SCALE Case Study:
Evolution of K-8 Science Instructional Guidance in Madison Metropolitan School District

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Introduction

Since the late 1990's, Madison Metropolitan School District (MMSD) has been attempting to transition from a highly decentralized district with a fragmented instructional system to one that has a coherent organizational framework that links district priorities and goals with school improvement policies and instructional support for teaching and learning. Within that context, district-level science specialists have been engaged in an extended period of strategic planning, development, and implementation of a coherent K-9 science program. The district's partnership with the SCALE (System-wide Change for All Learners and Educators) project, and specifically with UW-Madison scientists, educators, and researchers, has played an increasingly important role in supporting district staff as they develop their K-9 science initiative.

This case study report has three main objectives:

1. to describe the key policy changes taking place in the district within the domain of K-9 science education;
2. to analyze the factors that enable and constrain the district's capacity for making sustainable change to support a coherent plan for instructional guidance in science; and
3. to examine the impact of the SCALE partnership on MMSD's capacity to bring a rigorous science program to scale across the district.

The first section provides a snapshot of the district with respect to its student demographics and student performance indicators in science. The second section describes the specific efforts of the MMSD science program staff to develop and implement an inquiry-based K-9 science program aligned to the standards. The fourth section provides an analysis of some of the district's major organizational capacities and limitations in its efforts to create greater coherence in science instructional guidance, and the final section looks at the extent to which the SCALE partnership is contributing to those efforts.

This case study is based on analysis of data collected between the Fall of 2003 and Spring 2005. Data include: a) multiple in-depth interviews conducted with key district staff, including the Superintendent, Assistant Superintendents, Educational Framework Facilitator, Director of Teaching and Learning, the Science Coordinator, and Science Instructional Resource Teachers; b) district documents obtained from the MMSD website; c) instructional guidance documents provided by the district science staff; d) observations of district-led science meetings; and e) quantitative data on student enrollment and student achievement in science obtained from the WINNS system (on-line public-access data reporting system on student performance run by the state Department of Public Education). These data were analyzed to identify the major policy initiatives of the district and of the science program in particular. Analysis of organizational capacities and limitations was developed through observations of district meetings, multiple conversations with the district staff, and iterative discussions with research colleagues on SCALE's Research and Evaluation Team at the University of Wisconsin-Madison.

District Context

Demographics

The city of Madison, Wisconsin has a population of 208,000 and is home to both the state capitol and the University of Wisconsin-Madison, which enrolls over 41,000 students. Madison Metropolitan School District is the second largest district in the state and includes 47 schools (31 elementary, 11 middle, 4 comprehensive high schools, and one alternative high school). Although the total enrollment of the district has remained steady at about 25,000, the student population demographics have changed substantially over the past 15 years. Between 1989 and 2004 the percent of students of color in the district rose from 17.9% to 42.2%. The proportion increased across all racial/ethnic groups, but did so most significantly in the Latino population. Table 1 shows enrollment data from Fall 2004.

Table 1.
MMSD Enrollment by Student Group (Fall 2004)

Race/Ethnicity	% of Total Enrollment
White	57.8%
African American	20.5%
Hispanic	10.9%
Asian	10.2%
Native American	0.6%

The number of low-income students in the district also grew substantially. Between 1991 and 2005 the percent of students receiving free and reduced lunch grew from 20.3% to 37.2%. In addition, the proportion of English Language Learners has increased considerably. In 1991, fewer than 700 students were eligible for ESL services. Currently, the district provides ESL services for over 3300 students (13.5% of total enrollment). Finally, special education student enrollment increased from 10% to nearly 17% between 1991 and 2004.

Student Performance Indicators

MMSD students take the state assessments—Wisconsin Knowledge and Concepts Examinations (WKCE)— in reading, language arts, math, science, and social studies in grades 4, 8, and 10, as well as the Wisconsin Reading Comprehension Test in grade 3. As required by the No Child Left Behind legislation, state testing in math and reading is expanding in the 2005-2006 school year to include the WKCE-CRT (Criterion Referenced Tests) in reading and math in grades 3-8 and 10.

In November 2003, student performance on the WKCE in science in MMSD as a whole was generally comparable to the state average. Table 2 shows 2003 data on student performance in science for each tested grade level in the district and state. Across grade levels, MMSD had a higher percent of students scoring in the advanced category, and a slightly higher percent of students scoring in the minimal category, than the state as a whole. Data from 2002, while not displayed here, show similar patterns.

	Table 2. WKCE Science (November 2003)					
	4th grade		***8th grade***		***10th grade***	
	MMSD	WI	MMSD	WI	MMSD	WI
Minimal	3	3	14	12	18	16
Basic	18	14	16	16	9	11
Proficient	53	59	42	46	30	36
Advanced	24	21	27	23	40	34

When MMSD student performance data on the WKCE exam in science are disaggregated by student group, substantial racial and economic achievement gaps are evident. Figure 1 below shows student performance on the 2002 WKCE in science, disaggregated by race/ethnicity. As indicated, 86% of white students at the 4th grade level scored proficient or advanced in science while 63% of Asian students, 51% of Hispanic students, and 49% of Black students scored at those same proficiency levels. At the 8th and 10th grade level, student performance scores show even greater disparities between white students and students of color. Figure 2 shows student performance on the same test disaggregated by economic status. Here again, substantial achievement gaps are evident at each grade level.

Figure 1. MMSD: WKCE Science (2002)
Percent Proficient or Advanced by Race/Ethnicity

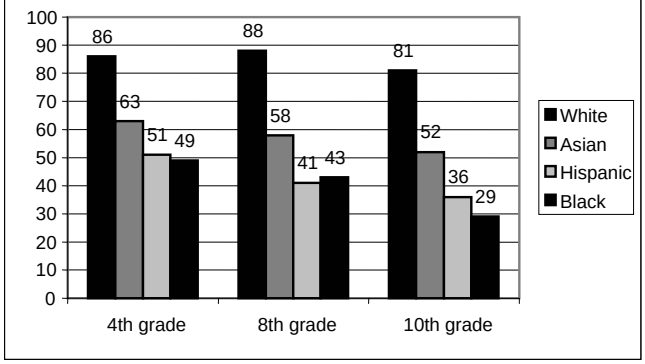
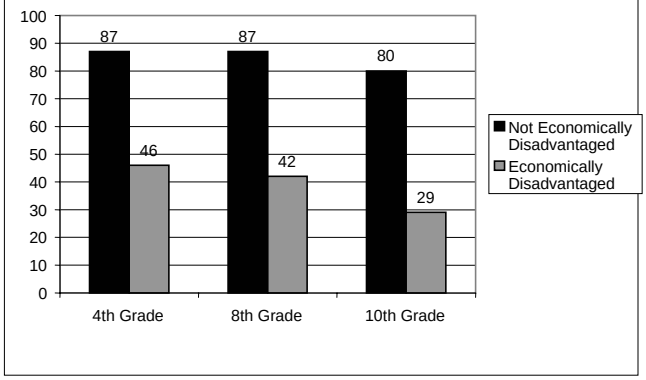


Figure 2. MMSD: WKCE 2002 Science
Percent Proficient or Advanced by Economic Status



Movement toward Standards-based Reform

Throughout the 1980's and 1990's, MMSD was a largely decentralized district. District and school management systems were very loosely coupled. The central office tended to be driven by crises rather than by a strategic planning process that was widely visible to district players. Schools and school administrators operated in isolation from each other and with a high degree of autonomy. Within the school, teachers independently exercised a great deal of control over the curriculum and instruction in their classrooms, and the level of collaboration among staff at the school level tended to be low. While the district contained "pockets of excellence" with respect to school leadership and teacher practice, there were few district-wide policies or tools that could effectively transfer those exemplary practices to other schools and settings in the district. Indeed, central office administrators considered abolishing the district's Teaching and

Learning Department, because it had so little influence on instructional guidance. In short, the instructional system was fragmented and lacked vertical and horizontal coherence. As the student demographics started to shift in the 1990's, the district found itself unprepared to adequately support high quality teaching and learning for all students.

In 1997, the district's Board of Education adopted the state's Wisconsin Model Academic Standards for grades 4, 8, and 10. Since that time, district content area specialists have used those standards as a basis for the development and alignment of grade-level standards, instructional guides, and professional development designed to help teachers understand the main concepts underlying the standards, plan their instruction, evaluate their curricular materials, and assess student understanding. Efforts to align instruction with standards at the high school level have lagged behind those at the K-8 level. However, steps have recently begun to be taken to define student learning outcomes in some core subjects in grades 9 and 10, and to align course content to those outcomes. While the district does not mandate the use of any single curriculum in any subject area, the use of a common curriculum across the district in certain subjects areas has evolved or been encouraged by directing professional development support toward a particular curriculum. For example, all middle schools use the Connected Math Program, and, as will be described in more detail later, the Full Option Science System (FOSS) is the recommended and supported curriculum in K-8 science.

Despite these district-level efforts to align instructional frameworks, curriculum recommendations, and professional development to the standards, it remained difficult for district-level staff, given the high degree of school and teacher autonomy, to influence both instruction at the classroom level and school leadership practices to support that instruction. As a result, soon after adoption of the state academic standards, the district's Teaching and Learning (T&L) Department introduced a standards-based report card system at the K-5 level. For each grade, the report cards list a condensed version of the appropriate grade-level standards in each subject area; teachers rate students' level of performance using a grading rubric developed by the T&L department. Currently the district is in the process of extending the reporting system through grade 8. According to the Director of the T&L Department, although the report cards were developed initially and primarily in order to provide families with more detailed information about what their children know and are able to do, the reporting system has had the side effect of increasing curricular coherence within and across schools in the district, and raising the level of accountability for teaching to the standards.

Science within MMSD

The major initiatives designed specifically to improve science instructional guidance within the district have been undertaken within the Teaching and Learning Department. As standards-based reform has taken root in the district, the T&L department has played an increasingly important role in supporting that development. Through its partnership with SCALE, the T&L department indicated that it sought to improve math and science education by: 1) supporting rigorous inquiry-based curriculum and instruction in math and science for all students; 2) increasing curricular coherence through accountability for teaching to the standards; 3) developing and using strategies to close the racial and economic achievement gap; 4) shifting toward teacher professional development models that are ongoing, collaborative, embedded, and on-site; 5) involving the higher education math and science community in K-12 education in ways that are

systemic and aligned with the district's goals and priorities, and 6) using research-based evidence, data, and tools.

The T&L department faces a number of challenges as it attempts to institute these principles. First, of course, is the limit on resources available to provide schools with the materials and professional development needed to fully implement high-quality programs. In recent years, MMSD has faced severe budget reductions. Programs and services have been cut, class sizes may soon be increased, and professional development resources scaled back. In addition to those resource difficulties, district math and science specialists indicate that the primary challenges they face are: a) building teachers' understanding of the standards, as well as their math and science pedagogical content knowledge; b) helping teachers differentiate their instruction and use rigorous instructional strategies for all students; c) working with principals to recognize and support high quality math and science instruction.

As in most districts, MMSD's efforts to implement and support a standards-based science program have lagged behind such efforts in language arts and mathematics. In 1998, the Board of Education outlined priorities related to reading and math which have heightened the emphasis on reading and math instruction at all grade levels and directed support resources to those areas. However, the district currently has no Board priority for student achievement in science. While there are nine district level Instructional Resource Teachers (IRTs) in math, there are just three content specialists in the science area: a Coordinator and two IRTs, one for elementary and one for secondary. These specialists are responsible for writing instructional guides, making curricular recommendations, researching exemplary instructional practices, evaluating assessment tools and strategies, and providing professional development support to the district's 47 schools.

Similar to many districts, MMSD faces significant challenges at the school level to improving science education. At the elementary level, instructional time and resources available to teach science are often quite limited, and teachers' content knowledge of the subject tends to be low. At the middle school level, this latter challenge is particularly salient as only a small percent of science teachers have a certification in the subject area. Many of the teachers teaching science lack a solid understanding of the subjects they teach. In addition, those with certification and/or expertise in science may be assigned to teach other subject areas at the discretion of the principal. At the high school level, the content of the basic science courses vary substantially from teacher to teacher and school to school. Across all levels, the history of teacher independence in the district with respect to science curriculum and instruction has slowed efforts to bring standards-based reform to teaching and learning in this subject.

Some changes are on the horizon. NCLB accountability requirements in the area of science will be introduced in 2007. MMSD's Superintendent anticipates that science achievement will become a Board of Education priority in the coming years. In addition, the Wisconsin Department of Public Instruction has convened a committee to develop a science framework and related grade level standards. MMSD science staff are participating on that committee and aligning their district efforts with the statewide framework. Over the past seven years, MMSD science specialists have been working to scale up the science program and bring greater coherence and focus to science education across the district. They have been engaged in a period of review and strategic planning to improve implementation of the district's K-8 science Scope and Sequence and to work with high school departments to develop a more coherent biology curriculum.

The period of review, planning, and change within science closely parallels and provides a good example of the district's attempt to move away from fragmentation and toward coherence within a standards-based reform framework. Below, I describe the progressive development of the K-8 science program over this period of time, focusing both on the main initiatives undertaken by district science specialists to increase the coherence of the program and SCALE's role in partnering with the district.

Before turning to that description, I will note that an essential piece of the story of policy development and adaptation in the K-9 science program has been the changing nature of the district's relationship with the University of Wisconsin-Madison, and in particular with science experts on campus. MMSD has a long history of engagement with the University of Wisconsin-Madison. The main district office is contiguous with the university grounds, and many grants have brought the research expertise and outreach resources of the university to bear on K-12 education in the district. In the past, however, collaborations between the university and the district most often involved connections between individual faculty members or scientists and individual teachers. For example, teachers who had a strong interest in science could take advantage of the extensive material and human resources of the university to deepen their science curriculum and develop specialized science projects in their classrooms. While these point-to-point connections helped produce a number of high quality science teachers, the majority remained untouched by such collaborations. Thus, rich as the university resources were, they were not being used to improve the overall quality of science teaching across the district. Since the introduction of standards-based reform in the district, and later, through the partnership with the SCALE project, science specialists at the district and UW-Madison partners have played an increasingly stronger role in coordinating and aligning the resources of the university with the overall needs of the district. As will be described in greater detail below, the district's collaborations with the university in the area of science are now being directed at supporting broad initiatives aligned with its vision of science education. In particular, SCALE's material, human, and intellectual resources are being utilized to support the implementation of a coherent and rigorous K-8 science program.

Evolution of K-8 Science Program

Development and Review of Scope and Sequence

In 1999, two years after MMSD adopted the state's Wisconsin Model Academic Standards, the district developed and launched a K-8 Science Scope and Sequence aligned to those standards. After reviewing a variety of science curricula, a district committee selected an inquiry-based curriculum—Full Option Science System (FOSS)—as the recommended vehicle for implementing the K-8 Scope and Sequence. FOSS was introduced initially in the elementary grades and two years later in the middle schools. Since that time, district science resources and professional development have been fully directed toward facilitating teacher understanding and use of the FOSS modules, as well as the related scientific concepts and instructional strategies.

In January 2003, the district began its partnership with SCALE, and SCALE funds were used to hire a secondary Instructional Resource Teacher in science. That fall, the district science specialists began a period of review and planning related to the implementation of the K-8 Scope and Sequence. One of the first steps taken by the Science Coordinator was to convene a Scope and Sequence Review Committee (SSRC) comprised of teachers, learning coordinators, district science staff, and UW/SCALE partners. The primary objective of the SSRC was to provide

input and feedback to district staff related to improving science education across the district. In addition, by involving teachers in the committee, district science staff were attempting to open the lines of communication between teachers and the central office with respect to developing a shared vision of science education.

The SSRC met over the course of two years. During the first year, the committee's work spawned developments within the science program in the following areas: 1) strategic analysis of student performance on the WKCE science assessments, and 2) assessment of the extent to which the Scope and Sequence and FOSS curriculum were being implemented across the district.

Strategic analysis of student performance on the WKCE science assessments. Raw data from the state achievement exams (WKCE) in science had long been reviewed by MMSD district science staff. However, district staff began to think systematically and strategically about how to effectively access, compile, analyze, and present data such that it could be used in meaningful ways by district administrators, principals, and teachers. In early 2004, district staff met with SCALE researchers to design a template for looking at student performance data. That template included: a) item analyses to better understand how students are performing on particular science standards; b) student demographics (race/ethnicity, economic status, student mobility, gender, and English language proficiency) across the district and disaggregated by school; and c) percent of students advanced and proficient in science throughout the district and in comparison with all Wisconsin public schools with breakdowns by gender, ethnicity, English proficiency, disability, and economic status.

Data from the past two years were compiled using this template and presented in a number of different forums. First, data were presented to the SSRC in the Spring 2004. On reviewing the data, committee members noted substantial achievement gaps by race/ethnicity and income in science, as well as particular schools that appeared to be making progress in reducing the gap. Subsequent discussion within the committee then focused on understanding the specific strategies used by schools to improve science education for students of color and economic disadvantage. District science staff also presented these data to the Board of Education and to a district-wide professional development session for principals. Such presentations of student performance data in science have allowed district science staff to make a case for increased district emphasis on improving science education

Science program implementation survey. Because implementation of the K-8 science Scope and Sequence and FOSS curriculum appeared to be uneven both within schools and across the district, MMSD in conjunction with SCALE researchers developed a teacher survey on enacted science curriculum, instruction, and professional development. Topics covered in the survey included: a) the types and extent of science curricula in use, with a particular focus on FOSS; b) science instructional practices; c) students' science activities; d) teachers' content knowledge; e) teachers' attitudes about science and student learning; and f) science professional development, resources, and leadership support in their school. The survey was distributed in late August 2004 under the auspices of SCALE, and results were compiled and findings presented to the SSRC in the late Fall.

Major findings from the survey indicated that: 1) implementation of the FOSS curriculum was stronger at the elementary school level than at the middle school level, with 64% of elementary teachers and 39% of middle school teachers reporting that the FOSS curriculum comprised the majority of their science curriculum; 2) three out of four teachers reported using inquiry-based

practices regularly in their science classrooms; 3) collaboration at the school level around science instruction remained very low; 4) a lack of well-defined learning expectations in science was evident at the school level; and 4) teachers across all levels reported they needed more resources, professional development, and time for collaboration with colleagues around science instruction and student learning.

While the findings confirmed much of what they had expected, district science specialists reported that the data provided an important district-wide measure of program implementation and pointed to the challenges that need to be addressed to build a stronger K-8 science program. As the program develops, the survey may be conducted again to gauge changes in teachers' instructional practices over time.

Revision of the Scope and Sequence

During the 2004-2005 academic year, district science staff, in consultation with the Scope and Sequence Review Committee, restructured the K-8 Scope and Sequence document. The previous document was built primarily around the FOSS topics and did not clearly outline grade level expectations. Although the FOSS curriculum continues to be the district-approved and recommended curriculum, the goal of the restructured document is to define and emphasize the main scientific concepts that should guide teachers' instruction at each grade level. For each of the science strands (i.e., earth science, life science, physical science), the new document contains grade-level standards and highlights how the main concepts relate to each other, develop over time, and spiral across grade levels.

District staff consider the new K-8 Scope and Sequence document to be a critical step in the creation of a more coherent, focused, standards-based, and system-wide approach to science education. The document allows for greater alignment among the state standards, district standards, report cards, grading guides, assessments, and professional development. District staff plan to use the new Scope and Sequence to focus professional development with grade-level teams and school administrators. Teachers will be able to use the document as they collaborate around student learning and assessment in science. The Scope and Sequence is also a public document that shows that, as NCLB accountability requirements are strengthened in the area of science, the district has a coherent plan for science education.

Changes in Delivery of Professional Development

One of the most important changes that district science staff are making to support stronger implementation of their K-8 science program is in the area of professional development. District science staff are working to focus their professional development efforts to support grade-level collaboration around student learning. During the first few years that teachers and schools began using the FOSS curriculum, district science specialists spent most of their professional development time with teachers reviewing the kits and the mechanics of conducting the investigations in the classroom, as well as providing an introduction to inquiry-based learning. As the Scope and Sequence and FOSS kits have come into wider use, district staff are spending more time working with teachers by grade level on the science content of units, the student learning objectives, and the assessment of student understanding of key concepts. The Elementary and Secondary Instructional Resource Teachers now conduct full-day science staff development retreats for each of the grade levels K-8, and professional advancement courses for middle school teachers. They also continue to work with schools and grade-level teams, providing on-site professional development, particularly to those schools whose school

improvement plans include science goals. Finally, district science staff have developed an interactive professional development website for teachers in the district. The website contains the revised Scope and Sequence document with links to grade-level standards, information about science inquiry and use of each of the FOSS modules, and links to assessment information and supplemental district and external resources.

Through these professional development efforts, the Instructional Resource Teachers aim to reach more teachers as they collaborate around science instruction. In past years, the district's science professional development workshops for teachers have been significantly under enrolled. As they gradually shift their professional development strategies to include more on-site work with grade-level teams, district staff hope to provide more focused and customized support to teachers to improve their content knowledge and instructional practices. At the same time, by encouraging teachers to participate actively in district-wide science committees, summer institutes, and professional advancement courses, district staff hope to build a cadre of teacher leaders who can serve as instructional resources within their buildings.

Integration of Immersion Units into the Core Curriculum

One of the goals of SCALE is to develop inquiry-based "immersion units" for in-depth understanding of key scientific concepts that partner districts can use to strengthen their science curriculum and instruction. MMSD science staff have participated in the ongoing conceptualization and development of immersion units with scientists on SCALE's Immersion Unit Design Team. However, they have also proceeded cautiously in designing a plan for integrating such units into their science program. The Science Coordinator has been adamant that new curricular units could only be integrated into the overall science program if: a) there was a clear weakness or gap in the existing core FOSS curriculum; b) the units were well aligned to the district's Scope and Sequence; and c) the professional development resources needed to support implementation of the units did not weaken their ability to support the core curriculum. As a result, since 2003, members of the Immersion Unit Design Team have been working with district science specialists to identify where the weaknesses in the core curriculum are, design extended inquiry-based immersion units related to the standards, and deliver professional development on the use of these units in ways that promote deep conceptual learning on the part of both teachers and students. As of March 2006, five immersion units were in the process of being developed and/or field tested in the district: 1) a kindergarden unit "Analyzing Animals," 2) a 3rd grade unit "Structures of Life," 3) a 4th grade unit "Electricity and Magnetism," 4) a 6th grade unit "Diversity of Life," and 5) a 7th grade unit "Exploring Landforms." Through this work, the partnership between the UW-Madison SCALE partners (scientists, researchers, and educators) and the district science staff has come to be highly valued on both sides. SCALE-affiliated faculty and staff at UW-Madison interviewed by this researcher for a related case study report a heightened level of awareness and capacity on their part to respond to district and teacher needs in the context of district-wide reform efforts. For their part, UW-Madison SCALE partners have brought district staff and teachers a more rigorous understanding of inquiry-based teaching, as well as increased capacity to support professional development models that promote such teaching.

High School Biology Initiative

The primary district initiative in high school science has focused on the development and implementation of a new structure for introductory biology. In the 2003-2005 school years, the district's secondary science IRT, UW/SCALE partners from the Center for Biology Education, and biology faculty from one of the district's four high schools, East High School, collaborated to develop a set of student learning outcomes and design and pilot a new course. UW and SCALE partners and the district's IRT are continuing to work with that department, providing the professional development support to implement and improve the course. The initiative is strongly connected to issues of equity, as the new biology course replaces the multiple, often lower-level science courses that had been offered to ninth grade students at that school. Other high schools are beginning to adopt the student learning outcomes developed by East High and use them to guide the development or modification of their introductory biology curriculum.

The East High School project led to the development of a broader high school science initiative. In February 2005, the Science Coordinator convened a half-day district-wide meeting of high school science teachers and department chairs to expand the conversation on science education, access, and equity. In that meeting, participants discussed research on equity, examined district- and school-level data, and talked about high school science education in light of the district's educational framework. In the 2005-2006 school year, district science staff have targeted a significant amount of professional development funds toward expanding the high school biology initiative. Over the course of the academic year, eight retreats are being held with high school science teachers across the district to discuss how to restructure introductory science. Currently, students are required to take two years of high school science anytime during their four years in order to graduate. While teachers assume that most students take an introductory science course in their first year, district data show that significant numbers of students are not doing so. Because education research links freshman math and science course enrollment with graduation and future success, one of the central goals of these professional development meetings is to work on increasing the numbers of students who take introductory science in their freshman year, as well as to provide the instructional supports needed to ensure that students are successful in that course.

Analysis of District Capacities and Limitations

As described earlier, over the past seven years MMSD has moved to strengthen standards-based reform within the district. With respect to instructional guidance across the subject areas, the Teaching and Learning Department has been focused on increasing curricular coherence within a standards-based reform agenda. Although the district has chosen not to mandate the use of any particular curriculum packages, it is working toward coherence through a focus on grade-level standards. Overall, the Department has shifted toward using professional development models that are more ongoing and collaborative. District-level Instructional Resource Teachers often work with selected grade-level teams at the school site over a period of time to support professional learning in the subject. In addition, by instituting a standards-based report card system K-8, the department has increased accountability for teaching to the standards.

The Department is struggling, however, to sharpen its efforts to reduce the achievement gap. While progress has been made in third grade reading, significant gaps are still evident in other subject areas, including math and science. Educational equity issues within the school district

are the source of much public controversy, with a relatively small but vocal parent community that is advocating for directing greater resources toward meeting the needs of high achieving students. This has slowed efforts to implement strong academic equity initiatives, particularly at the middle and early high school levels. Nonetheless, T&L content areas specialists continue working with teachers to provide a rigorous curriculum and to differentiate instruction for all students. In that context, the new high school biology initiative represents a significant effort to raise the achievement of students of color and economic disadvantage.

MMSD has clearly also made progress defining a strong and coherent K-8 program over the past seven years. The Scope and Sequence document now emphasizes key scientific concepts and processes, and the district science specialists have directed their professional development efforts at helping teachers to understand inquiry-based science education and to use the FOSS curriculum to support student understanding outlined in the document. In addition, immersion units are being developed to integrate with and strengthen the core science program. Clearly, the district continues to face limitations.. Science remains a low priority subject relative to literacy/language arts and math, and therefore, T&L staff do not have access to the level of material and human resources needed to fully support the science program. Nevertheless, the district has invested time and energy to set a direction in science and has targeted the resources it does have towards implementation.

Impact of SCALE Partnership

SCALE resources and influence have been evident within the initiatives of the Teaching and Learning Department and specifically in the review and development of the K-9 science programs. Below I summarize the multiple ways that the SCALE grant has contributed to the change efforts in science.

a) SCALE monies were used to fund the salary of the secondary science Instructional Resource Teacher. The addition of that staff position doubles the capacity of the science staff to work directly with teachers and principals at the school level.

b) During year 1, SCALE funds supported the district's membership in the Institute for Learning. Several MMSD district-level staff participated in professional development sessions conducted by the IFL. The most influential aspect of these sessions was the information related to the IFL Principles of Learning. Since that time, district science staff have integrated the Principles of Learning into many facets of the professional development they are providing to teachers and principals. Because several of the principles are visible in the MMSD educational framework, as well, the science specialists' professional development aligns with that document and provides school-level staff with consistent messages about the overarching instructional value system of the district.

c) SCALE resources have been used to support a variety of other professional development forums. For example, in the Fall of 2003, SCALE partners—MMSD, UW-Madison, and IFL—sponsored a middle school science inquiry conference. SCALE funds have also supported retreats for high school science departments to begin building professional learning communities.

d) The science survey described above in the section on K-8 science was developed and analyzed in conjunction with SCALE researchers. This survey provided the district with

its first broad look at science teachers' instructional practices, use of the FOSS curriculum, and professional development needs. Findings from the survey are informing the work of the district science coordinator and the science IRTs, and are being used to build understanding of and support for the science program among other district administrators, the Board of Education, and school leaders.

e) SCALE partners from the University of Wisconsin-Madison participated actively in the district's K-8 science Scope and Sequence Review Committee, facilitating discussions of WKCE data, the science survey, promising professional development practices, as well as the nature of scientific inquiry.

f) One of SCALE's equity researchers from the University of Pittsburgh is working with the district to develop its high school initiative. That researcher is participating in regular planning sessions with the district science specialists to design the eight retreats being held with high school biology teachers from the four comprehensive high schools in the district. Other UW-SCALE researchers with expertise in instructional leadership and professional development have recently joined the planning sessions as well.

g) The SCALE immersion design team has provided MMSD science staff and teachers with ongoing assistance in the development of multiple immersion units in the district, as well as the related professional development. The reciprocal relationship between the immersion design team and the district has matured over the course of the SCALE grant. District science specialists contributed to the conceptualization of the immersion model through multiple conversations with the design team about how, where, and why immersion units could best be used to extend and deepen a science program. The immersion design team has lent the district their science expertise, particularly in the area of inquiry-based education and curriculum planning.

h) Overall, SCALE is playing a major role in helping systematize the connections between the science staff in the district and STEM faculty at the University of Wisconsin-Madison. Through his ongoing work, the SCALE Principal Investigator has helped facilitate conversations between the district and STEM faculty that focus on how best to use the resources of the university to support systemic reform in K-12 science education. In addition, the immersion unit design team members have often served as a central link between the university science faculty and the district science specialists. This level of coordination represents a significant new development in the relationship between these educational institutions.

The SCALE partnership with MMSD, and in particular the ongoing relationship between UW-Madison and the district, has clearly evolved substantially over the first three years of the grant. Prior to SCALE, the district and the university's School of Education had many partnership activities. In the area of science, individual STEM faculty, staff, and graduate students interacted with individual K-12 teachers primarily around one-time projects. Through SCALE, the relationship between university scientists and the district has become much stronger and more aligned with the district's vision of a coherent, scalable science program. While district staff initially viewed the UW-SCALE partnership primarily as a set of financial resources to move their initiatives forward at a quicker pace, SCALE resources are now viewed much more broadly, namely as a combination of technical assistance, content area expertise, and intellectual resources that substantially increase their capacity to develop and support a strong, inquiry-

based, coherent science program. In turn, through engagement with the district science specialists, SCALE-affiliated university STEM faculty and staff have developed a greater understanding of the district's need to build a focused, standards-based science program. They have also increased their own capacity to provide the district with professional development support that is content rich and meaningful to teachers within the district's science framework. In short, the SCALE partnership has benefited both the district and its UW partners.

Conclusion

MMSD has taken some key steps to overcome its history of fragmentation with respect to its instructional guidance system. The district has established a standards-based educational reform agenda, and the Teaching and Learning Department is targeting their professional development to increase teachers' pedagogical content knowledge and ability to extend students' learning in the content areas, while instituting measures that hold teachers and schools accountable for covering the standards in their instruction. In conjunction with SCALE partners, the science specialists have defined what students should know at each grade level and are supporting teacher professional development related to the key scientific concepts and inquiry processes outlined in the Scope and Sequence. Nevertheless, MMSD has a long way to go before it is able to demonstrate that these steps will lead to significant improvements in student learning. Stronger collaboration between the Teaching and Learning Department and the Assistant Superintendents will be particularly critical in bringing exemplary instructional programs to scale across the district and in developing school leaders' capacity to support those programs.