pena-Sanchez
- Norma Baker
- Cheri Guenther
- Local District Math Staffs

- Bob Collins
- Todd Ullah
- Marlene Felix
- Ann Carnes
- Central and Local district science staff

Deliverables List

Math

- 4th grade math immersion units completed by Dec. 2007
- 5th grade math immersion units completed by Dec. 2007
- Math institutes for elementary
- Math institutes for secondary

Science

- Kindergarten immersion unit completed by Dec. 2007
- High School immersion unit in biology completed by Dec. 2007
- Two, grade 8 model lessons (chemistry and astronomy) completed June 2007
- Three, high school biology model lessons completed June 2007
- Agendas and facilitator guides for Professional Development Leadership Study Group
- Agendas and facilitator guides for K-12 District Science Leadership Institutes
- Agendas and facilitator guides for elementary inquiry modules

Madison Metropolitan School District (MMSD)

1. Year 5 Objectives and Benchmarks

System

The Madison Metropolitan School District (MMSD) continues to move forward with the implementation of the district's Framework and Strategic Plan. The Framework focuses all district resources and efforts on learning, engagement and relationships. It is the MMSD belief that in order to build systemic capacity to eliminate race as a predictor of academic achievement, the three non-hierarchical and intersecting guiding premises of learning, engagement and relationships are essential. The Department of Teaching and Learning supports the District Framework in all professional development to strengthen teacher capacity, efficacy and pedagogical content knowledge. SCALE continues to play a critical role by supporting our district goals in mathematics and science.

The district is committed to developing teacher expertise in mathematics and science. Four basic premises underlie the use of funds in the MMSD SCALE initiative:

1. Teacher expertise and skill is the most important variable in student achievement.
2. Professional development that includes on-site support for implementation is the most effective way to impact teacher expertise and skill.
3. Developing on-site teacher leadership capacity and expertise in content and pedagogy are integral for promoting and sustaining long-term change in teacher culture and practice.
4. Improving teacher quality will have a beneficial effect on all students, and will have a disproportionately positive impact on low achieving students.

Science

As a district, MMSD is continually increasing rigor, coherence and consistency in all content areas. MMSD Science implemented a district-wide K-8 Science Scope and Sequence in 2000. Within the Department of Teaching and Learning, the Science Division works to strengthen research-based and high-leverage instructional practices and embed them into the Scope and Sequence. The objectives are to involve all teachers of science in high-quality professional development and to build leadership and collaborative networks in order to sustain our work beyond the funding cycle of SCALE. Our SCALE partners continue to expand our abilities to structure rich and engaging professional development sessions that model best practices and build science learning communities among and across schools. All professional development includes conceptually deep and engaging learning experiences; multiple formative and summative assessment strategies; focus on differentiation to insure engagement and learning for all students including English Language Learners, student with Special Education needs and students requiring additional challenges. In addition to the focus on building capacity in elementary and middle school teachers and leaders, the District will also continue to focus SCALE resources in Year 5 on high school science teachers, providing professional development that will support their efforts to implement research-based teaching practices enabling diverse groups of students to succeed in freshman science courses.

- Continue professional development support for the district-wide K-8 Science Scope and Sequence Program and Grade Level Standards including Full Option Science System, (FOSS) and Science and Technology for Children (STC)
- Focus professional development and in-school support for new teachers at Grades K-8
- Finalize writing and begin professional development for the district-wide implementation of SCALE Immersion Units at Grade 3, Investigation Responses and Grade 6 Diversity of Life
- Provide professional learning opportunities for ESL and Special Education teachers supporting student learning in science classrooms
- Continue to develop broader instructional skills and differentiation strategies for teachers of freshman science to enable all students to participate in heterogeneously grouped science classes at the 9th grade level
- Develop and participate in leadership training for Instructional Resource Teachers and teacher leaders with other SCALE districts
- Develop and implement standards-based report card for middle school science
- Revise and re-administer the K-8 Science Survey (repeat of survey conducted in 2003)
- Continue collaboration with UW-Madison faculty to evaluate and revise the core sequence for pre-service middle school science teachers
- (Pending funding) Implement the Science Master's Institute (SMI) in collaboration with UW-Madison science faculty to develop critical pedagogical content knowledge for elementary certified teachers at the middle school level

Mathematics

MMSD Mathematics continues its focus on secondary mathematics and building teacher pedagogical content knowledge in order to fully engage students in conceptually rich and engaging mathematics. Our objectives are to involve all teachers of science in high-quality professional development and to build elementary and middle school leadership and collaborative networks in order to sustain our work beyond the funding cycle of SCALE. Particular focus continues with new teachers at the middle school level. Our SCALE partners continue to expand our abilities to structure rich and engaging professional development sessions that model best practices and build mathematics learning communities among and across schools. All professional development includes conceptually deep and engaging learning experiences; multiple formative and summative assessment strategies; focus on differentiation to insure engagement and learning for all students including English Language Learners, student with Special Education needs and students requiring additional challenges. In addition to the focus on building capacity at the secondary level, the District will also continue to focus SCALE resources in Year 5 on elementary teachers, providing professional development and intervention strategies that will enable struggling primary students to gain success in their first years of mathematics instruction.

- Continue professional development support for the district-wide middle school Connected Math Program (CMP)
- Focus professional development and in-school support for new teachers at the elementary and middle school level
- Continue professional development support for high school mathematics teachers of Algebra and Geometry

- Continue professional development support for the pilot of the Discovery Algebra Program at the high school level
- Provide professional learning opportunities for ESL and Special Education teachers supporting student learning in mathematics classrooms
- Develop and participate in leadership training for Instructional Resource Teachers and teacher leaders with other SCALE districts
- Develop and implement standards-based report card for middle school mathematics
- Continue collaboration with UW-Madison faculty to evaluate and re-design the core sequence for pre-service middle school mathematics teachers (13X)
- (Pending funding) Extend and build upon the successful implement of the Math Masters 1 and Math Master's 2 by extending the work to the elementary grades in the Expanding Mathematics Knowledge Program (EMK). In collaboration with UW-Madison mathematics faculty, Instructional Resource Teachers will develop critical pedagogical content knowledge for elementary certified teachers in Grades 3-5

2. Strategic Rationale for Institutionalization and Sustainability

SCALE Year 5 (2007)

One strategy for institutionalization and sustainability of the work in both mathematics and science in MMSD is the on-going professional development for teachers. SCALE funds support one Instructional Resource Teacher (IRT) for middle school mathematics and one for secondary science. The IRTs effectively double the Teaching and Learning staff capacity of mathematics and science, respectively.

The professional development plan for science includes a central staff person with responsibility for the initial training of middle school science teachers who are new to standards-based science curriculum and assessment adopted by district middle schools, follow-up training for more experienced staff, and special training for staff who support students with special educational needs or students who are English language learners; development of school-based leadership in each of the middle schools; and support of school-based efforts to implement strategies so every middle school student experiences deep, conceptually based instruction in science. Substitute teachers will be provided to release teachers for science inquiry development during contract hours in addition to compensation for work conducted after contract hours. Teacher leaders will be compensated for providing additional time after contract hours to implement strategies for school-wide systems and practices to increase academic rigor and deepen science inquiry learning. In addition to the focus on building capacity in middle school teachers and leaders, the district will also concentrate SCALE resources on district high school science teachers, providing professional development that will support their efforts to implement research-based teaching practices enabling diverse groups of students to succeed in freshman science courses.

The professional development plan for mathematics includes a central staff person with responsibility for the initial training of middle school teachers who are new to standards-based mathematics curriculum adopted by district middle schools, follow-up training for more experienced staff, and special training for staff who support students with special educational needs or students who are English language learners; development of school-based leadership in each of the middle schools; and support of school-based efforts to implement strategies so every

student experiences deep, conceptually based instruction in mathematics. In addition to this focus on middle school mathematics teachers, the district will also focus SCALE resources on support of high school mathematics departments piloting the implementation of both a standards-based algebra curriculum and a standards-based integrated mathematics curriculum. SCALE resources will also be used to compensate MMSD teachers leaders for work beyond the contract year (i.e., summer). Teacher leaders will provide professional development during summer school so summer school becomes not only an opportunity for students to develop an understanding of mathematics but also an opportunity for teachers to increase their understanding of mathematics and the pedagogy of teaching for student understanding. They will also provide other needed professional development for teachers over the summer so that teachers are better prepared to teach mathematics for student understanding when school opens again in the fall.

A second strategy for supporting the institutionalization and sustainability of the work is the development of and participation in leadership development in both mathematics and science. Science leadership development will include an intensive 8-session training of all science IRTs in collaboration with other SCALE districts. Mathematics will continue to conduct middle school CMP Leadership Training and extend this model to initiate an Elementary Mathematics Leadership Cadre.

A third strategy for supporting the institutionalization and sustainability of the work is the implementation of Title IIB grants (pending funding). Building on the success of the Title IIB Math Masters and Math Masters 2, the Science Masters Institutes (Grades 6-8) and Expanding Math Knowledge (Grades 3-5) will build long-term connections among numerous University of Wisconsin faculty and the MMSD Teaching & Learning Department. As MMSD staff co-design professional development for teachers in collaboration with UW content experts, the mutual refinement and appreciation of pedagogical content skill will serve not only current K-12 teachers but the educational experience of future teachers as well.

A fourth strategy for supporting the institutionalization and sustainability of the work is the collaborative work around the re-design of the core sequences of courses required for certification of middle school science and mathematics courses. Modeling the 13x course evaluation of mathematics courses, now in its second year at UW-Madison, Julie Underwood, Dean of the School of Education, has authorized the creation of a similar committee to evaluate and re-design the core sequence of science courses for pre-service middle school teachers. The IRT in both mathematics and science are members of these respective committees and are able to bring the richness and insights of both the practical and theoretical aspects gained from our SCALE collaboration. Although the full benefit of these efforts will not be realized until well beyond the SCALE funding cycle, the impetus for the creation of the studies is a concrete example of the on-going work to insure the sustainability of SCALE's influence for high quality mathematics and science education for our future.

3. Scope of Work (Including Timeline and Main Activities)

Mathematics

Elementary Mathematics Grades K-5.

The professional development plan for mathematics in the elementary school will be aimed at training in-school facilitators that are provided by Title I funding. Training may include summer workshops, release time for school day workshops, and/or attending regional workshops. They will be trained on the Learning Mathematics in the Primary Grades document used in MMSD as well the intervention component for the first grade. That work will expand to grades 3-5 with the development of a similar document. Support is also needed for the expansion of the Math Masters Project to grades 3-5.

- *Learning Math in the Primary Grades* (K-2) support during Jan 2007 – Summer 2007
- 3-5 Math Masters (pending Title IIB funding)
- Staffing/Development Spring of 2007
- Implementation Spring of 2007 thru Sept 2010
- *Learning Math in the Intermediate Grades* (3-5) Development Spring of 2007 – Dec 2007

Middle School Mathematics Grades 6-8

The professional development plan for mathematics includes a central staff person with responsibility for the initial training of middle school teachers who are new to standards-based mathematics curriculum adopted by district middle schools, follow-up training for more experienced staff, and special training for staff who support students with special educational needs or students who are English language learners; continued development of school-based leadership in each of the middle schools; and support of school-based efforts to implement strategies so every student experiences deep, conceptually based instruction in mathematics. In addition, it includes support of summer work on differentiated assessments.

- New Teacher Training (Ongoing) 3 release days per grade per year
- CMP Academy Spring (Ongoing) 4 release days per grade per year
- Math Masters Spring 2007 – Spring 2009 and possibly ongoing, 3 courses (3 days each) offered each semester

High School Mathematics Grades 9-12

The district will develop Leadership Teams for both Algebra and Geometry with representatives from all four high schools and the alternative high school. The Leadership Teams would also be provided sub-days and travel expenses to attend regional workshops (possibly in Spring 2007) provided by local and national mathematics organizations with structured time and support to share the knowledge gained with colleagues back in their schools. The Leadership Team would meet in August to collaborate on issues including but not limited to differentiation, standards-based grading, culturally sensitive curriculum, support classes, and TA/tutoring options. The Leadership Team would then plan goals for the 2007-08 school year. Representatives would also, co-deliver professional development with the High School Resource Teacher during the school year to their schools. The Leadership Teams would also meet throughout the 2007-08 school year to collaborate and share strategies between schools.

- Algebra Leadership Team (Ongoing) 3 release days per semester
- Geometry Leadership Team (Ongoing) 3 release days per semester

Science

MMSD Science will focus on three major initiatives in Year 5 (1/1/2007 – 12/31/2007). Those initiatives include curriculum sustainability, instructional excellence and equity for all students. The activities below outline the steps being implemented to continue the momentum toward sustaining the vibrant, research-based K-12 science program. These steps fuse student engagement with instructional excellence and systemically addresses equity at all grade levels.

Immersion K-8 (Spring 2007- Summer 2007)

Finalize and implement all immersion units into the core Grade Level Standards and Scope & Sequence. The immersion units that will be finalized include:

K	Analyzing Animals
3 rd Grade	Investigating Responses
4 th Grade	Electricity and Magnetism: Making Connections
4 th Grade	Elements of Immersion in STC Microworlds
6 th Grade	Investigating Life's Diversity
7 th Grade	Exploring Earth's Landforms
8 th Grade	Electrical Alarm Systems

Science Notebooks (Spring 2007 – Fall 2007)

The Science and Language Arts divisions within the Teaching and Learning Department will incorporate the areas of Literacy, Six Traits of Writing and The Traits of a Reader, with the Science Notebooks. Staff will collaborate on integrated initiatives to be presented at professional development.

New Teacher Support (On-going Spring 2007 – Fall 2007+)

New teachers will analyze the Science Standards during an Introduction to Science Inquiry and Pedagogy Course.

Science will critically analyze the outcomes of the introductory course to insure that all new teachers are provided with adequate instructional and content support to teach science effectively in their first year. Additional classroom support may be designed to follow up each new teacher in the district.

Science Scope & Sequence Curricula Support (Spring 2007 – Summer 2007)

- Toolbox revisited
- Revise K-5 Report Card to align with Grade Level Standards
- Revised K-5 Grading Guide to align with Grade Level Standards
- Design the K-8 Science Scope and Sequence (book 2)
- Design and implement 6-8 Report Card to align with Grade Level Standards
- Incorporation of student assessment rubrics developed and tested as a district-member of the Assessing Student Knowledge. This effort is a 4-year grant in collaboration with the Lawrence Hall of Science and NSF

- Science curricular support for new teachers
- Design and implement integrated K-8 curricular supports and strategies (such as differentiation) with the core academic areas and fine arts for all students (i.e. Special Ed/ESL support)
- On-line science materials support

Professional Development (On-going Spring 2007 – Fall 2007+)

- Explore Distance Professional Development
- School-based work to overview the Grade Level Standards
- Re-design summer institutes for cost-effectiveness and increase participation

Leadership Development (Spring 2007 – Summer 2007)

- MMSD will work with UW-SCALE staff to provide input into 06-07 proposed professional development for lead facilitators
- MMSD will participate in workshops with LAUSD, DPS and PPSD
- MMSD will engage in 8 sessions
- MMSD will apply what is learned to develop leadership base in schools
- MMSD will work with the UW–Madison and the School of Education to redesign the pre-service teacher program for science

Collaboration with Special Education and ESL for Effective Professional Development

- Follow up and analysis of the 7th Grade Chemical Interactions Lab Notebook
- Work to co-plan and facilitate collaborative professional development
- Financial structure and timeline for joint professional development – focusing on the broad needs of teachers at a specific grade level/course

Revise and Re-administer K-8 Science Survey

- Revise the K-8 Science Survey (Fall 2007)
- Administer and analyze (Spring-Summer 2008)

High School Grades 9-12 (On-going Spring 2007 – Fall 2007+)

Five professional development days are planned for 2006-07 to continue to provide support as the district implements the 9th grade initiative to insure all 9th grade students are enrolled in a grade-level, credit earning core course by 2007-2008. The work at high school science is targeting the freshman level 9th grade science course. In three high schools this course is Biology and one high school offers an Integrated Science Course for freshman. Sessions will be full day and incorporate school-team work in addition to cross-district work. Agenda topics include:

- Assessment and grading strategies in diverse classrooms
- Differentiation
- Specific strategies for ESL and Special Education
- Modeling
- Articulation with middle school feeder schools

4. Deliverables and Staffing

Staffing

Steve Jernegan, Instructional Resource Teacher Grades 6-8 Mathematics, 100%

The professional development plan for mathematics includes a central staff person with responsibility for the initial training of middle school teachers who are new to standards-based mathematics curriculum adopted by district middle schools, follow-up training for more experienced staff, and special training for staff who support students with special educational needs or students who are English language learners; development of school-based leadership in each of the middle schools; and support of school-based efforts to implement strategies so every student experiences deep, conceptually based instruction in mathematics.

Sue Johnson, Instructional Resource Teacher Grades 6-12 Science, 100%

The professional development plan for science includes a central staff person with responsibility for the initial training of middle school science teachers who are new to standards-based science curriculum and assessment adopted by district middle schools, follow-up training for more experienced staff, and special training for staff who support students with special educational needs or students who are English language learners; development of school-based leadership in each of the middle schools; and support of school-based efforts to implement strategies so every middle school student experiences deep, conceptually based instruction in science.

Deliverables List

- Standards Based Middle School Report Card
- Learning Mathematics Guide in the Intermediate Grades
- K-8 Science Instructional Support Guide
- Revised K-8 Science Survey
- Standards Based Differentiated Assessments for Connected Math

Providence Public School District (PPSD)

1. Year 5 Objectives and Benchmarks

System

- Sustain core Math and Science initiatives funded by SCALE
- Leverage SCALE funds to expand upon Core Math Science Initiatives including IHE, federal, and private sector partners
- Increase base of Math/Science teacher leader capacity
- 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 assures 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

Mathematics:

- Grades K-5: professional development in Math Investigations content and pedagogy for 30 PPCSD elementary schools using SCALE support, program vendors, the East Bay Educational Collaborative (EBEC) and Toyota
- Grades 5-8: professional development in Connected Math 2 content and pedagogy for 6 PPCSD middle schools using SCALE support, program vendors, EBEC, NASA and Toyota
- Grades 9-12: professional development in Algebra 1 content and pedagogy for 10 district high schools using SCALE support, program vendors, EBEC and Toyota
- Grades K-12: professional development for Math Intervention strategies including elementary FASTT Math and Connected Math 2/Algebra 1 content and pedagogy using SCALE support, EBEC, program vendors and Toyota
- Grades 5-12: summer school professional development in Connected Math 2 content and pedagogy for Math remediation among students at risk of promotion and/or graduation using SCALE support, EBEC, John & Wales University, program vendors and Toyota
- Grades 5-8: middle school pilot using Agile Mind for Mathematics with support of SCALE and program vendor
- Transition implementation of current district elementary Math coaches to a Teacher/Coach model for all 30 district elementary schools. Professional development focused on best practices including SCALE experience, national benchmarking exercises and Math Coach focus groups
- Grades K-12; continuation of SCALE/NASA Math/Science Integration and Intervention Initiatives for CMP 2 content and pedagogy professional

development with SCALE support including support from EBEC, NASA and Toyota

Science

- Continuation of K-8 FOSS/STC kit with implementation and expansion of the District program for Grade 2 in all 30 district elementary schools with specific support from EBEC, Save the Bay, the Audubon Society, program vendors and SCALE member best practices including Science Immersion
- Grade 9: Physics First implementation including professional development and training in physics content and pedagogy with SCALE support, EBEC, CPO Science, and the Rhode Island Department of Elementary and Secondary Education
- Grades 9-12: Exploration of Science Immersion including professional development in content and pedagogy as developed by UW-Madison for the recently implemented science course sequence in PPSD for physics, chemistry and biology with support of SCALE members and EBEC's Applied Learning Immersion Model
- Grade 11: Biology pilot using Agile Mind including professional development under development with support from SCALE members, UW-Madison, and program vendors
- Real time interim assessment model development including professional development and training for Grades 9-12 Science with support of SCALE and program vendors

2. Strategic Rationale for Institutionalization and Sustainability

SCALE Year 5 (2007)

PPSD has recently experienced a renewed vitality within its SCALE membership activity. Partly this activity is due to the stabilization in the PPSD administration including appointments for Superintendent, Deputy Superintendent, high school and math/science directorships. In addition, realignment of the SCALE partnership has significantly increased the effectiveness of the SCALE programs and resources long term opportunities for institutionalization and sustainability.

The new PPSD administration is dedicated to focusing on alignment of resources and total commitment to core Math and Science programs already in place. To this end, PPSD has reaffirmed its commitment to NSF SCALE including a reemphasis and expanded investment to the SCALE mission and best practices that have been developed over the past 4 years among the SCALE Partnership.

SCALE administration has embraced PPSD's renewed dedication and desire to leverage SCALE activities. SCALE has invested considerable resources and time to assist PPSD during this time of transition. In less than six months time, SCALE has brought PPSD up to speed and has embraced the needs of its faculty and students with an eye toward benchmarking for best practices which is a cornerstone of the PPSD strategic plan for long term sustainability and district health.

The PPSD strategy for institutionalization and sustainability focuses on total vertical alignment and resource allocation to core math and science programs already in place. The PPSD approach embraces benchmarking best practices to guide decision making and is based upon four simple points of achieving the PPSD mission, *“Students First, Teachers are its most valuable resource, Classroom Focus, and Continuous Improvement.”*

Post-SCALE (2008 +)

PPSD has the potential to realize long-term stability and sustainability of most all of its SCALE initiatives. The district is actively working to assess, plan and implement STEM linkages beyond 2007. Moreover, PPSD has urged the SCALE administration and its SCALE partners to seriously consider an extension of the program so as to insure the sustainability of the first five years. In many ways, this extension would ultimately demonstrate the true test and measure of the power, influence, dynamics, and impact the SCALE platform team had and is having on public education.

3. Scope of Work (Including Timeline and Main Activities)

Year 5 implementation Plan PPSD												
Work Scope Timeline Calendar Year 2007												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
SCALE Funded Activities:												
Math:												
K-5 Math Investigations PD												
Gr. 5-8 CMP2 PD												
Gr. 9-12 Algebra 1 PD												
K 3-4 FASTT Math Pilot and PD												
Gr. 5-12 Summer School Math remediation PD												
Gr. 5-8 Agile Mind Math Pilot And PD												
Elementary Teacher/Coach Transition Model Benchmark Exercise and PD												
K-8 SCALE/NASA Math Integration/intervention PD and Training												

NSF SCALE

2007

Year 5 implementation Plan

PPSD

Work Scope Timeline Calendar Year 2007

Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec

SCALE Funded Activities:

Science

Continuation of K-8 FOSS KIT
Science Implementation

Gr. 9 Physics First
Implementation

Gr. 9-12 Immersion Science
Exploration

Gr. 11 Agile Mind Biology Pilot
and PD

Real Time Interim Assessment
Tools and PD

4. Deliverables and Staffing

Staffing

Dr. Frances Gallo, Deputy Superintendent

Michael P. Lauro, Supervisor: K-12 Math, Science, PE& Health

Deliverables List

- Data Driven Indicators auditing Proficiency Gains/Results realized by the SCALE Investment in PPSD Math/Science initiatives using Balanced Score Cards.

California State University Dominguez Hills (CSUDH)

1. Year 5 Benchmarks and Objectives

System

- Continue to develop a network of local area IHEs focused on a coherent system of support and partnership with LAUSD
- Plan and conduct a Los Angeles area IHE conference to consider best practices in the learning and teaching of mathematics and science
- Work with all SCALE districts to build the connections between the districts and the STEM faculty at IHEs
- Triple the size of the cadre of STEM faculty involved in SCALE work
- Promote the institutionalization of the SCALE Theory of Action and results within the CSU system

Mathematics

- Co-develop a pilot program for 4th and 5th grade teachers to support more effective classroom instruction
- Co-develop with LAUSD and CSU, Northridge SCALE/QED math institutes for Algebra and Algebra Readiness.
- Investigate the possibility of piloting the Algebra Agile Mind online program in a selected locations in LAUSD
- Leverage the funding provided by the CA Mathematics Project to improve the retention rate of new mathematics teachers within the LAUSD system

Science

- Support the co-development of the immersion units through UW-Madison, BSCS and Agile Mind.
- Support the leadership training for the facilitators
- Provide the professional development for LAUSD teachers
- Provide opportunities for the professional development of the institute facilitators both in mathematics and science.

2. Strategic Rationale for Institutionalization and Sustainability

In the original Five-Year Strategic Plan SCALE promised that it would “establish in ...institutions of higher education that are local to the districts two types of university courses aimed at increasing the quality, number, and diversity of K-12 mathematics and science teachers in our four partner districts. “ These courses were to be of two types: those within the STEM content areas and those that are housed in the teacher preparation divisions. For the first type of course the intention was on “...developing interest in teaching rather than on providing comprehensive pedagogy training courses” while the second type was intended to “... provide science and mathematics pedagogy courses for students pursuing mathematics or science education Master’s or Certificate degrees that are tightly aligned to the [districts’] professional learning dimension.”

As SCALE proceeded with its work it became very evident that of the five NSF key features one of the most critical was the “Partnership” dimension. Within the area surrounding the massive Los Angeles Unified School District strengthening the connections between the local IHEs, particularly with the STEM and STEM education faculty, could provide the opportunity for real change and progress. In order to drive this change, while SCALE provided the framework, additional human and capital resources were required. In Fall, 2004 these became available through QED (Quality Educator Development), a U.S. Department of Education Teacher Quality Enhancement award to CSUDH.

QED was the missing piece to the puzzle that provided opportunities to begin to fulfill the promises made by the SCALE Theory of Action. In particular QED resources have cemented the partnership between LAUSD and the CSU STEM and Education faculty that prepare a large number of new teachers and administrators for the district yearly.

The work done through the CSUs (Northridge, Dominguez Hills, and Los Angeles) is jointly supported and tightly connected by SCALE and QED that share the same purposes and ideals. The work plan that follows is closely aligned and constructed with that of LAUSD.

SCALE Year 5 (2007)

In 2000, a National Research Council’s (NRC) Committee on Science and Mathematics Teacher Preparation report outlined recommendations for improving math and science education through teacher pre- and in-service preparation. The CSUDH Case Study Report entitled *Organizational Change In An Institution Of Higher Education: Improving K-20 Math And Science Education Through A University-School Partnership* found that “...the SCALE and QED initiatives at CSUDH are in line with...” those NRC recommendations which include:

- Building partnerships with local school districts,
- Creating greater collaboration across departments and colleges in the IHEs,
- Promoting active learning in STEM undergraduate courses,
- Increasing understanding of STEM faculty about K-12 education, and
- Changing the reward criteria with respect to retention, promotion and tenure.

During the SCALE Year 5 the CSUDH STEM and STEM education faculty, being mindful of the above initiatives and the NSF key features for a Math Science Partnership, will continue to work in partnership with UW-Madison and LAUSD colleagues to address the issues of equity and access for all students in the learning of rich and challenging mathematics K-12.

The lessons learned from its SCALE work will serve to inform the pre-service teacher education. Already the faculty who have been engaged in the SCALE/QED work are starting to change their practice in their undergraduate content courses.

The science faculty is working to develop programs to submit for approval to the California Teacher Credentialing Commission for subject matter authorization. The STEM faculty along with colleagues from the College of Education and the LAUSD will be working toward finalizing a set of science content courses to serve as the concentration for middle school and high school science teachers seeking a Masters degree in Curriculum and Instruction.

The Biology and Chemistry faculty at both CSUDH and CSUN will be involved in the new BSCS and Agile Mind initiatives to develop challenging courses for high school science in LAUSD.

The math and science faculty from three CSU campuses (Dominguez Hills, Northridge and Los Angeles) will work together with the District math and science leadership, specialists and advisors in leadership development sessions to perfect the professional development opportunities being planned for summer 2007 and beyond.

Post-SCALE (2008 +)

CSUDH will continue to support, through SCALE and QED funds, one-week workshops for the 4th and 5th grade science immersion units in order to complete the important Teacher Professional Continuum grant award to study the effectiveness of the immersion units and associated professional development.

3. Scope of Work (Including Timeline and Main Activities)

(Please see LAUSD Plan of Work for actual timelines)

Timeline *January 1, 2007 – December 2007*

- Additional Main Activity
- Plan and conduct IHE conference in Los Angeles area for late spring 2007

New Partnership Initiative: SCALE with Agile Mind, Dana Center, and BSCS

It should be noted that the proposed work that is described in this section is, at the time of the submission of the Year 5 Implementation Plan, under active discussion by all of the principal parties. In particular, no agreements have been reached and the actual details of the work, should it go forward, will be the subject of many collaborative exchanges. However, at the time of the submitting the Year 5 Implementation Plan, the possibility appears real enough, and the future anticipated impact of the work exciting enough, that the decision was made to include this section in the Year 5 Implementation Plan. Part of the timing of negotiating this possible work was influenced by the larger events that were resolving in the SCALE Partnership during the same period.

Agile Mind is an education company formed in 2001 to enhance both equity and high achievement in challenging academic courses. In collaboration with the Charles A. Dana Center at the University of Texas at Austin, the company has developed research-based resources to support high achievement for a broad range of students. All Agile Mind work to date has been in mathematics. The Agile Mind, Dana Center, BSCS and SCALE leaderships are now exploring how to combine their unique strengths to produce and test an experimental 9th grade biology Agile Mind and SCALE immersion-based course.

Agile Mind is committed to three ideas: excellence, equity, and sustainable school capacity. Their mission is to provide the tools and support teachers need to improve student performance while supporting exemplary, sustainable teaching practices. For and with educators and

administrators, they have developed, continuously tested and improved our productivity tools, performance reports, and professional development services to support effective college preparatory instruction for a broad spectrum of students.

For students, they have created powerful tools and strategies that help them excel in the examination-driven advanced courses that are crucial for admission to America's leading colleges and universities. Agile Mind is built on a combination of high-tech and high-touch strategies. In addition to Internet-delivered services, educators and administrators also receive face-to-face seminars, mentoring, and high-quality support materials to manage their demanding workloads, improve their expertise, and dramatically improve outcomes for their students.

During a meeting in June of 2006 over the possibility of some Agile Mind mathematics involvement with SCALE partners, the idea of an Agile Mind expansion into science was discussed. As the result of meetings in San Francisco (Agile Mind), Los Angeles (LAUSD and CSUDH), and Austin (Dana Center and Agile Mind), a new partnership is prepared to do just that. Specifically, SCALE, Agile Mind, BSCS, the Dana Center, LAUSD, and CSUDH plan in SCALE Year 5 to develop and beta test a new web-based 9th grade biology course that will meet the needs of LAUSD and CSUDH and test the concept discussed. The platform for this course will be Agile Mind, it will be aligned to the California Standards, it will incorporate elements of SCALE science immersion, and following the collaborative model that has been developed by SCALE, CSUDH, and LAUSD, the materials will be co-developed by teams from Agile Mind, BSCS, the Dana Center, CSUDH biology faculty and biology education faculty, LAUSD science experts and leaders, and the professional development will be co-developed and co-delivered by teams from the same organizations.

The goal of this work will be to 1) develop a complete high school biology web-based curriculum that facilitates teacher planning and learning, student learning, continuous feedback to the teacher and others on student performance; 2) extend the SCALE equity work to the core curriculum; 3) roll out this course to all 72 high schools and the 60,000 ninth graders in LAUSD; 4) expand the collaborative model developed by SCALE in science immersion with LAUSD and CSUDH; and 5) use this proto-type for other similar Agile Mind/immersion-based K-12 science course development that can serve both SCALE and the nation.

4. Deliverables and Staffing

Staffing

25 Physics, Chemistry, Earth Sciences, Biology, Mathematics and Education faculty from CSUDH, CSULA, and CSUN currently engaged in SCALE/QED work

Intention is to recruit another 25 faculty from the CSUs and their feeder community colleges to work with the existing group during SCALE year 5 and beyond with QED

Deliverables List

- Please see LAUSD list
- IHE conference during late spring
- Science subject matter authorization programs
- Science courses for Masters degree

University of Wisconsin – Madison

1. Year 5 Objectives and Benchmarks

System

- Continue to develop and refine applications of SCALEnet, the online collaborative workspace, in ways that support and enhance SCALE work.
- Continue to develop networks of STEM faculty, STEM Education faculty, and MMSD Science leaders to improve the K-20 preparation and professional development of K-12 science teachers.
- Continue to develop networks of mathematics faculty, mathematics education faculty, and MMSD mathematics leaders to improve the K-20 preparation and professional development of K-12 mathematics teachers.

Mathematics

- Support the continuing Math Masters professional development program that is now targeted at all MMSD middle school mathematics teachers.
- If funded (Title IIb), support the new Elementary Math Masters professional development program modeled after the original Math Masters program but targeted at elementary teachers.
- Continue to recruit new UW-Madison mathematics and other STEM discipline faculty to participate in both of the above.

Science

- Support the collaborative UW-Madison MMSD effort to design, test, and implement a new course sequence for pre-service middle school science teachers.
- If funded (Title IIb), support the new Science Masters professional development modeled after the original Math Masters program but targeted at middle school science teachers.
- Continue to recruit new UW-Madison STEM faculty to play meaningful roles with respect to their research in ways that are relevant to K-12 science education and science teacher professional development.
- Support the SCALE districts with co-developed resource materials, immersion units, and model lesson instructional materials for classroom and professional development use.
- Support teacher professional development institutes in the districts with co-facilitation teams made up of STEM faculty, STEM education faculty, district leadership, and teachers.
- Co-design and co-facilitate professional development for professional development facilitators in the SCALE districts in partnership with BSCS and WestEd.
- Co-design and co-facilitate professional development for SCALE district and IHE science leadership focused on building capacity and sustainability in partnership with BSCS and WestEd.
- UW-Madison immersion team will work with all SCALE districts to connect with principals at the school sites.

2. Strategic Rationale for Institutionalization and Sustainability

The SCALE IHE Year 5 work targeted at organizational change at UW-Madison are informed by the work of the SCALE RET IHE report “A Preliminary Case Study of SCALE Activities at the University of Wisconsin-Madison: Factors influencing change initiatives in STEM undergraduate education, teacher training, and partnerships with K-12 districts.” For example, the report notes:

The SCALE theory of change is based on a systemic understanding of the educational systems that inform and support K-12 math and science education. This theory holds that if improvements in IHE participation in teacher preparation and professional development are to be sustainable and significant, then it is necessary that:

1. Change take place in the ways that STEM faculty approach teaching and learning;
2. Change take place in the ways that STEM and education faculty participate in teacher preparation and collaborative efforts; and,
3. Change take place in the organizational units of the IHE to “overcome the conservative nature’ of the IHE, so that faculty participation in teacher preparation and collaborations are supported.

The overall goals of SCALE Year 5 work targeted at UW-Madison are to continue to define, support and help lead coherent activities that promote these changes. For example, as the IHE report also notes:

A preliminary assessment suggests that SCALE leaders are using the following implicit theory of change at UW-Madison: “plant small seeds of change at points in the system deemed most likely to eventually yield large changes, and do so by building on and collaborating with other change initiatives (at UW and in other institutions) that complement SCALE goals, and by identifying and working with individuals already interested in these goals. Thus far, the key points in the system that we have identified include individual faculty, whose exposure to new pedagogies may bear fruit in later years and in unforeseen ways, and departmental and college level committees, where change is a long-term proposition and actors are just now putting in place pieces that they believe will affect change in coming years.

There are three areas of lines work that will help engender these changes by “planting small seeds”: 1) professional development for MMSD (and other district) K-8 math and science teachers co-developed and co-delivered by teams that include MMSD master teachers and UW-Madison STEM faculty; 2) pre-service math and science curriculum reform; 3) innovative new ways of engaging STEM faculty with SCALE related work.

3. Plan of Work (Including Timeline and Main Activities)

SCALE Administration and Leadership

The SCALE Administrative Office (SAO) and the SCALE Knowledge Management Team serve the SCALE partnership and each of the project partners with administrative support. The aim of

the SCALE Leadership structure is to reflect a highly interactive, collegial system that 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 and is served by modern communication technologies and informed by feedback loops at all levels of the partnership. A key focus of the SAO has been to identify points where the SCALE partners need to communicate more effectively, and developing processes and procedures to facilitate collaboration among the partners. Related to this is the challenge of supporting SCALE programs and professionals working from different geographic locations. Another challenge we have identified is managing partnership workflow efficiently by planning and running meetings to optimize efficient use of SCALE participants' time and cognitive capacity, and by planning sufficient time and resources to meet deadlines. All of these challenges involve maximizing communication by managing both the information itself and the flow of that information.

The SCALE Knowledge Management Team serves 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 discussions lists, document storage, calendaring, and project management tools. From this documentation services such as a monthly partnership newsletter are generated and distributed monthly to inform of recent and upcoming events, news, reports, and scholarly publications. Major recent projects include re-organization of all travel documentation, administrative, financial documentation as well as UW-Madison Immersion team workspace and workflows. In Year 5 the SCALE SAO and Knowledge Management Team will continue these support roles.

Science Immersion Development

Over the last four years, the science immersion team's focus and vision has evolved both because our understanding of the work grew in collaboration with the districts and IHEs and because our team began to work at a systemic level to support the districts. The science immersion team is working, with immersion units as a tool, towards a system-wide goal for changing the way science is taught in school districts and affiliated universities to touch all students and educators. Our approach relies heavily on collaborations to develop partnerships and build capacity to sustain the work long after SCALE.

Due to the scale at which the science immersion team is working in the districts, the goals for implementation and professional development have evolved to be multidimensional to build the capacity and the awareness needed to accomplish the work. With the fundamental goal of improving science for all students and educators, three professional learning experiences for science leadership (university and district) have evolved: 1) The collaborative process for developing the written immersion unit, 2) The collaborative design and co-facilitation of professional development for the immersion unit, and 3) The formation of leadership study groups to develop cross-institutional professional development facilitators with a common vision. These three aspects of the UW immersion work have become vehicles for systemic

change that will impact both districts and the local universities and both pre- and in-service teachers and their students.

The Year 5 science immersion work will focus on the following key areas in partnership with the SCALE districts, IHEs, BSCS, and WestEd:

- Classroom instructional and resource materials development
- Professional development for teachers
- Professional development for professional development facilitators
- Professional development for K-12 district and IHE math and science leadership

Classroom instructional and resource materials development

The science immersion team will use its collective expertise to facilitate instructional materials development, unit revisions, and writing for publication to benefit all SCALE districts. This work will include the following:

- Collaborative development of a second version of the Immersion Unit Toolbox, a teacher resource book designed to both compliment the National Research Council's inquiry addendum and explicitly support application of classroom strategies that are specifically used throughout all Immersion Units as best practices for teaching and learning. The goal for the Toolbox is that it accompanies every immersion unit as a practical application handbook that will help teachers successfully implement any unit as intended, with strategies and techniques that support all students in developing deep conceptual understanding. Because of its application-in-the-classroom focus, this Toolbox will also be an important resource to help teachers transfer the best practices embedded in immersion units to other content areas. The collaborative development of the Toolbox is already underway, and MMSD will be using the Toolbox district-wide as a companion to their Scope and Sequence and Grade Level Standards manual.
- Co-facilitation of the immersion model for instructional materials development, working side-by-side with BSCS to develop high school immersion units in biology, chemistry, and physics with LAUSD and PPSD. Building on the strong collaboration model that emphasizes both process and product, the UW science immersion team will extend its capacity by working with BSCS to complete these units, and, by staying involved in both the planning and co-facilitation, will assure that the co-development process and quality of the materials is consistent with the high quality and experiences that districts have come to expect in science immersion. Additionally, SCALE and the districts will benefit from collaborating with BSCS, a non-profit science education organization with 50 years experience in research-based instructional materials development.
- Collaborative development of online science instructional materials with SCALE partners and Agile Mind. The UW science immersion team has been involved in the initial envisioning for this work, examining the feasibility and likelihood that Agile Mind science materials could effectively support all teachers and learners in SCALE districts and will continue to be part of the collaborative team that will shape and design those materials. The Agile Mind science resources will, because of the UW science immersion team participation in the collaboration, be consistent in using inquiry-based science instruction and minds-on teaching strategies and techniques that users will recognize

from immersion, to continue to build coherence with the work done over the last four years to reform science education through SCALE.

- Revision of immersion units based on feedback from field-test classrooms is scheduled for the Grade 5 Weather immersion unit, and several other units will receive modest revisions and be formatted into their final version for distribution in SCALE. One primary goal for their revision work is to use information gathered from classroom teachers to further develop the implementation guides and background information for lessons so that they support teachers with necessary content knowledge, effective and pedagogically-sound teaching strategies, and an understanding of the rationale for the unit's approach. In this way, each immersion unit is refined and further developed to become "educative" for both teachers and learners (EA Davis, J Krajcik, 2005).
- Collaboratively writing papers for publication about science immersion work is underway, and the UW science immersion team plans to continue to take the lead to initiate, facilitate the collaboration, and edit these several papers, as well as to submit them for publication to appropriate journals. By supporting publication work, the science immersion team can both share lessons learned through SCALE with other educators and help IHE junior faculty and all SCALE collaborators to gain recognition for their contributions to the development and evolution of the vision and goals for science immersion.

Professional development for teachers

The science immersion team will be working with all SCALE districts in year 5 to support professional development for teachers. See K12 partner district plans.

Professional development Leadership Study Group for professional development facilitators

The SCALE and QED partnership in the LA basin is building a common vision for improving all students' understanding of science by supporting teachers to employ best practices for science teaching and learning as exemplified in immersion units. For this work to reach all students requires a strong team of professional development facilitators who are able to implement high quality and coherent teacher learning experiences. To accomplish this, we are building a cadre of professional development facilitators with a common vision and the skills and abilities to serve the professional development needs in LAUSD and the CSUs. The cadre is also central to the SCALE/QED overarching vision for cross-institutional partnership designed for sustainability. This professional learning community (known as the Professional Development Leadership Study Group) is comprised of members of the CSU faculty, district science branch, and several lead teachers and is designed to build a strong core of leaders with a shared vision for reforming science teaching and learning. In year 5, the goal 2 staff will be working with MMSD, DPS, and PPSD to transfer the successful aspects of this work to meet the districts needs and fit within their district and IHE framework.

Professional development for district math and science leadership: K12 District Science and Math Leadership Institutes

In 2007, SCALE will support collaboration among SCALE districts' science and math leaders and WestEd directed at setting goals and developing plans for building regional partnerships and growing a cadre of highly qualified professional development facilitators. The focus of this series will be to support district leaders to understand the current research about systemic science

reform efforts and apply the research to planning for professional learning opportunities in their own contexts to build capacity for employing a coherent approach to teacher professional development.

- Session I: Professional Development for Systemic Reform: The professional development framework and understanding change.
- Session II: Concerns Based Adoption Model: Aligning interventions appropriately to support effective adoption and implementation of a reform-based innovation.
- Session III: Building collaborations across institutions to build capacity and impact the K–16 educational system.
- Developing a Professional Leadership Study Group to develop a cadre of professional facilitators with a common vision and facilitation skills and abilities.
- Session IV: Sustainability and Long-term planning: Application to short- and long-term district plans.

UW-Madison K-12 and IHE Collaboration

Collaborative Professional Development

Middle School Math Masters Extension

For two years SCALE has been involved with the MMSD-UW-Madison Math Masters Program. This program was funded primarily by two successful Title IIB awards and took place during the 2004-05 and 2005-06 school years. These awards are now over. SCALE provided leadership and evaluation for this important work. The goal of the Math Masters project was to increase middle school students' achievement in mathematics by strengthening the quality of mathematics instruction. This improvement was provided through the provision of content-based professional development linked to both State Content Standards and Teacher Standards, and professional development on high leverage research-based strategies to develop student understanding of mathematical content.

SCALE will help extend this successful professional development model. We will build on the Math Masters program in three ways. (1) We will expand the size of the program, to enable all middle school mathematics teachers in the MMSD to benefit from this professional development opportunity. (2) We will extend the work of the Math Masters project by involving graduate students, thereby providing them a professional development opportunity. These graduate students will work in teams with mathematics faculty and MMSD math master teachers as they prepare the problems, design the delivery, and co-teach the MMAT courses. (3) This work also will inform the development and implementation of a new five-course mathematics sequence that the campus Math/Education Liaison Committee is developing for pre-service middle school mathematics teacher education. SCALE will provide participating graduate student and faculty stipends, and MMSD will use general funds necessary to provide release time for the target population of middle school math teachers.

Middle School Science Masters Extension

In the summer of 2006, SCALE worked with MMSD staff to develop a Title IIB proposal for middle school science teacher professional development modeled on the successful middle school math masters program. If this program is funded, then SCALE will work with MMSD and UW-Madison to help successfully implement the program. The goal of the Science Master's Institute is to increase middle school students' achievement in science by strengthening the

quality of science instruction through provision of content and inquiry-based professional development linked to both State Content Standards and Teacher Standards and professional development on high leverage research-based strategies to develop student understanding of science content.

The Science Masters Institute (SMI) will focus on developing the content and inquiry-based pedagogy of 120 middle school science teachers (grades 6-8) around the major conceptual strands in earth, life and physical science within an inquiry framework. Its design will engage teachers in an inquiry process to construct deep conceptual understanding of the content described as a principle of quality professional development by Loucks-Horsley, et. al. (2005), and will use a wide spectrum of research-based strategies that meet the needs of our increasingly diverse student population.

Elementary School Math Masters

In the summer of 2006, SCALE worked with MMSD staff to develop a Title IIB proposal for elementary school math teacher professional development modeled on the successful middle school math masters program. If this program is funded, then SCALE will work with MMSD and UW-Madison to help successfully implement the program. The goal is to increase 3rd -5th grade student achievement in math by strengthening the quality of math instruction via provision of content-based professional development linked to State Content and Teacher Standards and professional development on high leverage research-based strategies to develop student understanding of math content. This program will provide professional development to 180 teachers over three years.

Pre-Service Curricular Reform

For the past several years there has been a Middle School Math Pre-Service Committee, due in part to leadership from the Assistant Dean from the College of Education. The committee has been concerned that elementary and secondary math teachers have the same content preparation. SCALE personnel were instrumental in helping to organize the successor to this committee, the Math/Education Liaison Committee. This committee combines the campus Middle School Math Pre-Service Committee with the internal Mathematics Department Committee on the elementary and middle school pre-service mathematics courses. The co-chairs of this committee have both participated in the Math Masters Project, and the relatively large committee (twelve members) has representatives from the math department, the math education group, and the MMSD school district. The overarching goal of the committee is to help create a new course sequence for middle school mathematics pre-service content training, and to better integrate the efforts and talents of the math department, the math education group, and the MMSD mathematics leadership.

Specifically, the committee also is discussing the possibility of developing a middle school math certificate program at UW-Madison. One goal of this committee is that their work eventually influences the state Department of Public Instruction to adopt a new requirement for middle school math certification. At this time, aspiring middle school teachers can be licensed with the state requirements in the "Early Childhood through Middle Childhood Regular Education" category. This license, which only requires the three-course math sequence (Math 130, 131, 132), is considered by many to be insufficient for elementary teachers, let alone for middle school math teachers.

The UW-Madison SCALE leadership has worked with the School of Education and numerous faculty during Year 4 to discuss and plan for a Science/Science Education Liaison Committee that will work that is parallel to the work of the Math/Math Education Liaison Committee. This committee will focus on revising the science requirements for future middle school science teachers. Current requirements for middle school teacher candidates are the same as for elementary candidates, and thus are considered by many to constitute insufficient content preparation for middle school science teaching.

Innovative STEM Faculty Engagement

SCALE continues to explore new avenues that could creatively tap the potential of scientific research at UW-Madison in ways that are mutually beneficial to the goals of faculty and staff engaged in that scientific research and K-12 education goals and needs. Two important units of change at a research university are large research groups and also ongoing centers. SCALE is trying to operate to help “match impedances” between the rhythms and forces that drive these university units and the rhythms and forces that drive K-12 education.

Curriculum Design Summit and on-line content delivery tool

The Cooperative Institute for Meteorological Satellite Studies (CIMSS) was formed through a Memorandum of Understanding among the University of Wisconsin-Madison (UW-Madison), the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). Atmospheric and Oceanic Sciences Professor Steve Ackerman is the CIMSS Director and has been an active participant not only in SCALE, but also the Center for the Integration of Research, Teaching and Learning (CIRTL), an NSF higher education teaching and learning center.

Last fall, Professor Ackermann worked with SCALE on an NSF proposal that has been awarded. They proposed to develop, implement and evaluate an inquiry-based distance learning professional development course for high school science teachers that will teach Earth System Science with a focus on satellite-based observations. Teacher recruitment efforts for this project will be concentrated in the Native American, Latino/Latina and African American communities, where participation and representation in science, technology, engineering and mathematics (STEM) disciplines and in the geosciences is lowest. Two fundamental innovations will derive from this project.

The first innovation involves a Curriculum Design Summit preceding course development that brings together master teachers, scientists, educators and evaluators to craft a geoscience curriculum specifically designed to meet the needs of high school science teachers. Included at this summit will be a SCALE member from the LAUSD/CSUDH Team and a SCALE master teacher from MMSD. The SCALE program has been a pioneer in modeling collaborations between school districts and universities. The professional development course we propose to develop will build on the many lessons learned by the SCALE program.

Second, the course will include VISITview, an innovative on-line content delivery tool that facilitates real-time teaching and discussion sessions. Along with affording many instructional aspects similar to a traditional classroom for teachers taking the course, VISITview will also enable content experts to make on-line follow-up visits to the classroom. These virtual classroom

visits will expose high school teachers and students to practicing geoscientists, increasing the awareness of geoscience careers and enabling scientists to share their excitement and enthusiasm with course participants and their students. This exposure and interaction will be particularly valuable to those groups currently underrepresented in STEM disciplines. CSUDH has expressed an interest in playing a role in the development of this on-line course, and in a way that they might actually use as an on-line undergraduate course. Meetings are scheduled through the Fall of 2006 to work out a design and beta test implementation plan that includes the Los Angeles basin as a test site. SCALE will use some of its resources to help in the implementation of this work.

Integrating changes in undergraduate Biochemistry labs into SCALE Immersion units for K-12 districts.

An example at a slightly smaller scale is the research lab of Brian Fox, Marvin J. Johnson Professor in Fermentation Biochemistry, UW-Madison. Professor Fox approached SCALE to explore the possibility of amplifying their work through an alliance with some SCALE districts. In a recent proposal he and his research group proposed:

....restructuring the Biochemistry undergraduate laboratory instruction at the University of Wisconsin to incorporate cell-free protein translation methods as an integral part of the efforts arise from the extensive experience of the PI in undergraduate laboratory teaching. A longer-term goal will be to investigate whether instructional kits based on wheat germ cell-free protein translation could also be suitable for implementation at the K-12 level. The possibilities to undertake this investigative work can be done as a partnership with major school districts (e.g., Madison, Providence and Los Angeles). One advantage of the partnership would be to help provide more solid cognitive threads to classroom practice and established state standards for science education.

SCALE will work with Professor Fox and his group on the longer-term goal to see if these resources can, for example, be integrated into LAUSD/CSUDH science immersion work. SCALE continues to explore new avenues that could creatively tap the potential of scientific research at UW-Madison in ways that are mutually beneficial to the goals of faculty and staff engaged in that scientific research and K-12 education goals and needs.

4. Deliverables and Staffing

Staffing

SCALE Administrative Office and Knowledge Management

Terry Millar – PI and Project Director
Sarah Mason – Project Manager
Dennis Kennedy – Financial Administration
Eileen Kellor – Office Administration
David Sleasman – Knowledge Manager
Aiping Wan – Web Programmer
Angela Hoistion – Media Specialist

Science Immersion Development

Dan Lauffer, Goal 2 Leader

Hedi Baxter, Goal 2 Co-Leader

Jennifer Folsom, district liaison, writer and district professional development provider

Kevin Niemi, district liaison, professional development provider

Matt D'Amato, writer and district professional development provider

Robert Bohanan, professional development provider

Becky Holmes, editor

Additional hire, TBD

In-Service Science Professional Development Reform

Team of UW Math and Math Ed Faculty and MMSD Math Leaders

In-Service Mathematics Professional Development Reform

Team of UW Science and Science Ed Faculty and MMSD Science Leaders

Pre-Service Mathematics Curricular Reform

Team of UW Math and Math Ed Faculty and MMSD Math Leaders

Pre-Service Mathematics Curricular Reform

Team of UW Science and Science Ed Faculty and MMSD Science Leaders

Innovative STEM Faculty Engagement

Terry Millar, Goal 3 co-Leader

SCALE staff as needed

Research and Evaluation

Building a Partnership

Scope of Work

This document describes the Building a Partnership (BP) team plan of work for SCALE Year 5 (2007), and for a no-cost extension year (2008). Four lines of work involve the team's last round of data gathering and analysis, each of which will result in separate products, and also will provide key material for a book. In brief, the four lines of work are: (1) Partnership Literature Review, which provides a warrant for the research on educational partnerships, enables the team to understand what we can contribute and why our research questions are valuable at this point in time, and informs the design and analysis of the other BP studies; (2) the SCALEviews study, which takes a broad view of why and how K12-IHE partnerships form, and goes more deeply into describing the dynamics of a selected set of working groups in Year 5; (3) the Working Group Mapping study, which draws on the SCALEviews interviews and focuses on the structural aspects of the partnership; and (4) the Cross Case Working Group study, which looks closely at partnership formation, interpersonal dynamics, and leadership as they evolve in real time within four working groups that focus on professional development or curriculum design. A fifth line of work involves the preparation of a book proposal and manuscript, and production of several papers for presentation at national conferences, and for publication in major journals.

Throughout this document, we use the term "K12-IHE partnership" to represent an organization (partnership) formed between K12 organizations and IHEs to accomplish work that the organizations, working alone, could not accomplish.

1. K12-IHE Partnership Literature Review line of work, to be completed by April 30, 2007, by Matthew Clifford, assisted by undergraduate student.

The research question pursued by the K12-IHE Partnership Literature Review is "What is the status of research on educational partnerships?" This line of work is primarily intended to support the other BP lines of work and thus the partnership book. The literature review establishes the field of our work and provides a warrant for our research on educational partnerships. It encompasses theoretical and research articles on cross-organizational partnerships in education, and also references healthcare and business fields. We are constructing a query-able EndNote database of articles that will have been made available to all WCER researchers and, by request, to others by December 2006. By April 2007, Clifford will make the final Literature Review available as a working paper on the SCALE and WCER websites.

Our preliminary findings suggest that research literature on educational partnerships is very limited, in comparison to healthcare and business fields where factors of success have been identified and tested. Where educational research on partnerships is available, it tends to focus on measurement of student, and to a lesser degree, teacher outcomes, but the methodologies used raise attribution questions. Findings from the draft literature review already have proven of great value in the development of the book plans, and have been used in all BP papers written and presentations made during this period.

2. SCALEviews line of work, to be completed by May 30, 2007, by Susan Millar (lead), Matt Clifford, Matthew Hora, Natalie Tran, and Vanessa Coe.

The SCALEviews line of work is pursuing the broad research question that the BP book addresses: Why do K12-IHE partnerships form, and how do K12 – IHE partnerships function? Taking the SCALE partnership as our source of information, this line of work is focusing broadly on how key participants from all partner organizations understand the goals, strategies, processes, and outcomes of this partnership. These data help us to understand how this partnership is structured, and how these structures change over time in response to emergent, internally and externally-derived opportunities and constraints. During interviews, and through observation of selected key SCALE meetings, we are gathering participants' stories about their motivation to begin and persist in SCALE, the context of SCALE operations, the strategies SCALE actors use to accomplish partnership goals, and their SCALE accomplishments and unmet challenges. Stories are commonly used in organizational analyses to describe organizations as they are "lived." Accordingly, SCALEviews analysis processes are designed to allow construction of a multi-vocal narrative of SCALE.

As of December 2006, we will have completed an initial analysis of 117 interview transcripts in Nvivo, and will have added a narrative dimension to our research process. To add this narrative dimension, we will have (by the end of December 2006):

- selected a sample of some 30 working groups most responsible for pursuing SCALE goals, and most able to describe the challenges encountered, the strategies typically used to solve the associated problems, and the most salient types of outcomes of these efforts; and
- drafted summaries of each selected working group, simultaneously identifying gaps in the interviewee stories used to produce these summaries and preparing interview protocols designed to help fill those gaps.

This sample of featured working groups will include groups sponsored by each of the partner organizations, and by multiple partner organizations. In addition, it will include groups notable for their productivity and promise of establishing sustainable new cross-institutional networks (such as the LAUSD/SCALE/QED Secondary Science Immersion Working Group), and groups notable for periods of unproductive conflict and inefficient use of human resources (such as the top leadership team, prior to the departure of the University of Pittsburgh from SCALE).

During January and February 2007, we will conduct a final round of SCALEviews interviews with an estimated 30 key SCALE participants and former participants who figure prominently in the draft summaries of the selected working groups. Each interviewee will receive, prior to their interview, relevant draft working group and key individual summaries, and draft organizational maps (see below). During the interview, they will be asked to comment on and fill in gaps in the stories presented in these draft summaries. After revising these summaries, we will ask these interviewees to review and approve final versions. This revision and review work will be accomplished by the end of March, 2007. These summaries will be made available as an ad hoc report to current SCALE leaders plus IFL leaders.

During April, we will undertake a process designed to produce a typology of partnership working groups that is planned to be central to the partnership book. We will undertake an inductive thematic analysis (in Nvivo) of our completed summaries of selected working groups

and key individuals in order to identify important attributes of working groups, and to identify their main goals and challenges encountered. During May 2006, we will compare the themes that emerged from this analysis with themes that are formulated in Clifford's K12-IHE Partnership Literature Review and Working Group Cross Case Studies, and will revise our set of key attributes of the working groups. We then will analyze the working group and key individual summaries to classify each, on a 3-point continuum, with respect to these key attributes and the identified problems/challenges. Then, using these classifications, we will identify patterns in the key attributes and challenges of the working groups. We anticipate that this analysis (done using Excel, following a process S. Millar used during analysis for a national study of master's programs) will result in an empirically-based typology of working groups.

In addition, when we turn to writing the book, we will use various analytical frameworks developed by anthropologists, sociologists, organizational theorists and learning theorists to conduct a cross-case analysis of these working group summaries. Among the frameworks to be considered are Lave's theory of situated cognition, J. S. Brown's theory of "creative abrasion," and Axelrod and Cohen's complexity theory.

3. Working Group Mapping line of work, to be completed by July 30, 2007, by Susan Millar (lead), Natalie Tran, Vanessa Coe, and Matt Clifford.

The Working Group Mapping line of work also is designed to help us answer our broad research question: Why do K12-IHE partnerships form, and how do K12 – IHE partnerships function? The Working Group Mapping study provides information on how a complex partnership is structured, and how this structure evolves over time. This line of work not only provides information needed for writing the partnership book, but also provides the SCALE leadership with useful formative information. The Working Group Mapping study results in descriptive statistics of partnership participation and graphic representations of the partnership organization that are similar, in many ways, to organizational charts. (See Millar & Clifford, 2005 for discussion of method.)

During September – December 2006, Millar, Tran, and Coe will have analyzed the SCALE working group data in SCALEbase (a relational database designed for use by both the RET and the SCALE Administrative Office), and represented these data in the form of organizational maps. In January and February, 2007, during the last round of SCALEviews interviews (see above), we will member check these maps with leaders of each SCALE partner organization. We will present the approved maps, along with descriptive analysis, in an informal report for SCALE leaders by the end of March, 2007.

During March, 2007, we will update SCALEbase with data from the final round of 2007 SCALEviews interviews. During April and May, Millar, Tran, and Coe will reanalyze the SCALE working group data in SCALEbase and modify the March 2007 organizational maps. In June 2007, we will ask leaders of each SCALE partner organization to check these revised maps for accuracy. We will present this last set of approved maps, along with descriptive analysis and comparisons over time, in a final informal report for SCALE leaders by July 30, 2007. The findings in this report will be used in the book to provide an overview of the partnership's organizational structures which is broad yet based in far more empirical detail than is usually available about the structures of education partnerships.

4. Working Group Cross Case Study line of work, to be completed by September 2007, by Matthew Clifford (lead) and Susan Millar.

The research question pursued by this Working Group Case Study line of work is, “How, at a micro-level, do K12-IHE partnerships address two key instructional leadership tasks, professional development and curriculum design?” While the SCALEviews and Mapping studies examine the motivation for collaboration, and the changing nature of SCALE as an organization, the Working Group studies provide a micro-level analysis of how K12-IHE partnerships are experienced, focusing on how collaborative relationships are built among K12-IHE actors, and how the groups function in order to achieve outcomes. In short, this research provides a description of the partnership’s instructional leadership practices. This study also contrasts with SCALEviews in that the groups selected for this study only include those engaged in professional development and curriculum design.

This line of work is producing four cases that focus on how leaders collaborate across higher education and K-12 district organizational boundaries within SCALE. Data for each case is drawn from observations of group activity and interviews with group members, and focuses on science or mathematics instructional leadership efforts to design and implement curriculum revisions or teacher professional development policies and programs. The cross-case analysis will show how working groups develop systems of leadership and how those systems reflect and are intended to change the partnering organization. The overall study is informed by distributed leadership theorists such as Spillane, Halverson, Gronn, and Lambert.

By December 20, 2006, the LAUSD Secondary Science Immersion and the Madison Metropolitan High School Equity professional development cases will have been completed. Data collection for the third, the Providence High School Science Improvement working group, will have begun in October, 2006, and will continue through spring 2007. Our intention was to select an IFL-related working group as the fourth case study. However, this will not be possible, as data gathering must occur in real time, and the University of Pittsburgh left the partnership in late summer 2006. Other groups under consideration are the LAUSD Elementary Mathematics Leadership Group, UW-Madison Pre-Service Science Course Development group, UW-Madison Math Masters Group, or the LAUSD/UW/CSU/Dana Center/Agile Mind group. A decision will be made in fall 2006, and data collection on the final case site will commence in February, 2007. The last two cases will be finalized by June, 2007. The cross-case analysis will be completed by September, 2007, and submitted for publication in a juried journal, such as *Organization*, by January 2008. Clifford and Millar will also develop a conference presentation and paper based on this work for the annual meeting of the AERA in 2008. This research will be integrated into the partnership book.

5. SCALE Partnership Book and other scholarly products, to be completed by December 31, 2008, by Susan Millar (lead), Matt Clifford, and Matthew Hora.

The above four lines of work are all designed to provide the material needed for several documents written for broad external audiences. As of June 2007, most BP effort will be focused on the preparation of these documents, and on presentations at national conferences. We plan to use the following timeline to develop these products.

Partnership Book

Millar, Clifford, and Hora, assisted by Bill Clune, will submit a full proposal for partnership book to a publisher by August 31, 2007. During September, while waiting for a response, we will continue with analysis and writing for other external publications (see below). Once we hear from the publisher, we will develop a timeline for submitting the completed manuscript by August 31, 2008. We plan to devote one more month, during fall 2008, to book revisions. Our intent is to complete all work on this book (except for galley proofs) by December 31, 2008.

Other writing for external audiences

During the second half of 2007 and during 2008, we will produce several proposals for conference presentations and several papers for submission to scholarly journals and magazines. These are listed in the deliverables section, below.

Deliverables for period of September 2006 – December 2007

Reports for SCALE Leaders

- Millar, S., Clifford, M., Hora, M., Tran, N., Coe, V. (July 2007). Summaries of Selected SCALE Working Groups and Key Individuals. Ad hoc report available to SCALE leaders on request.
- Clifford, M. & Smith, Z. (April 2007). Ransacking the literature: What research says about school-university partnership. Ad hoc report.
- Millar, S. Tran, N., Coe, V., and Clifford, M. (March 2007). Organizational Maps Depicting the Evolution of SCALE through Year Four.
- Clifford, M. (June 2007). Instructional leadership through K12-IHE partnership: The case of curriculum and professional development design for science improvement in Providence.
- Clifford, M. (June 2007). Instructional leadership through K12-IHE partnership: Fourth Case, TBD.
- Millar, S. Tran, N., Coe, V., and Clifford, M. (July 2007). Glimpsing the Evolution of SCALE through Organizational Maps.

Book Proposal and Manuscript

- Millar, S., Clifford, M., and Hora, M. (August 2007). Proposal for partnership book, submitted to book publisher.
- Millar, S., Clifford, M., and Hora, M. (December, 2008). Building a Partnership Book (title not yet determined).

Conference Presentation Proposals

- Millar, S., Clifford, M., and Hora, M. (April 2008). Proposal for symposium on key findings from SCALE Building a Partnership book, to be presented at AERA.
- Clifford, M. (April 2008). AERA presentation on working group study findings. Title TBD.
- Clifford, M., Hora, M., & Tran, N. (April 2008). Images of Others and ourselves: Cross-Institutional Perspectives on Collaboration between K-12 and Higher Education. AERA presentation

- Millar, S., Clifford, M., and Hora, M. (2008). Proposal for a paper presenting findings pertaining to how K12-IHE partnership working groups vary with respect to work requiring exploration or exploitation, to a conference held in mid-2008.

Papers to Be Submitted for Publication

- Clifford, along with Lauffer, Baxter, T. Millar, & Krinsky will submit their manuscript titled “SCALED Immersion Reform in K-18 Science Education,” to a journal such *Science Scope* (published by the National Science Teachers Association). A completion date not yet established, but is expected in 2007.
- Clifford will submit his AERA 2006 paper, “Cross-institutional collaboration and learning: How and why K12-IHE actors form partnerships for learning, innovation, and science instruction reform,” to a journal in spring 2007.
- Clifford will submit his cross-case analysis of K12-IHE partnerships for science/math instructional leadership in urban educational systems to *Organization*, or *Education Administration Quarterly*, by January 2008.
- Millar, Clifford, and Hora will submit a paper on key findings from their SCALE Building a Partnership book to *Change Magazine* in September 2008.
- Clifford, M. (2008) Analysis of Motivations to Participate in K12-IHE Partnerships by Home Organization. Exact title TBD. Possible submission to instructional leadership journal catering to IHE and K12 audience by October 2008.
- Millar, Clifford, and Hora will submit a paper summarizing key findings from their SCALE Building a Partnership book to an academic journal by November 30, 2008.
- Millar, Clifford, and Hora, will submit a paper presenting findings pertaining to how K12-IHE partnership working groups vary with respect to work requiring exploration or exploitation strategies to an academic journal by November 30, 2008.

Staffing

- Susan Millar, team leader and researcher: 0.75 FTE through 6/30/07; 0.8 FTE through 12/31/07
- Matthew Clifford, team manager and researcher: 1.0 FTE
- Matthew Hora, researcher: 0.2 FTE
- Natalie Tran, graduate student: 0.5 FTE
- Vanessa Coe, student assistant: 800 hours
- Student transcriber

SCALE Quality Indicator System

Scope of Work

For the scope of work in Year 5, the 2006 SQIS annual report will be completed in December 2006. This report will include tables and charts that present data to answer three basic questions for different demographic groups:

1. Has the achievement for a grade improved over time? (Cross-sectional attainment analysis)
2. Has the relative achievement of the district compared to the state improved over time? (Cross-sectional attainment of the district compared to the state without the district)
3. Has the achievement gap between different groups of students narrowed?

Other available data will be included such as the percent of students by proficiency levels.

The 2007 SQIS annual report will be due in December 2007 and will include similar analysis as the 2006 SQIS annual report, but will include what data are available at the time for the 2006-2007 school year.

To produce these reports will require us to collect student achievement data from the school districts when available. A request for data goes to districts in the spring. Usually we can get the data files from the district in the summer. We will continue to inquire and seek data on teacher professional development. Although districts have been able to provide us with student achievement data for a number of years, we have been less successful in obtaining district data on the amount of mathematics and science professional development teachers receive each year. We have acquired from MMSD a very detailed data set on the number of hours each district mathematics and science teacher has spent in professional development by year. This will give us the opportunity to do some analyses of the relationship between professional development and student performance. We have not been successful in receiving the same data from the other districts, although we continue to ask for these data in data requests. It could be that such data are included in a human resource database whereas we have access to data contained in the accountability or curriculum database. As such, we will continue to inquire from districts about data on teacher professional development.

A final report on the Madison East High mathematics curriculum study will be written by the end of December 2006. This report will describe the findings from the three year study of mathematics curricula at the high school along with some description of classroom practices.

Acquiring new data for the Math and Science Partnership (MSP) Management Information System (MIS) should present fewer burdens than prior years since district staff can modify previous extract and transform code rather than build new queries from scratch. LAUSD, however, may decide not to release individual level data to SCALE. If this decision is made, there will likely be a significant increase in the amount of work required by both SCALE and LAUSD staff due to increased specification of how data should be cleansed, aggregated, formatted and reported. Once data are acquired by SCALE staff, they will be loaded into the SCALE data warehouse and integrated with previously collected data. This process will be more

or less onerous depending on the number of changes that may have occurred within each district concerning how data are collected and stored in local information systems. Once cleansed and integrated, staff will rerun SQL code to create 2005-06 MSP-MIS data tables. We are still negotiating with Westat the MIS data submitted for Year 3. We hope to resolve this by the end of October 2006 and submit the MIS Year 3 data by that date. We will submit the Year 4 MIS data in November 2006 and the Year 5 MIS data in November 2007.

Staffing for the Indicator System

Norman Webb will head the Quality Indicator System for Goal 5 for 2006-2007. He will devote 15% of his time to this effort. His time will primarily be spent in coordinating work on the SQIS, convening meetings of the SCALE data group, and helping to write the annual report. Chris Thorn will coordinate those who are developing the data system in support of SCALE and the SQIS at 10% of his time. Jeff Watson will allocate 25% of his time to the data system and SQIS along with 25% of this time to the MIS effort. Larry Schultz will allocate 25% of this time to working on the database that underlies the indicator system. Jeff Swift will work 100% time as an academic staff in support of data analysis, entry, and development of charts. About half of his time will be directed toward the indicator system while the other half will be devoted to the MIS effort. John Jensen will work 25% with data mainly in support of the Building a Partnership work.

Institutions of Higher Education Case Studies

Scope of Work

The Institute of Higher Education (IHE) Case Studies line of work for the SCALE Research and Evaluation Team (RET) is comprised of four studies: 1) Case Study of California State University, Dominguez Hills; 2) Case Study of California State University, Northridge; 3) Case Study of University of Wisconsin-Madison; and, 4) Cross-Case Analysis of the three IHEs case studies.

The purpose of the case studies is to assess any changes occurring in pre- and in-service training for K-12 math and science teachers, and if the changes can be attributed to SCALE activities. Since these programs are context-specific and complex systems of action, the qualitative case study design was selected. The research design for this line of work is a multi-case design, where research methods are replicated at different sites in order to assess, explore, and describe the context in which SCALE activities take place at IHEs. Each study draws upon in-depth interviews with key faculty and administrators, analysis of documents and reports, and limited observations of meetings and seminars.

Each case study will be comprised of two phases of data collection, analysis, and reporting: a descriptive phase and an exploratory phase. The descriptive phase will collect background material and explore broadly defined topics related to SCALE and pre- and in-service training programs. The exploratory phase will build upon findings from the descriptive phase, focus on emerging themes and topics for further exploration, and assess the ultimate impacts of SCALE on the pre- and in-service programs of each IHE. For each of the IHEs noted above, a preliminary and a final case study report will be developed.

A final, cross-case analysis based on findings from the case studies will be conducted at the end of 2007, upon completion of the three final case studies. However, in order to accurately capture the scope of SCALE activities from 2002-2007 in IHE settings, two additional sites will be briefly studied. One of these sites, the Metropolitan State College of Denver, is an IHE that was involved in SCALE for a brief time. The other site, the East Bay Educational Collaborative in Rhode Island, is providing intensive in-service training that is analogous to that provided by IHEs in other locations. Including these sites in the final cross-case analysis will provide two additional data points for the triangulation of key themes and trends, thus increasing the generalizability of the research findings. The analysis of these sites for the final cross-case analysis will employ the same methods as the primary case studies (both descriptive and exploratory), and will be conducted in a relatively short span of time.

During the January – December 2007 period, the following work is planned:

Weekly analysis meetings

Matthew Hora and Susan Millar meet weekly to review Hora's progress and discuss emerging findings and theories. Hora also participates in weekly meetings of the Building a Partnership team, and monthly meetings of the RET. These meetings provide him information relevant to the IHE Case Studies, and opportunities to develop new insights into his IHE Case Study work.

Literature review

Hora will continue to review literature relevant to interactions between teacher education and STEM faculty in IHEs, and to IHE/K-12 partnerships as he proceeds with the IHE case studies.

California State University, Dominguez Hills Final Case Study

Hora will conduct interviews with approximately 25 CSUDH administrators and faculty during October and November of 2006. He will analyze these data, along with other relevant observation and document data and produce a final CSUDH report as of February 28, 2007. S. Millar will review and edit this case study.

University of Wisconsin-Madison Final Case Study

Hora will conduct interviews with 25 UW-Madison administrators and faculty in March and April of 2007. He and a graduate assistant will analyze these data, along with other relevant observation and document data, and draft the final UW-Madison case study by April 2007. S. Millar will review and edit this case study. Hora will present this case study at AERA, if the proposal is accepted.

California State University, Northridge Final Case Study

Matthew Hora will conduct interviews with 25 CSUN administrators and faculty in May and June of 2007. He and a graduate assistant will analyze these data, along with other relevant observation and document data, and draft the final CSUN case study by October, 2007. S. Millar will review and edit this case study.

East Bay Educational Collaborative

Matthew Hora will conduct interviews with 10 EBEC staff in May 2007. These data, along with other relevant observation and document data, will be analyzed by a graduate assistant, and will be included in the final cross-case study.

Metropolitan State College of Denver

Matthew Hora will conduct interviews with eight MSCD administrators and faculty in July 2007. These data, along with other relevant observation and document data, will be analyzed by a graduate assistant, and will be included in the final cross-case study.

Cross-Case Study

Hora will conduct analysis for the Cross-Case Study throughout the year, and will write this study during October, November, and December. Completion of the final cross-case study is planned for December 30, 2007. S. Millar will review and edit this case study. Hora will submit to AERA 2008 a proposal in which he will present finding of this case study.

Deliverables for period of September 2006 – December 2007

Hora, M., (2007). California State University, Dominguez Hills, Final SCALE Case Study. University of Wisconsin-Madison. (February, 2007)

Hora, M., (2007). UW-Madison, Final SCALE Case Study. University of Wisconsin-Madison. (April, 2007)

Hora, M., (2007). California State University, Northridge, Final SCALE Case Study. University of Wisconsin-Madison. (September, 2007)

Hora, M., (2007). Cross-Case Study of SCALE Impact on Selected Institutions of Higher Education. University of Wisconsin-Madison. (December, 2007)

Staffing

- Matthew Hora – 8.0 FTE
- Susan Millar - 0.1 FTE
- Graduate Assistant – 0.5 FTE
- Student hourlies for transcribing

District Case Studies/Targeted Studies

Scope of Work

The scope of work for district case studies in Year 5 (continuing into the no-cost extension period in Year 6) will include the following four activities:

1. *Two in-depth case studies.* Data will be gathered and results reported for two in-depth case studies: implementation of interim student assessments in PPSD and implementation of middle school science immersion in LAUSD (Plate Tectonics unit)
2. *Synthesis of district case studies (panoramic and in-depth).* Clune will write a synthesis of all district case studies, both panoramic and in-depth.
3. *Cross-partner conference on lessons learned from science immersion.* Clune will organize a cross-partnership conference (or think tank) on lessons learned about science immersion in the partnership and write or co-write a conference synthesis.
4. *Chapter 2 of the Building a Partnership book.* Clune will co-author with Matt Clifford and Susan Millar this chapter of the building a partnership book.

Details on these activities (including products and timeline) are provided below, followed by sections on staffing and budget.

1. In-depth study of interim assessments in Providence Public Schools

In this study, Clune and White examine the implementation of interim assessments, their history, purpose, and technical characteristics, with a special focus on how the data are reported, used, and responded to, in light of their intended purpose of improving instruction. Document collection and interviews with district staff and teachers in six schools took place in Spring 2006. A wider sample of teachers will be interviewed in Fall, 2006. The wider sample will include 16 additional schools bringing the total schools visited to 22 of the 24 total schools in the district, as shown in the following table:

School Level	Phase I	Phase II	Total Schools Sampled	Total Schools
Elementary	2	10	12	25
Middle	2	3	5	9
High School	2	3	5	10
Total	6	16	22	44

The interview protocol for focus groups in the schools has been modified in light of findings from Phase I. All focus group participants will be asked to fill out a short survey instrument containing forced-choice items with space for short comments. The open-ended questions have been reduced to four to accommodate the short time in the school day for teachers to join the focus group (and the revolving door participation by different teachers) experienced in Phase I. The questions are now more sharply focused on the key issues about how teachers interpret and

use the results from the interim assessments to make changes in instruction (see protocol, Appendix A). District staff also will be re-interviewed to check for developments and shifts in strategy.

Time line and products for the study as are as follows:

- Phase 2 interviews of district staff and schools: November, 2006
- Transcription, coding, analysis: December, 2006 - April, 2007
- Final report: August, 2007

2. In-depth/ targeted study of science immersion in LAUSD

The in-depth case study of science immersion in LAUSD will consist of a study of middle school immersion professional development design and delivery, teacher implementation of immersion units in classrooms, effects on student learning, and system support for immersion teaching and learning at all levels (e.g., school, local district, central office, higher education). Because of the follow-through to classroom instruction and student achievement, the study is a hybrid of what previously had been considered separate categories in the RET design -- the in-depth case study and the targeted study, the latter being defined by its focus on instruction and student achievement. In fact, the new study incorporates all of what had previously been done by Bruce King in his targeted study of science immersion in LAUSD. See summary of King's work recently presented to a cross-district group at <https://workspace.wcer.wisc.edu/gm/document-1.9.65384>

The middle school immersion study methodology is multi-faceted. The focus of the study is on Grade 6 science immersion (Plate Tectonics). Three teacher institutes have been conducted this summer. RET researchers observed all three institutes to document professional development delivery. The following instruments/research activities were also conducted with institute participants:

1. Administration of institute science content knowledge pre- and post-test (developed under NSF RETA grant by Horizon Research).
2. Administration of 2-part survey: (a) Teacher demographics, professional preparation, and measures of teachers' local school capacity for supporting inquiry science teaching and learning, and (b) A version of the *Survey of Enacted Curriculum* that has been customized to the content domain of the Plate Tectonics immersion unit. Institute participants take this survey at the institute to report on the instructional content (topics and cognitive demand) of the part of the curriculum devoted to plate tectonics as they taught it in SY 2005-06. They will take the survey again once they have completed the unit in SY 2006-07. This will allow assessing the impact of the immersion unit and professional development on classroom teaching.
3. Focus groups to assess teachers' institute experiences.

Subsequent to the institutes the following research activities will be conducted:

1. Two-three classroom observations of each of 30 randomly selected institute participants
2. Interviews with all observed teachers.

3. Collection and analysis of student work samples for all observed classrooms.
4. Post-implementation survey of classroom content with all institute participants.
5. Analysis of district quarterly benchmark assessments to compare the achievement of students in classrooms of teachers who have taken the immersion institute to student in classrooms with teachers who have not.
6. Interviews with principals, local district and central office administrators to learn about district support for and obstacles to broad and deep implementation of middle school science immersion in LAUSD.

The Grade 6 immersion study calls for observing 30 teachers for 2-3 lessons each. Observations will be of two types. First, all observations will include a RET-trained observer who will complete the RET classroom observation protocol. Second, at least half of all observations will also include a LAUSD Program Evaluation and Research Branch (PERB) observer who will focus on capturing verbatim data from lessons and creating lesson narratives. The two types of observation data combined will provide a systematic, detailed record of lesson content, pedagogy, and student engagement, including the extent to which lessons reflect the immersion vision as exemplified in immersion institutes and materials. Three PERB observers who will participate in Gr. 6 immersion classroom observations participated in training for the RET structured classroom observation protocol to insure understanding of the range and nature of classroom activity for which it will be most important to capture illustrative dialogue and narrative.

A final note on the RET middle school science immersion research in LAUSD is the way in which it is connected to other projects and researchers to optimize the range and quality of analysis that will ultimately be possible. For example, we designed Part A of our teacher survey in conjunction with Adam Gamoran, PI of an NSF Teacher Professional Continuum (TPC) study of elementary immersion in LAUSD. Using the same instrument will permit comparing school capacity issues in LAUSD across the elementary and secondary levels to better understand the range of organizational factors affecting effective implementation of immersion instruction. The classroom observation instrument for the middle school immersion study is also the same one being used by LAUSD PERB researchers and the TPC study. This, too, will allow comparing immersion initiative effects between elementary and secondary levels.

Time line for data collection is as follows:

1. Data collection at Summer Science Immersion Institutes for Gr. 6 unit (complete mid-August).
2. Train UW Madison RET staff, Immersion Development Team staff, and CSU faculty in classroom observation protocol for science immersion (mid- to late- August).
3. Coordinate classroom observation of Gr 6 immersion science instruction in LAUSD (Mid-August through December).
4. Coordinate immersion implementation interviews with LAUSD district, local district and school instructional leaders (January through May 2007).

Research reports:

1. Summary of Summer Immersion Institute Participant Science Content Knowledge Learning Gains (Sept/Oct 2006)
2. Summary of Summer Insitute Delivery (including focus group data) (Sept/Oct 2006)
3. Analysis of Survey data from summer insitute participants (nov/Dec 2006)

4. Analysis of post-implementation teacher survey data (March 2007)
5. Analysis of classroom observations of immersion implementation (March/April 2007)
6. Analysis of Immersion Teacher interviews (May 2006)
7. Analysis of Immersion classroom student work (March/April 2007)
8. Analysis of science instructional leader interviews (May 2007)
9. Analysis of Periodic Assessment data from LAUSD Gr 6 science classrooms (immersion insitute participants and non-participants) (May/June 2007)
10. Draft report synthesizing above data/reports addressing overall implementation and effects of science immersion initiative in LAUSD at Grade 6 level. (Begin work in June 2007, complete draft August 2007)

3. Synthesis of district case studies (panoramic and in-depth)

Year 5 is the natural time for synthesis of all the district case studies, and important cumulative lessons have emerged that will be the topic of a final report by the case studies director (Clune). The case studies examined how the four SCALE districts went about designing and implementing an effective instructional delivery system -- a set of policies and organizational routines capable of producing rigorous and equitable instruction and student learning. Across all the districts, exemplary principles and policies emerged that together serve as a model of best practice. A preview and preliminary understanding is that the best practice in the SCALE districts is:

1. Outcome-oriented, guided by a deep, coherent vision of instruction and learning
2. Bottom-up, oriented to the periphery rather than the center, focusing on what is actually delivered to schools and teachers
3. Simple, relying on a relatively few tools with high leverage on instruction
4. Affordable, making efficient use of the resources and time of district and school staff and avoiding waste
5. Coherent, offering consistent guidance while avoiding confusion and contradictory messages
6. Distributed, emphasizing common purpose, co-construction and buy-in between districts and expert partners, within districts, and within schools
7. Adaptable, emphasizing continuous improvement, systemic thinking, and organizational learning
8. Sustainable, avoiding negative organizational dynamics, such as organizational conflict, loose coupling and rapid decay from changing circumstances and staff turnover

The building blocks of such a system as seen in the best practice of districts seem to be the following. The synthesis paper will provide specific, concrete examples of:

1. Regular leadership training in key principles of student learning, such as effort-based intelligence and active learning
2. Standards-based alignment of the formal artifacts and "pillars" of instructional guidance, including instructional guides, scope and sequence, grade level expectations, student assessments, and mandated curricula
3. System management and coordination based on clear goals for student learning, feedback on performance, and methods of continuous improvement
4. Professional development of teachers matched closely with the enacted curriculum, key principles of learning, and research-based principles of effectiveness

5. Standards-based, formative assessment of students adapted to the schedules and goals of particular teachers with results delivered in a format and at a time appropriate for correcting student misconceptions
6. Training and accountability of school principals in the key activities or tasks of effective distributed instructional leadership in schools

Timeline and products. The synthesis will be conceptualized on an ongoing basis, written starting in Fall, 2007, and completed for internal review during the no-cost extension period by March, 2008.

4. Cross-partner conference on lessons learned from science immersion

As stated, Clune will organize a cross-partnership conference (or think tank) on lessons learned about science immersion in the partnership and write or co-write a conference synthesis. The value of holding a common event became apparent in discussions of the various studies and perspectives on science immersion that have occurred and otherwise will not be pulled together in one place. These include:

- The in-depth study of science immersion in LAUSD in district case studies (headed by Eric Osthoff)
- Case studies of impact on IHEs of immersion development and implementation (e.g., Matt Hora) and studies of partnership working groups from the BP team (Matt Clifford)
- The experience and perspective of the immersion implementers in the partnership, including Dan Lauffer and Hedi Baxter
- The experience of district and IHE implementers in LAUSD
- Evaluation findings from the QED evaluator, Susan Tucker, on science immersion institutes
- The results of the randomized controlled experiment funded under a TPC grant and conducted by Adam Gamoran in elementary immersion in LAUSD
- The experience of science immersion in MMSD, which is not the focus of a research study but can be captured through descriptions and accounts of district personnel
- The principles of effective professional development as they throw light on professional development, a perspective introduced by Andy Porter in an RET video conference
- Research and implementation experience of Chris Schunn from the Pittsburgh school district

At this juncture and subject to modifications, the basic plan for the conference is one and one-half days with small papers, presentations, and discussions, videotaped and observed by RET (as usual for such SCALE events).

Timeline and products. The conference is planned for Fall, 2007. A preliminary draft of papers, proceedings, and the synthesis would be written and available for internal review by March, 2008.

Chapter 2 of Building a Partnership book.

Clune has been asked to co-author with Matt Clifford and Susan Millar Chapter 2 of the building a partnership book, described as follows in the BP Year 5 implementation plan:

Chapter 2. Overarching Framework and Story of the Leadership Group. Chapter 2 presents both the overarching framework for SCALE and key information about one source of change attributable to the partnership – the story of how the top-level leaders from each of the main partner organizations participated in the SCALE partnership. As information on the context in which each of the partner organizations operates is needed to understand this story, this also is provided. We tell this story from the standpoints of the leaders of these partner organizations. In short, this is a story of SCALE IHE players competing for influence with the districts, and the district responses. Here we present the differences in what the leaders from each partner organization expected and then experienced. This is also where we present how restructuring of the originally planned division of labor was strongly affected by the emergence of self-organizing working groups, and how response from the top leaders to the work of these groups, in turn, affected the working groups.

Clune has spent many hours with Millar, Clifford, and others in SCALE discussing the "big grain size" dynamics of the partnership. Integrating Clune's perspective with the chapter plan and perspectives of the other authors remains to be worked out. This chapter will focus on structural and organizational factors producing the big divisions of labor in the partnership, the streams of work and cooperation, and the organizational disputes and conflicts (in a sense, the plate tectonics of the partnership). Among the pieces Clune is interested in analyzing and writing about are:

- Largely unarticulated and widely divergent assumptions about the division of labor underlying the partnership mission and strategy that became apparent as events developed and specific issues emerged "on the ground"
- Distinct and divergent understandings of the primary bonds of communication, authority, and planning between the university partners and the districts that again became apparent with emerging events
- In contrast, the continuity and relative tractability of the district perspective (roughly one of meeting district needs through expertise of the universities) and the role of the districts as the "quiet engine" of the productive working groups

Clune's perspective is based on his experience as a member of the UW-Madison partner organization, significant socialization in the IFL perspective and understanding of the IFL and the district partners derived from the district case studies. The task of collaboration will be to test assertions against the body of data collected by the BP team, modify conclusions, and highlight key pieces of evidence. This chapter will be reviewed by top leaders of all current and former SCALE partner organizations.

Timeline and products. The timeline submitted by the BP team in their Year 5 implementation plan is quoted below. Most of the work will occur from Fall, 2007 to August, 2008.

Millar, Clifford, and Hora, assisted by Bill Clune, will submit a full proposal for partnership book to a publisher by August 31, 2007. During September, while waiting for a response, we will continue with analysis and writing for other external publications. Once we hear from the publisher, we will develop a timeline for submitting the completed manuscript by August 31, 2008. We plan to devote one more month, during fall 2008, to book revisions. Our intent is to complete all work on this book (except for galley proofs) by December 31, 2008.

Staffing

Staffing of the district case studies team is as follows:

Clune, 60%
Osthoff, 75%
White, 100%
Ferrare, x%
Kerry Kretchmar, 100%
New research assistant, 50%

LAUSD immersion study staffing and activities.

Observations. The table below provides the names of observers from the UW-Madison and CSUs who have been trained in the classroom observation protocol and will conduct observations for the study. Also shown is the number of teachers that will be covered by each observer, and the number of trips it is estimated researchers will make to LA to conduct observations.

Observer Name (Team)	# Teachers to Observe	# Trips to LA for Classroom Observations
Eric Osthoff (RET)	3-4	2
Paula White (RET)	3-4	2
Kerry Kretchmar/Joe Ferrare (RET)	3-4	2
Hedi Baxter (Immersion Design)	3-4	6 trips for RET. (Immersion Design Team members will be traveling to LA for their implementation work. When possible we will schedule their observations to coincide with trips they are already making for their other SCALE activities in LA).
Matt D'Amato (Immersion Design)	3-4	
Jennifer Folsom (Immersion Design)	3-4	
Joe Braun (CSUDH)	3	NA
John Keyantash (CSUDH)	3	
Jim Hill (CSUDH)	3	
Gerry Simila (CSU-Northridge)	3	

Analysis of Survey Data. The study involves 2 survey instruments. Joe Ferrare will have primary responsibility for managing the survey data and implementing analysis plans under the guidance of Eric Osthoff, Adam Gamoran, and John Smithson. John Smithson will assist with the analysis of the “micro-SEC” data.

Analysis of Student Achievement Data. The study calls for analysis of student achievement (on district periodic assessments) for students in the classrooms of teachers who participated in immersion institutes, plus a small random sample of students of teachers from classrooms of

teachers who did not participate in institutes. Joe Ferrare will carry out this analysis under the guidance of Andy Porter.

Analysis of student work samples. Analysis of student work samples will be coordinated by Kerry Kretchmar and Eric Osthoff. SCALE Immersion Design Team members will be asked to lend their content expertise to the effort by participating in scoring.

Stipends for Teacher Surveys and Interviews. The project promised stipends totaling \$2050 to teachers for the completion of post-implementation interviews (30 teachers @ \$25 each) and post-implementation surveys (52 teachers @ \$25 each).