

Michigan Mathematics and Science Centers Network

Building a 21st century workforce by inspiring and nurturing excellence in mathematics and science for all Michigan schools, students, teachers and communities.

2011-2012 Annual Report

Prepared by
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MICHIGAN MATHEMATICS AND SCIENCE CENTERS NETWORK

Building a 21st century workforce by inspiring and nurturing excellence in mathematics and science for all Michigan schools, students, teachers, and communities.

The Michigan Mathematics and Science Centers Network is a primary infrastructure supporting the improvement of mathematics, science, and technology education in Michigan. Programs and services of the thirty-three Mathematics and Science Centers (M/S Centers) are made available to all Michigan public and private schools in their service areas. ***This report summarizes the work across the Network during the 2011-12 school year. Individual Centers produce an annual report of accomplishments available from each Center.***

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FUNDING CHANGES

The Mathematics and Science Centers Program was created by legislation in 1988, providing grant funds to establish Centers in cooperation with school districts, higher education institutions, science museums, and professional associations. Since that time, the program has undergone significant changes, including development of a new Master Plan in 2007 for funding and operating Centers and implementation of several important statewide programs. Today, all school districts across Michigan have access in their region to one of 33 M/S Centers.

Base funding for M/S Centers is now part of the annual State Aid Act-Section 99 and totaled \$1.875 million for the 2011-2012 school year. **Centers continue to be severely handicapped by inadequate funding. In 2009-10, the Network's legislative funding was reduced by an additional 25%; since 2002, Center funding has been cut a total of 82%. Opportunities for schools, teachers, and students to improve science, mathematics, and technology education are severely limited. In 2011-2012, state funding cuts resulted in 32% fewer professional development hours for teachers and 92% fewer program hours for students as compared to the 2002-2003 school year, when full funding was available.**

IMPACTS AND OPPORTUNITIES



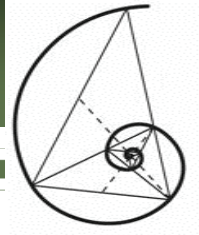
The Michigan Mathematics and Science Centers Network offered programs and services to thousands of teachers and their students, all designed to improve the teaching and learning of mathematics and science. In 2009-10, the Network's legislative funding was reduced by an additional 25%; since 2002, Center funding has been cut a total of 82%. *This was the ninth year of significantly reduced funding from the Michigan Legislature, which necessitated reductions in programming. The 33 Centers continued to provide public and private schools in their regions with various student services, teacher professional development, curriculum, leadership, community partnership, and resource sharing programs.* Below are highlights from the annual report of the Michigan Mathematics and Science Centers Network. Readers are encouraged to review the entire report. Information about the Network is available from Valerie Masuga, President (vmasuga@eup.k12.mi.us or 906-632-3373).

Highlights from the 2011-12 Annual Report

- In addition to the many regular local and regional activities, the Network facilitated six major statewide project serving Michigan teachers and their students:
 - ◊ Science and Mathematics Misconceptions Management (SaM³)
 - ◊ PRIME
 - ◊ Family Engineering
 - ◊ MSU Measurement Project
 - ◊ Assessment collaboration and juried review of a database of math and science items
 - ◊ STEM Partnership
- 12,423 different teachers and other educators participated in programs, including: 257 teaching pre-K, 5,060 teaching elementary, 2,024 teaching middle/jr. high, 2,447 teaching high school, 1,183 mixed grade levels, and 1,452 identified as others (administrators, paraprofessionals, etc.).
- 1,868 professional development programs were offered: 785 in math, 752 in science, 134 in technology, and 197 in other topics.
- A total of 9,845 hours of PD were provided; 28,413 total PD enrollments.
- 61,720 students participated directly in Center programs: 356 pre-K, 30,849 elementary, 4,745 elementary and middle/jr. high, 5,700 middle/jr. high, 4,765 middle/jr. high and high school, 9,086 high school, and 6,219 from mixed grade levels (some students may have attended multiple programs).
- Over the past 13 years, 29,417 PD programs were offered; total enrollment in 13 years was 432,581 (many teachers participated multiple years in multiple programs).
- In the past 13 years, 2,605,724 students were served directly by Centers (some students were served multiple years in more than one program).
- Through a special statewide teacher professional development initiative—SaM³—Centers served over 70 middle and high school mathematics and science teachers. The goals of this multi-year project are to increase 1) teacher content and pedagogical knowledge of 7th-12th grade mathematics and science subjects and 2) teacher awareness of student misconceptions of content in mathematics and science.
- Math and Science Centers, in collaboration with Michigan Virtual University, provided statewide professional development to middle and high school math teachers through Algebra for All which ended in 2011. Fourteen Math/Science Centers across Michigan served over 520 middle and high school teachers of algebra, including special education teachers. Over 2,500 students were involved in the project. Project PRIME is a continuation of Algebra for All with many of the same participants.
- Centers provided innovative outreach and accelerated high school programs to meet student needs in their service areas. These highly motivating math and science programs are not otherwise available to schools.
- Centers targeted high priority schools, providing intensive assistance including: classroom-level professional development, classroom observations to identify areas of need, modeling science lessons, targeted small group PD, content integration advice, assessment assistance, achievement gap analysis, and resource acquisition.
- Centers collaborated on activities with 34 different public and private Michigan colleges and universities, engaging science, math, engineering, and technology faculty.



Value of Statewide Projects



The 33 Michigan Mathematics and Science Centers have functioned as a collaborative Network since their inception in 1988. Recent years have been marked by an increase of statewide projects. The Network provides common professional development or student activities to target the needs of teachers, students, schools and districts across the state. The Network has become an essential means of communication between organizations, like the MDE, Michigan teachers, and students.

Network statewide projects:

- Provide research-based, ready-to-implement curriculum and professional development.
- Focus on topics and issues important to teachers and the state.
- Address the needs of students and teachers.
- Connect local teachers to a broader network of teachers.
- Allow the collection of student and teacher data.
- Lend credibility and urgency to the nature of the content presented.
- Provide financial support for substitutes and instructional materials.
- Allow teachers to remain up-to-date with the latest information.
- Give teachers the opportunity to step outside the role of teacher and experience a leadership role.
- Brings resource materials into the hands of teachers.

Statewide Projects in 2011

- SaM³ (Science and Mathematics Misconceptions Management)
- Project PRIME (Promoting Reform in Mathematics Education)
- Family Engineering
- MSU Measurement Project
- Assessment collaboration and juried review of a database of math and science items
- Michigan STEM Partnership

Other aspects of statewide projects:

- Economy-of-scale allows Centers to share resources and planning. All Centers, regardless of size, are able to offer instructional services that may not otherwise happen. Limited resources are used more efficiently.
- Centers have opportunities to collaborate and network with each other. They look beyond themselves and focus on the needs of others across the state.
- Centers and teachers have opportunities to build and strengthen relationships with universities and ISDs.
- Increased visibility as a network and as individual Centers in the community.
- Increased communication with local principals, curriculum directors, teachers, etc.
- Teachers learn and implement new technology such as Nspire calculators.
- After participating in numerous projects, Centers have cadres of teachers “speaking the same language” and willing to share instructional strategies, successes, and failures.



ACCOMPLISHMENTS OF SaM³—Year 2

Science and Mathematics Misconceptions Management

The goal of the MMSCN and partners' four-year Science and Mathematics Misconceptions Management (SaM³) grant program is to increase the content and pedagogy knowledge of 7-12th grade mathematics and science teachers and to increase teacher awareness of student misconceptions of content in these two disciplines. The program focuses on the provision of professional development to two groups of teachers:

- A core group of teachers who are providing instruction in schools designated by the Michigan Department of Education (MDE) as “Persistently Lowest Achieving Schools” in Michigan who will participate as Long Term Schools over the four year grant period, (Cohort 1). Long-Term School teacher teams in Cohort 1 meet each summer for a one-day summer conference to share their year of learning and plan for the next year of PLCs.
- Teacher teams from schools that have identified in their School Improvement Plans a need to reform mathematics and science instruction complete the state SaM³ PD program in one year (Cohort 2 and Cohort 3).

Over the course of the four-year grant cycle, each of 33 Michigan Mathematics and Science Centers will have the opportunity to send a teacher team of 6 math and 6 science teachers in grades 7-12 to the state SaM³ Tier 1 professional development program. These teacher teams participate in a five-day SaM³ Summer Institute and in six full-day Professional Learning Community (PLC) programs in their home school district, with targeted outcomes of:

- Increased core content knowledge, with an instructional context of Fractions (math) and Energy (science) across the disciplines, for Cohort 2 teachers.
- Increased core content knowledge, with an instructional context of Models in Mathematics and Science, across the disciplines, for Cohort 1 teachers (Long Term Schools).
- Increased understanding of content knowledge and student misconceptions in the teacher's content area.
- Implementation of strategies to student misconceptions and teach for understanding.
- Development of usable lesson plans to address student misconceptions in their classroom.
- Ability to analyze student work for understanding.
- Consistent and timely feedback on instruction and student understanding.

In Year 2 of this Section 99.6 grant program, regional Math/Science Center facilitators were trained, providing further outreach to SaM³ Tier 2 teachers. Each Center applied to receive funds to present a regional SaM³ professional development training for 7-12th grade math and science teachers, in addition to sending a Tier 1 teacher team to the state SaM³ professional development. In the 2012-13 school year, twenty-eight Centers will offer a Tier 2 SaM³ professional development training and PLCs in their region.

A third Cohort of state SaM³ Tier 1 teacher teams will be trained at the SaM³ Summer Institute in 2013, with PLCs led by state facilitators during the 2013-14 school year. In June of 2014, all three cohorts of Tier 1 teacher teams will come together to share professional learning in a statewide SaM³ Summer Summit.

For more information about SaM³, please contact Pam Bunch, SaM³ project director, Pam.Bunch@lisd.us.



Promoting Reform in Mathematics Education (PRIME): 2011-2012 Highlights

Promoting Reform in Mathematics Education (PRIME) builds the algebra and geometry content with pedagogical knowledge of middle and high school teachers to ensure that mathematics classroom instruction meets the learning needs of all students. In 2011-2012, PRIME served 740 teachers at fourteen sites statewide through a consortium of partners: Wayne RESA's Mathematics and Science Center (Wayne RESA), the University of Michigan Dearborn's Center for Mathematics Education (CME), and the Michigan Mathematics and Science Centers Network (MMSCN). Coaching was provided for a randomly chosen 50 percent of school teams. All teachers had the opportunity to participate in up to four after-school meetings during the school year.

The evaluation design included pre/post performance of teachers on the Learning for Mathematics Teaching Scale (LMT), a calculator skills survey, and a survey of teacher beliefs and practices. Interviews were conducted with 41 teachers at five sites across the state and the project leadership team, including facilitators and site directors. A pilot was conducted to explore the feasibility of using classroom videos as measures of lesson implementation.

TEACHER MEASURES. LMT results indicate highly significant growth overall from Fall 2011 to Spring 2012; twelve of fourteen sites showed significance. All seven self-reported indicators of teacher pedagogical practices and 32 calculator skills also showed significant improvement ($p \leq 0.05$).

LMT RESULTS IN PERCENT CORRECT (N = 641 MATCHED SCORES)

LMT SCALE IN PERCENT CORRECT	PRE-TEST		POST-TEST		SIGNIFICANCE LEVEL <i>p</i> value
	Mean	S.D.	Mean	S.D.	
Total Scale (60 items)	78.3	13.6	83.9	11.5	0.001
Geometry Sub-Scale	87.2	11.3	91.2	8.8	0.001
Algebra Sub-Scale	70.0	17.8	77.1	16.0	0.001

MICHIGAN STATE TEST RESULTS. The percent and number of PRIME students achieving proficiency in mathematics on the MEAP and the MME are shown below. The data represents results from each school participating in PRIME; teacher-level data was not available from the Michigan Department of Education. PRIME high school students scored proficient at a rate five percent higher than their peers statewide. Note that MEAP scores were collected prior to the beginning of PRIME in November 2011.

MEAP AND MME STUDENT PROFICIENCY DATA FOR PRIME SCHOOLS

ASSESSMENT	NUMBER OF PRIME STUDENTS TESTED	PRIME NUMBER PROFICIENT	PRIME PERCENT PROFICIENT	STATE PERCENT PROFICIENT
MEAP Fall 2011	29,732	7,976	27	29
MME Spring 2012	51,393	17,293	34	29
TOTAL	81,125	25,269	31	29

PRIME is a continuation of Algebra for All (2009-2011) with many of the same participants. These teachers have achieved a significant number of skills measured on the LMT, particularly the geometry items, and for the first time for a Partnership MSP grant, teachers in 2011-2012 reported significant changes in their own instructional practices. Students of PRIME high school teachers have demonstrated proficiency above the state average. To paraphrase one participant, teachers have learned a lot and now they are ready to develop their own lessons and to implement the new practices in their classrooms.



FAMILY ENGINEERING: 2011-2012 Highlights

Many Mathematics and Science Centers hosted Family Engineering events during 2011-2012. The program is designed to address the United States' need for an increased number and greater diversity of students skilled in math, science, technology, and engineering. The Family Engineering program for 6-12 year-olds and their parents is modeled after the popular *Family Science* and *Family Math* programs, begun in the 1980's and 1990's, that have spread around the world. Family Engineering increases public understanding and appreciation of the role engineering plays in everyday life and raises awareness of the many career opportunities in engineering. Student chapters of professional engineering organizations on college campuses, elementary classroom teachers, engineering professionals, and informal educators are encouraged to host Family Engineering events in their communities.

A \$1.5 million grant to Michigan Technological University and partner organizations, The Foundation for Family Science and Engineering and the American Association for Engineering Education, funded the development and field-testing of family engineering activities representing a wide variety of engineering disciplines and skills suitable for use in a variety of settings with diverse audiences. These activities have been published in the *Family Engineering Activity & Event Planning Guide* (June 2011), which includes 22 short opener activities and 15 longer (20-45 minutes) engineering challenges that families can work together to tackle using the engineering design process. The new Guide also provides a step-by-step procedure for planning and conducting a successful Family Engineering event hosted by an organization, school, university, business, or corporation for diverse audiences, using simple, inexpensive readily available materials, in a variety of community settings. A dynamic website (www.familyengineering.org) provides resources and support for entities implementing the family engineering program.

MTU reports that program evaluations confirm that the Family Engineering activities are fun and engaging and that children and their parents experience significant increases in their interest in and awareness of engineering in their everyday lives as a result of the program. Parents also report an increase in their willingness to consider engineering as a possible career option for their children.

During 2011-2012, participating Math and Science Centers invested staff time and other Center resources to organize, recruit families, and facilitate Family Engineering events in support of MI STEM Week. These efforts were made possible through funding from the Square One Education Network and the National Defense Education Fund. The following represent some relevant data regarding these events:

- 32 Centers ran at least one event in support of MI STEM Week
- Centers reported that 2,870 students and 2,064 adults attended 59 Family Engineering events
- Based on survey results, the following represents the distribution of participating students/grade levels:

Grade Level	K	1	2	3	4	5	6	7	8	9	10
Number of Students	129	251	285	274	231	243	85	122	18	2	235

- 97% (677 out of 695) of surveyed participants indicated they would recommend the events to others
- All but one Center reported data based on a 5-question pre/post survey. Overall, mean pre/post scores for each question showed positive improvement (Q1, +1.57; Q2, +4.59; Q3, +1.24; Q4, +0.76; and Q5, +1.12)
- A number of Centers plan to continue hosting Family Engineering events during 2012-2013.

For more information about Family Engineering, please contact Valerie Masuga, President of Michigan Mathematics and Science Centers Network and Director of the EUP M/S Center, vmasuga@eup.k12.mi.us.



Michigan Mathematics and Science Partnership Grants *Highlighting*

Greater Proficiency in Mathematics (GPM): Upper Peninsula Mathematics and Science Partnership (UPMSP)

and

Supporting the Implementation of Intel[®] Math (SI²M) SVSU Regional Mathematics and Science Center

Michigan Mathematics and Science Partnerships. The Michigan Mathematics and Science Centers Network has collaborated with institutions of higher education and other partners to propose and implement Michigan Mathematics and Science Partnerships (MSPs) over the past several years. Nearly all Centers have participated in one or more MSPs. Several Centers are currently involved in these partnerships and more have been proposed to the Michigan Department of Education. The Michigan MSP grant program requires active participation of one or more Centers in a project. Some MSPs have been statewide, involving many Centers.

Two Math Partnerships focus on the Intel[®] Math Program. Two current Mathematics and Science Partnerships are highlighted here. Both are using the Intel[®] mathematics materials. The *Greater Proficiency in Mathematics (GPM)* is an MSP grant that supports the development of a deeper understanding of mathematical concepts among elementary and middle school teachers across the Upper Peninsula. The primary components of the program are: (1) the implementation of content specific workshops in partnership with the Intel[®] Math program and (2) the Mathematics Learning Communities program, a companion program to Intel[®] Math. The *Supporting the Implementation of Intel[®] Math (SI²M)* MSP grant supports the development of a deeper understanding of mathematics content and pedagogy among elementary and middle school teachers in Arenac, Bay, Midland, Saginaw, and Tuscola counties. The first two elements of the program are the same as for *GPM*, but *SI²M* also includes a third component, coaching to provide ongoing support to the participants in their school setting.

GPM Intel[®] Math. This project has completed the first year of the two-year grant. It involves 11 workshop days at 5 separate Upper Peninsula Mathematics and Science Centers. Math faculty members have been recruited from three Upper Peninsula universities—Michigan Technological University, Lake Superior State University, and Northern Michigan University—to receive training from Intel[®] Math and to teach the Intel[®] course to K-8 teacher participants. The first five days of the course were taught through a Summer Institute that took place in August 2012; the remaining six days are being spread across the 2012-13 school year. In all, 118 K-8 teachers attended the Summer Institute. Teachers are also participating in a professional learning community specific to the needs and pedagogy of high quality mathematics instruction in the elementary and middle grades. Ten teacher leaders of these Mathematics Learning Communities (MLCs) have been identified, two for each of the five participating Mathematics and Science Centers. The teacher leaders were trained in the facilitation of the MLC through a three-day training conference that was held in April 2012. The MLCs are taking place both through face-to-face workshops and an online community, and are focusing efforts on pedagogical practices as they relate to the more rigorous mathematics content provided through the other learning activities.

SI²M Intel[®] Math. The project also has completed the first year of the two-year grant, and also involves 11 workshop days. Math faculty members have been recruited from Saginaw Valley State University and Delta College to receive training from Intel[®] Math and to teach the Intel[®] course to K-8 teacher participants. The first five days of the course were taught through a Summer Institute that took place in August 2012; the remaining six days are being spread across the 2012-13 school year. In all, 46 K-8 teachers attended the Summer Institute as part of one of two cohorts (17 in Cohort 1 and 29 in Cohort 2). Teachers are also participating in professional learning communities throughout the 2012-2013 school year. The goal is to facilitate lessons in their classrooms and then bring samples of student work to share with their colleagues for examination. Teachers will also receive individual or paired coaching throughout the 2012-2013 school year. Coaches will meet with teachers once per month to support their efforts to implement the course content into their classrooms. Project coaches will strive to support teacher participants in a safe, blame-free environment, where they can reflect on their lessons and receive the encouragement they need to keep trying in their efforts to implement their training and navigate changes to their instructional practices.

Michigan Mathematics and Science Partnership Grants *Preliminary Evaluation Findings* *Highlights From Both GPM/SI²M*

The following summary evaluation findings are based on the analysis of data collected between April and September 2012. All represent pre-program or baseline data. Future reports will include an analysis of both pre and post data.

Teacher Comments:

- The End-of-Session Questionnaire from the 2012 Summer Institute indicates that many benefited greatly by the presentation of the Intel[®] materials.
 - ◆ “I appreciated the opportunities to talk with other teacher professionals and university faculty.”
 - ◆ “I gained the ‘big picture’ of how concepts trickle down to beginning at the early grades.”
 - ◆ “I feel much more confident in math topics.”
 - ◆ “I learned a lot and understand how deepening my knowledge will help me teach concepts.”
 - ◆ “I came expecting new ways to teach math to my students, but I got that and a better understanding myself! I loved it!”

Teacher Needs:

- Several content areas of need were identified through the Intel[®] pre-test administered to teachers at the beginning of the Summer Institute. Low mean scores were found for the following content areas listed below **for both Intel[®] MSP projects**:
 - ◆ Invertibility.
 - ◆ Rate.
 - ◆ Distributing, expanding, simplifying, and factoring expressions.
 - ◆ Completing a table of values and writing an equation for $p(x)$.
 - ◆ Finding the slope of an equation (in the form of $y = mx + b$) and drawing a graph of the line represented by the equation.
- Through the pre-survey, many teachers **for both Intel[®] MSP projects** reported that they were not as familiar with the new Common Core mathematics standards as they need to be. Teachers were asked to rate their familiarity with the new standards on a scale of 1-5, with 1 = low familiarity and 5 = high familiarity. *The majority of GPM teachers* (76 of 118 respondents) gave a rating of “3” or lower; the majority of *SI²M teachers* (33 of 46 respondents) gave a rating of “3” or lower.

Preliminary Student Assessments:

- A pre/post content test for five **GPM** grade levels (3rd, 4th, 5th, 6th, and 7th) was developed and validated. Five teacher participants from each of the grade levels were selected to administer the pre-test to their students in September 2012. There is clearly a need for improvement across all grade levels, as the mean pre-test score was lower than 61% correct for all classes—even as low as 19.5% for one 5th grade class.
- A pre/post content test for five **SI²M** grade levels (3rd, 4th, 5th, 6th, and 7th) was developed and validated. Eight teacher participants administered the pre-test to their students in September 2012. There is clearly a need for improvement across all grade levels, as the mean pre-test score was lower than 59% correct for all classes—even as low as 16.4% for one 5th grade class.
- Post-tests will be administered next spring, and a paired sample t-test will be performed to assess improvement.



MSU Measurement Project: Strengthening Measurement Curriculum, Teaching, and Research

Project Accomplishments: 2011-2012

The 2011-12 school year was the third year in which this measurement research and development project (unofficially “STEM II”) provided professional development to elementary teachers around the state of Michigan. Teacher professional development is but one component of this project that aims (more broadly) to assess the measurement content of existing curriculum materials, design and adapt tasks and new experiences to help teachers teach measurement and students learn more effectively, and assist mathematics and science educators around the state who share those goals. Dr. Jack Smith at Michigan State University is the lead researcher on the project. The Michigan Mathematics/Science Centers Network has collaborated with Dr. Smith since 2010, with active support from the Michigan Department of Education.

In 2011-12, the project produced a detailed analysis of the measurement content of the *Common Core State Standards in Mathematics (CCSSM)* (available for download at <https://www.msu.edu/~stemproj/teaching.html>). The project also hosted a statewide meeting in Midland, MI that explored the relationship between length measurement and the teaching and learning of fractions as the latter topic is outlined in the CCSSM, among other topics. The approach to teaching and learning fractions via length measurement is available to interested educators. This meeting was attended by 18 professional development partners to the project from around the state. The majority had already delivered measurement professional development to elementary teachers in their region; the rest were preparing to do so in Spring 2012. That Spring, three days of professional development were delivered in 11 regions served by ISD and/or Math/Science Center staff to hundreds of elementary teachers around the state. Based on the successes of the previous year, the impact on the state’s teachers expanded this year, in part because of higher levels of district contributions that complemented the support provided by the project. The professional development of this project continues in 2012-13, using unspent funds.

For more information about the MSU Measurement project, please contact Valerie Masuga, President of Michigan Mathematics and Science Centers Network and Director of the EUP M/S Center, vmasuga@eup.k12.mi.us, or Jack Smith, Co-Director of the Educational Psychology and Educational Technology doctoral program at Michigan State University, email: jsmith@msu.edu.



M/S Centers Network Assessment Committee: *Providing math and science assessment items to districts*



Purpose: Support effective classroom assessment in mathematics and science.	
<p>Objectives: To support effective classroom assessment in mathematics and science, the Assessment Committee will</p> <ul style="list-style-type: none"> • Broaden teachers’ understanding of effective assessment • Increase the use of multiple measures to improve student achievement • Assist teachers in accessing high-quality items and assessments • Help teachers to effectively use high-quality items and assessments 	<p>Current Strategies: In order to reach the purpose and objectives, the current focus of the Assessment Committee has been to</p> <ul style="list-style-type: none"> • Develop and implement a comprehensive course that addresses balanced assessment, the keys to quality assessment, and strategies for evaluating, jurying, and using multiple-choice items • Maintain and disseminate an item bank of high-quality items tied to standards

Activities and Outcomes for 2011-12:

Implemented the graduate-level course “*Implementing the Keys to Quality Assessment*”, as a pilot course in July 2012 at the Eastern UP ISD with 33 participants (mostly K-12 classroom math and science teachers). A three-part evaluation was conducted with statistically significant gains from pre-to-post.

Evaluation Component Description	Data Analysis
A pre/post questionnaire was given to determine if participants reported gains in familiarity with Michigan’s content expectations and the elements of effective formative and summative assessments. Answers ranged on a scale from 1 to 4, 1 being “not familiar” and 4 being “very familiar”.	According to the data, participants reported increased familiarity with each of the six components surveyed, especially with respect to the characteristics of quality formative assessments with a gain of +1.20 (from 2.12 to 3.32), and summative assessments with a gain of +1.24 (from 2.15 to 3.39).
To assess participants’ ability to skillfully recognize the elements of quality classroom assessments, the pre-test included a sample assessment taken from <i>Classroom Assessment for Student Learning</i> by Rick Stiggins. Participants were asked to read the assessment and rate each of the five components of quality assessments on a scale of 1 to 5, 1 being “weak”, and 5 being “strong”. Stiggins had included his own evaluation of the assessment, and these values were taken as the “accepted” values. It was anticipated that, after engaging in the course, participants would more closely approach the “accepted” evaluation (i.e. decreased “error”) of what was, admittedly, a very weak sample assessment.	Participants were able to recognize a weak assessment when they saw one, especially with respect to “Sound Assessment Design”, even prior to the course. But on the post-test, they did show improvement overall in effectively critiquing the sample. The greatest growth was shown in recognizing “Clear Purpose” with error decreasing from +1.58 to +0.70 or moving from a pre-test average of 2.58 to a post-test average of 1.70 when the accepted rating was “1.0”; and “Student Involvement” with error decreasing from +0.96 to +0.55 or moving from a pre-test average of 1.96 to a post-test average of 1.55 when the accepted rating was “1.0”.
A brief self-assessment was given on the post-test, again on a scale of 1 to 5, 1 being “disagree”, and 5 being “agree”.	Participants felt most confident in their abilities to “use assessment results to modify my teaching” (post-test average = 4.46) and “describing the type of learning my targets demand from students” (post-test average = 4.33).
Anecdotal comments from participants.	<p>“This will be a <u>shift</u> in my teaching approach at many levels.”</p> <p>“I will use the information to improve my assessments and teaching.”</p> <p>“The collaboration time was great.”</p> <p>“Charged up my attitude toward CCSS.”</p>

For more information about the Network Assessment Committee contact Amy Oliver, Director, Allegan/Van Buren M/S Center (aoliver@alleganaesa.org or 269-686-5087).

Annual Report to the Michigan Department of Education Pre/Post Teacher and Student Participant Assessment Data—2011-2012 from Selected Interventions

In the 2011-2012 enabling legislation for the Michigan Mathematics and Science Centers Network, the Michigan Legislature required that all Centers, in June 2012, submit results of pre and post assessments in selected activities for teachers and students. Center Directors, in collaboration with Michigan Department of Education representatives, created a system for reporting results designed to be consistent across all Centers. Each Center selected one teacher activity (professional development session, workshop, or event) and one student activity (workshop, class, or event) at which they administered a pre- and post-assessment pertinent to the activity.

To provide consistency across Centers, it was decided that a 10-point scoring/rating scale would be used on each assessment. Mean scores on the pre- and post-assessments were determined. The Center-specific tables in the report included information for teacher and student activity, including: dates of pre and post assessments, topics of the interventions, the subject matter addressed, target audience and number of attendees, pre-assessment mean, post-assessment mean, and mean score change. The data were presented as descriptive results and did not represent a statistical analysis of the pre-to-post change.

For more information about the Math/Science Centers Network and annual reporting of results, contact Valerie Masuga, Network President, at (906) 632-3373 (vmasuga@eup.k12.mi.us). For more information about this report, contact Dr. Mary Anne Sydlik at SAMPI—Western Michigan University (maryanne.sydlik@wmich.edu).

Select 2011-12 Program Impact highlights can be found in the Appendix. The following represent data gleaned from all the Center pre/post assessment activities and data.

Teacher Activities

- More than 1,148 teachers participated in the reported activities
- Eighteen programs were related to mathematics, including five Project PRIME and three Algebra for All activities
- Eleven science-related activities were reported, including seven covering the Next Generation Science Standards
- Five teacher activities involved the Common Core State Standards (either mathematics or science-related)
- One activity involved technology

Student Activities

- More than 1,837 students participated in the reported activities
- The break-down of targeted grade levels was: nineteen K-8 student activities; six middle-school; three high school; and one K-11 activity
- A majority (22) of the reported activities involved engineering or engineering-related topics
- Fewer activities (7) concentrated on science
- Only one activity mentioned mathematics

Math Leadership Team (MLT) and Science Leadership Team (SLT)

The Math and Science Leadership Teams consists of MMSCN directors. Each of the 33 Center directors is on either the MLT or the SLT, depending on their area of expertise. The MLT and SLT meet during the MMSCN Quarterly meetings. The meeting time is focused on discussing current issues related to science and mathematics. It provides the opportunity for the directors to discuss mathematics and science current topics and trends in a smaller setting.

Science Leadership Team Accomplishments: 2011-2012

In the past year, the SLT divided into three smaller work groups: Technology, Science Lab Safety, and the Next Generation Science Standards.

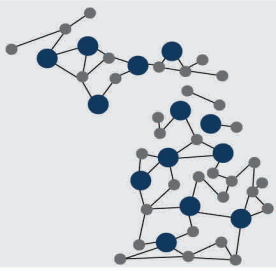
- **TI-Nspire Science:** Training was offered to every Center in May, 2012 at Wayne RESA in the TI-Nspire Science. This training was provided for free and each Center that attended received a teacher bundle for use at their Center. Seventeen (17) Centers participated in this offering.
- **Science Lab Safety online course** was made available for SB-CEUs: This course is offered quarterly for Middle School (0.6 SB-CEUs) and High School (0.7 SB-CEUs). The sessions run April-June, July-September, October-December, January-March. The Macomb Mathematics and Science Center is the point of contact for submissions.
- **Next Generation Science Standards (NGSS) public review sessions:** Through collaborative work of multiple members, materials were provided to each Center director to conduct a public review session for the NGSS in the Spring of 2012. The SLT also created a smaller sub-group to work on preparation and response to the NGSS in between quarterly Network meetings.
- **Michigan Mathematics and Science Centers Network Website maintenance:** The SLT spent time at each quarterly meeting reviewing the various web components. The SLT also secured access to the main site so that corrections and additions can more easily occur.

For more information about the SLT, please contact Alycia Meriweather, Director of the Detroit M/S Center, alycia.meriweather@detroitk12.org.

Math Leadership Team Accomplishments: 2011-2012

- **MSU Measurement** – Twenty-three (23) M/S Centers participated in the MSU Measurement professional development opportunity by sending one or two facilitators to be trained in the 3-day workshop provided by Dr. Jack Smith, MSU. A few Centers are working with schools for a second year, and others are working with new schools during their second year of the program. A new training to extend the work with schools is planned for the 2011-2012 school year.
- **RTI** – Response to Intervention has been a common topic of conversation in the MLT and it was agreed that the Board should be brought up to date in that regard. Jenni Trusock, Huron M/S director, agreed to, and presented RTI to the Board – what it is, as well as resources to support it.
- **CCSS-M** – The group has enlisted Valerie Mills, former Director of Oakland M/S/T Center and active member of the National Council of Supervisors of Mathematics (NCSM), to keep the Board updated on the Common Core State Standards and work of the Smarter Balanced Assessment Consortium. Valerie has provided a brief report at MLT meetings and presented the Practices to the Board at the May 2012 Quarterly Meeting of the MMSCN.
- **EMATHS** – In order to continue the good work that Algebra for All has begun in the state around high school mathematics, and in response to an opportunity proposed by Debbie Ferry, Macomb ISD, the MLT began discussions to scale up the successful EMATHS program statewide. Debbie has offered each Center two seats to be trained as EMATHS facilitators this August in conjunction with the MCTM conference. Twenty-eight (28) Centers have shown interest in participation.

For more information about the MLT, please contact Valerie Masuga, President of Michigan Mathematics and Science Centers Network and Director of the EUP M/S Center, vmasuga@eup.k12.mi.us.



The Michigan STEM Partnership is a statewide public-private collaboration elevating STEM education in a way that increases student career or college readiness. The MMSCN leads the STEM Partnership effort.

Partnership Development

Successes include:

- A strong steering committee* of education and business members who provide direction to the regional hubs. The public-private Partnership committee developed the following mission and vision statements:
 - Mission:** A partnership of educators, businesses, communities and government that cultivates a society that promotes innovation, elevates student achievement and supports the development of the 21st Century workforce through high-quality STEM education.
 - Vision:** Our vision is to build and retain a STEM literate population by connecting public-private STEM champions into dedicated partnerships that establish Michigan as a national leader in economic and talent development, innovation and prosperity.
- Five regional hubs established leadership, charters and a quarterly meeting schedule. Each hub has built memberships of regional K-20 educators and business representatives.
- Participation in the first Michigan STEM Week by hosting Family Engineering Nights across the state, giving K-6 students and their parents exposure to potential STEM careers to increase interest at an early age.
- Membership in STEMx, a national network of statewide STEM education organizations. Michigan is one of 13 member states and sent a representative to the first STEMx meeting October 19 in Columbus, Ohio.
- A panel discussion at the annual STEM Synergy Summit hosted by Square One Education Network at Eastern Michigan University.
- Representatives attended the Change the Equation conference in Washington, D.C., and the U.S. News STEM Solutions Conference in Dallas.
- Supporting Next Generation Science Standard reviews hosted by regional Michigan Mathematics and Science Centers.
- Documentation of more than 200 state STEM education assets and experts on a searchable asset map on the mstempartnership.com website, hosted by Michigan Virtual University (MVU). The website also includes information about the Partnership and a calendar of hub and steering committee meetings.
- Partnering with the state of Colorado to send 15 teachers on a research trip to Africa in the summer of 2013. During the XSci project, the teachers will work at Jane Goodall's Gombe Stream Research Center and climb Mt. Kilimanjaro. Teachers will be selected from each of the five hubs.
- Developed the @stempartnership Twitter following to about 500 people, including Governor Rick Snyder and House Speaker Jase Bolger. Using the #michstem hashtag, @stempartnership provides STEM education news from Michigan and across the country in addition to Partnership news.

*** Steering Committee**

The Partnership Steering Committee members include representatives from WIN, MVU, Dow, Michigan Economic Development Corporation, Consumers Energy, The Presidents Council, State Universities of Michigan, Van Andel Institute, Michigan Mathematics and Science Centers Network, Michigan Department of Education and the U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC). Each hub also has a representative. The Steering Committee is responsible for monitoring the five regional hubs and statewide projects.

Funding

The Partnership was granted \$100,000 Michigan Legislature for an executive director and operational expenses and \$250,000 for hub activities and conference attendance by the Michigan Economic Development Corporation. The Steering Committee subcommittee is finalizing a job description for the executive director position.

For more information about the Michigan STEM Partnership, please contact Larry Casler, Executive Director of the Michigan Mathematics and Science Centers Network, lecasler69@gmail.com.

Innovative Student Programs

In Centers across the Network, students have opportunities to learn and work in unusual environments; sample Science, Technology, Engineering, and Mathematics (STEM) careers; and engage in real-world research with practicing scientists and other professionals. Often partnering with business and industry, government agencies, non-profit organizations, and individuals, programs are designed to motivate ALL students to pursue STEM subjects in elementary, middle, and high school, as well as in college and adult careers. Interesting and exciting opportunities made available through M/S Centers, and not usually available in their home schools and districts, open new worlds to these students.

Accelerated High School Programs

High school students spend half of each school day at Centers enrolled in challenging and diverse college preparatory programs in science, mathematics, and technology. Equipped with up-to-date science and computer labs, students engage in activities to learn about basic and cutting-edge STEM topics.

Many students, as part of their Math/Science Center experience, are also enrolled in college courses, where they learn college-level science and mathematics subject matter.

In the junior/senior years, students have opportunities to work with mentors, including physicians, surgeons, computer scientists, chemists, veterinarians, field and lab biologists, and other researchers.

Five Centers currently provide accelerated high school programs: Battle Creek Area, Berrien County, Kalamazoo Area, Macomb County, and Mecosta-Osceola Counties.

In the 2011-12 school year, 1,019 students were enrolled in accelerated high school programs. Students graduated with ACT scores above state and national averages. For example, Berrien's 23 graduating seniors averaged SAT scores of 30. 100% of graduating seniors entered college programs. Two Battle Creek Area M/S Center students were named Merit Scholars. Graduating seniors were offered \$6.4 million in scholarships. At the Kalamazoo Area M/S Center, one hundred thirty-eight (138) juniors and seniors were enrolled in at least one Advanced Placement course during the school year; at Macomb, all seniors were enrolled in AP science classes and 2/3 were enrolled in AP Calculus. More information about Accelerated High School programs can be found on page 21.

Other Innovative Student Services

Many Centers provide innovative outreach programming using local resources to provide opportunities and to meet needs of schools, teachers, and students in their service areas. These highly motivating programs are not otherwise available to schools. Innovative instructional practices are used to engage ALL students. Below are a few examples of unique programming provided by Centers.

- Detroit Mathematics and Science Center hosted the *You Be The Chemist Detroit Regional Competition and Student Demonstrations* in March 2012. The Detroit regional event included student demonstrators, who shared their chemistry knowledge and spread the excitement of chemistry and careers in chemistry to many more people. Detroit Public Schools sent 3 students to the state competition. PVS-Nolwood Chemicals was the regional sponsor.
- Eastern Upper Peninsula Mathematics and Science Center held the sixth annual *Trig-Star Competition*. Eighteen students from seven districts participated. After the morning competition, students had lunch together and then headed out for a short, surveying field trip.
- The Regional Mathematics and Science Center at Saginaw Valley State University offered *STEM Summer Camp 2011* with partial funding provided through a Dow Corning Advisory grant. The camp was aimed at encouraging students in grades 3-5 and 6-8 to explore the STEM fields. Eighty-nine (89) students attended, seventy (70) of them with a Dow Corning scholarship. The target audiences for the scholarship funds included female, under-represented minority, and low income students.
- The Grand Traverse Regional M/S/T Center held the *17th Annual Water Watch Program*, where students from 12 regional districts measured the chemical and biological quality at several locations in our local watersheds. At Student Congress, 187 of those students participated in a variety of field trips and heard presentations from several resource professionals about locally relevant environmental issues and topics.

FOCUS ON HIGH PRIORITY AND PERSISTENTLY LOWEST ACHIEVING SCHOOLS

Providing Services to High Priority Schools Continues to be a Major Focus of the Michigan Mathematics and Science Centers Network.

As high priority schools are identified by the Michigan Department of Education, Centers make a variety of programs and services available to help improve teaching and learning of science and mathematics at these schools. The 33 Centers regularly invite all high priority/persistently lowest achieving, among other schools in their service areas to participate in staff professional development, student programming, curriculum support activities, and instructional resource distribution. Print, electronic, and personal invitations are extended to schools and teachers throughout each school year. As financial resources become available, Centers customize services for specific high priority schools.

Examples of Programs and Services for High Priority Schools

Centers target high priority and persistently lowest achieving schools each year, providing intensive building-wide professional development. PD occurs at the classroom level and group level. PD at the classroom level may include: 1) modeling math or science lessons; 2) conducting lesson observations to determine areas of need; 3) design and implement customized small group PD; 4) provide curriculum revision advice; 5) conduct achievement gap analysis; and 6) assist in accessing instructional resources.

Macomb County M/S/T Center worked with high-priority schools in a focused partnership with districts to provide multiple 60 hours of math and science summer school for at-risk students. The program was available in science to students at the 10 lowest performing districts and to all math students that did not score in the top two categories of the 2011 MEAP. The Center provided money for materials and salaries, training, software and resources for the program. The local districts identified teachers that would be successful with students and helped to release them for training at the Center. While the outcomes of the program are still being evaluated and will require the results of the 2012 MEAP, they are confident that it has already had a significant impact on student achievement levels.

The Oakland Schools/OSMTech Developing Excellence in Learning and Teaching Algebra (DELTA) MSP grant developed and presented a comprehensive set of resources that will support improvements in the learning and teaching of algebra across Oakland County at the secondary level. The MSP grant included nine high-needs high schools and their feeder middle schools, and Oakland Schools provided supplementary funds so other districts could use DELTA's resources and opportunities. In 2011-2012, Who's on First?: Building Coherence Connections, and Retention across Grades Teams of middle and high school teachers worked together to trace the development of key algebraic topics and related instructional strategies across the grade levels. This work allowed participants to better understand the teaching and learning trajectories of algebraic topics and to identify their portion, avoiding duplication and opening up time for a deeper learning experience.

FOCUS ON HIGH PRIORITY AND PERSISTENTLY LOWEST ACHIEVING SCHOOLS

Persistently Lowest Achieving Schools Served by the Network

Beginning in 2010, state law required the identification of the lowest achieving schools. Based on an analysis of participation data from across the Network, the table below shows the extent of professional development programming provided by the Network in 2011-12 to teachers in the 146 schools identified as persistently lowest achieving schools.

Persistently lowest achieving schools served	71
Number of teachers from persistently lowest achieving schools served	199
Number of different activities/programs provided to teachers in persistently lowest achieving schools	148
Number of activity hours provided to teachers in persistently lowest achieving schools	1,446.4
Number of total contact hours received by teachers across all persistently lowest achieving schools	3,174.55

Teachers in 71 out of 146 (49%) persistently lowest achieving schools received professional development programming in the 2011-12 school year, in addition to teachers in high priority AND non-high priority schools. This has been accomplished despite an 82% decline in Network funding.

Battle Creek Area Math/Science Center Serving High Priority Schools

The Battle Creek Math/Science Center provided writing in science workshops for all high priority schools in its service area. The work will continue throughout the 2012-2013 school year.

In 2010-2011, BCAMSC staff worked with a high priority school district to develop an elementary STEM school as a pilot for focused and intensive math, science, and technology curriculum. In 2011-2012, staff coordinated efforts between the elementary STEM school and a middle school, planning for a new STEM middle school to open in fall 2012. BCAMSC facilitated meetings between the school staff, working on professional development, curriculum, school matriculation, staffing, and overall partnerships. The school demographics include 98% poverty and 70% minority. Center staff also provided curriculum leadership and summer professional development for the entire staff as well as assisted in the overall design of the schools. The elementary STEM school is a pilot turn-around school and BCAMSC will assist in programming throughout years 2 and 3 as well. BCAMSC facilitated a Science Program Improvement Review, from NSTA, beginning in winter 2011. This review provided feedback for science school improvement. The SPIR review was also provided for the district's high school, labeled this year as one of the lowest performing schools. The feedback is being used in 2012-13 for program improvement in science. The SPIR review, as well as baseline MEAP, parent and student focus group data, will be used at baseline data for the both the elementary and high schools.

Dickinson-Iron-Menominee Center Works with a High Priority School

The Center partnered with a High-Priority School within the service area providing strong support for school improvement. The Center coordinated services from STEM faculty at Lake Superior State University, providing in-depth, school specific observation and recommendations for instructional improvement, best practices and pedagogy. Master teachers from another school in the service area provided video-taped lessons for study by LSSU faculty, LSSU college students, high-priority school staff, ISD staff and Center director. The Center provided instruction and administration of Survey of Enacted Curriculum to encourage teacher improvement of classroom practice and instructional content. The Center also helped provide instruction, technology and equipment to support and improve classroom instruction and best practices.

PROFESSIONAL DEVELOPMENT

State Board of Education Priority:
“Provide effective support and professional development for teachers and administrators.”

U.S. Department of Education goal:
“Preparing high quality teachers.”

Mathematics and Science Centers Network Goal:
“Provide professional development opportunities to strengthen and update teaching practices based on current research and local needs.”

Statewide Professional Development

1,868 professional development sessions were offered by M/S Centers in 2011-2012.

9,845 hours of professional development programming were offered by M/S Centers in 2011-2012.

28,413 teachers and administrators enrolled in one or more professional development sessions facilitated by M/S Centers. These participating teachers and administrators averaged 14.5 hours of professional development offered by M/S Centers in 2011-2012.*

*Detailed numbers of hours, enrollments, and content of professional development sessions can be found on pages 32-33.

TYPES of PROFESSIONAL DEVELOPMENT OFFERED THROUGH CENTERS' PROGRAMMING

- Content knowledge workshops
- Professional development series
- Graduate courses
- Courses leading to certification in mathematics and science
- Distance-learning series
- Sponsorship of teachers to attend educational conferences
- New teacher induction programs
- Mentoring programs
- Summer institutes
- Video-conferencing
- In-class coaching
- Technology training and integration
- Lesson study
- Professional learning communities and study groups
- Online webinars and classes
- Statewide professional development

Examples of Professional Development

Targeted at High Priority/Persistently Lowest Achieving Schools

- Centers throughout the state have worked intensively with high priority schools through Project PRIME, SaM³, two Intel Math MSPs, and local initiatives.
- The Livingston/Washtenaw Math/Science Center worked with Lincoln Senior High, a Persistently Low Achieving school by providing Studying Math Learning training for all middle school Algebra and high school teachers as foundational work for the year. Throughout the year, the Center worked with two groups – Algebra I and Algebra II teachers. Both groups studied curriculum maps and pacing guides were created aligned to the Common Core State Standards and instructional techniques.
- The Genesee Area Math/Science Centers provided Flint Community School teachers, where 90% of buildings are designated as High Priority, by experts from EarthForce International in the proper usage of their curriculum on watershed management and incorporating a service learning component for groups of participating students.

IMPACTS AND OPPORTUNITIES: PROFESSIONAL DEVELOPMENT SERVICES

How are Centers impacting classroom practice?

- Observed changes in teaching practice due to participation in the Center program include more hands-on investigations, inquiry-based teaching and learning, concept mapping, and technology integration.
- Training on the use of science kits has encouraged inquiry-based learning.
- Feedback from teachers indicates that confidence in teaching science and math basic content is increasing.

Teachers are becoming mathematics and science leaders in their schools and districts.

- Many of the Mathematics and Science Centers, including Grand Traverse, Livingston/Washtenaw, and AMA/IOSCO held Common Core State Standards professional development sessions, which were focused on the Michigan Department of Education recommendations to share the changes and the timeline for transitioning to the Common Core State Standards with administrators and teacher leaders.
- In addition, at least seven Mathematics and Science Centers, including Berrien, Detroit, and Lapeer, held Next Generation Science Standards (NGSS) rollout events that provided the opportunity to be informed about the process, and to provide feedback as the standards continue to be formed.
- Central Michigan SMTC received funding from the National Science Foundation's "Research Experiences for Teachers" program which allowed physics teachers to spend 6 weeks conducting legitimate engineering research in CMU labs with highly published engineering professors.

Teachers who participate in Center programming learn research-based, best instructional practice for all students in their classrooms.

- Teachers Network-wide are engaged in best practice workshops and , as a result, are deepening their content knowledge of mathematics and science.
- The Detroit Mathematics and Science Center's Resource Center materials gave many teachers the confidence and resources needed to make hands-on inquiry-based activities a regular part of their science instruction.
- Grand Traverse Regional M/S/T Center had 32 Mathematics teachers who received follow-up EMATHS training for Algebra I, Algebra II and Geometry and 25 Mathematics teachers received training for Project PRIME/Algebra for All.

Opportunities to strengthen teachers' use of assessment to improve instruction.

- At the Lapeer County M/S Center, staff prepared teachers for the Smarter Balanced Assessment (SBA), by providing a Formative Assessment PD in a 5 part series.
- The Allegan/Van Buren M/S Center supported intensive professional development and curriculum work for Martin Public School's secondary math and science teachers. The framework for this professional development was MDE's Formative Assessment for Michigan Educators (FAME).
- The Huron Math and Science Center provided programming that helped K-12 teachers countywide align curriculum with state expectations and adjust instruction in preparation for the new SMARTER Balanced Assessment System.

STUDENT SERVICES

Michigan Department of Education Goal:
“Significant improvement in the academic performance of all students with major emphasis on lowest achieving schools and students”

- Examples of Programs for Underrepresented Students**
- Active recruitment of underrepresented students for accelerated and special programs, including summer camps.
 - Conferences for middle school girls focused on math, science and/or engineering.
 - M/S Centers provide strategies for teachers to work with special needs students, such as differentiated instruction, Universal Design for Learning, and methods for teaching, writing and literacy.

U.S. Department of Education Goal:
“Improving the academic achievement of the disadvantaged”

- Support for Students Attending High Priority Schools**
- M/S Centers identify high priority schools for targeted programming, such as summer courses and special mathematics and science opportunities that support and enhance classroom work.
 - Whenever possible, programs are offered to students at no (or low) cost.

U.S. Department of Education Goal:
“Promoting innovative programs”

- Accelerated High School Programs**
- Five Centers in collaboration with local districts provide advanced mathematics and science courses through half-day accelerated high school pull-out programs. Recruitment of minorities is a high priority. See page 21 for reported outcomes of these programs.
 - Centers save Michigan families money by providing Advanced Placement courses and dual enrollment opportunities with local colleges.

CUTS TO STUDENT PROGRAMMING

In 2009-10, the Network’s base funding was reduced by an additional 25%. Since 2002, Center funding has been cut a total of 82%. Due to a ninth year of significantly reduced funding from the Michigan Legislature, student programming hours have been drastically reduced. In the past year, there were 92% fewer programming hours than nine years ago. In addition, some of the accelerated high school programs are in jeopardy.

- What types of student outreach services are provided by M/S Centers?**
- Weekend, evening, and after-school programs
 - Research and professional programs
 - Classroom instructional programs
 - Outdoor education programs
 - Mathematics, science, and engineering fairs
 - Summer camps and academies
 - Internships in industry and medical fields
 - Mentoring
 - Academic competitions/LEGO Leagues
 - Advanced technology training
 - Online learning through Michigan Virtual University
 - Resources available for schools such as STAR Labs

IMPACTS AND OPPORTUNITIES: PROGRAMMING FOR STUDENTS

Students Explore STEM Careers and Opportunities

- The Macomb County Center held its 7th consecutive **Middle School STEM Career Symposium**, which drew nearly 300 middle school students. Students were arranged by interest and given time to interact with professional women from over 20 careers in math and science. Each student was scheduled into four sessions that included information on required schooling, work culture and opportunities to engage in the materials and tools of each career.
- The GVSU Regional Center's **Summer Health Activities and Professions Exploration (sHaPe)** program gave area middle school students, mostly from urban Grand Rapids and Wyoming, hands-on exposure to various health professions. At the end of camp, participants were interested in improving their personal health and had a greater interest in specific health careers.
- Mason-Lake Oceana M/S Center's **ASM Tech Early College** provided students with the opportunity to pursue STEM-related fields and earn up to two years of college credit for free. There were two cohorts with over 30 students in each group. Students are exposed to STEM activities during their evening meetings and during summer camp and take field trips to 4-year universities to learn about STEM career options. Students also went on the GVSU Research Vessel to study water quality of our local lakes. The Center also has connected ASM Tech students with ProAct Services Corporation to learn more about STEM careers which are available locally.
- The Glenn T. Seaborg M/S Center conducts a series of weekend and summer enrichment classes called "**College for Kids**" (C4K) for grades K-8: Twenty-two sessions of Summer College for Kids served approximately 324 students. In the summer, community members and teacher presenters conduct the Summer College for Kids, which features five weeks of weeklong activities. One Michigan Works! intern and 14 classroom instructors led the student sessions. The weekend program runs during the school year, conducted by NMU's education students under the supervision of Center staff. In the winter and fall, 203 C4K students were taught by 40 pre-service NMU teachers over three Saturday sessions.
- At the St. Clair RESA M/S Center, the **Middle School Academic Academy** is a countywide initiative that brings academically accelerated students to RESA in order to learn science, technology, engineering and math.

Increased Interest in Health Careers

Searching for Health Conference: Partnering with the Western Michigan University College of Health and Human Services, KAMSC 9th and 10th grade students engaged via conference with public health professionals to learn more about health issues that now, or will in the future, affect their lives. Partnerships with the Western Michigan University College of Engineering, Pfizer, and Bronson Methodist Hospital and Borgess Hospital also have provided opportunities for students to engage in research and/or a mentorship at these facilities.

Innovative Vehicle Design: Hands-on Involvement in STEM

A team of 20 high school students from districts throughout the Huron M/S Center service area designed and built a one-person electric vehicle. The 2011 vehicle created by Huron County students (Team H8) was Forrest, a battery-powered vehicle. In keeping with the theme "Electrification," students integrated a variety of electronic components into the design of the vehicle. In addition to engineering, designing, and building the vehicle, students also created advertising and marketing materials, which were displayed at the performance day event at Michigan International Speedway.

IMPACTS AND OPPORTUNITIES: PROGRAMMING FOR STUDENTS (continued)

Students Participate in Academic Competitions

World in Motion through the Detroit M/S Center: As a part of the World in Motion program, elementary students built and tested toy vehicles with the help of their teachers and volunteers from General Motors Corporation. Several teams received mini grants from the Detroit M/S Center to attend the regional competition at Cobo Hall.

2012 Tri-County Elementary Science Olympiad Hillsdale-Lenawee-Monroe M/S Center: A total of 211 students from 3rd-5th grade participated at Siena Heights University. Student teams competed in events such as Botany Pentathlon or Circuit Wizardry to gain points for their school.

MathCounts and You Be The Chemist Competitions: Centers continue to offer students various mathematics and science competitions. MathCounts is heavily supported by local engineers. You Be The Chemist Competition is supported by Dow Midland. These competitions have increased students' interest in mathematics and science. Furthermore, these competitions help students to "feel good" about being good at mathematics and science.

Students Work With Professionals

The **Battle Creek Area M/S Center's Architecture, Construction, and Engineering Mentor program (ACE)** offers students an opportunity to work closely with professional mentors to complete a formal project from design to development. On a weekly basis, students and mentors gather to learn various aspects of the many career opportunities in architecture, construction, and engineering. ACE requires field trips to construction sites to see the process in action, which is a critical piece to the program.

Another important piece is that students work side-by-side with professionals to develop a concept with the tools professionals use. BCAMSC is one of three programs in Michigan and one of approximately 100 across the U.S. ACE firms, including Skanska, Tower Pinkster, and SME, support this program.

EXAMPLES OF OUTCOMES IN ACCELERATED HIGH SCHOOL PROGRAMS

- One hundred percent of students graduating in 2012 from Center-sponsored accelerated high school programs went on to pursue college degrees.
- All 2011 Macomb County M/S/T Center seniors were enrolled in AP level science classes and over 2/3 of the seniors were enrolled in AP Calculus, while the remaining completed traditional calculus. 100% of this year's seniors graduated and were accepted to college programs.
- Students graduating from accelerated high school programs received millions in grants: \$3.1 million in the Kalamazoo area, over \$2 million in Berrien County, \$876,622 in the Mecosta area, and \$1.3 million in Battle Creek.
- The Battle Creek Area M/S Center produced two National Merit Scholars, 2 Commended Scholars, and 100% senior matriculation to college. At the school, 115 AP exams were administered with a 96% pass rate.

LEADERSHIP

**Michigan Department of Education
School Improvement Framework
Standard:** "Create a shared environment where everyone contributes to a cumulative, purposeful, and positive effect on student learning."

Mathematics and Science Centers Network Goal:
"Articulate a shared vision of improved teaching and learning of mathematics and science, facilitate collaboration among Centers, and develop professional development programs to meet the needs of Network members."

STATEWIDE INITIATIVES

The Michigan M/S Centers Network has taken a lead role in several major statewide initiatives to improve mathematics and science:

- SaM³ (Science and Mathematics Misconceptions Management)
- Project PRIME
- Family Engineering
- Measurement for Elementary Teachers
- Assessment collaboration and juried review of a database of math and science items
- Michigan STEM Partnership

See pages 4-10 and 13 for details about some of these programs.

NETWORK LEADERSHIP ACTIVITIES

Each quarterly Network meeting includes presentations about new resources and programs, updates on MDE initiatives and grant opportunities, and focused workshops related to Center functions and organization, evaluations, and professional development.

In addition, Center Directors receive MDE, CCSS, HSCE and MEAP updates that they pass on to local school district administrators and teachers.

DEVELOPING TEACHER LEADERS TO SERVE HIGH PRIORITY SCHOOLS

The Michigan Mathematics and Science Centers Network has continued to provide teacher leaders to high priority districts. MMSTLC (Michigan Mathematics and Science Teacher Leader Collaborative), which ran from 2006-2009, provided the building blocks to develop a teacher leader network. As a result of MMSTLC, many regions of Michigan now have Teacher Leaders available to serve as leaders in regional and statewide efforts to improve the teaching and learning of mathematics and science.

For example, at the Great Lakes Mathematics and Science Center, the availability of peer-led professional development in both math and science, using TSLs who participated in previous years in MMSTLC, or Math and Science Collaborative groups, played a major role in getting these services to local schools. This work focused on providing professional development in instructional strategies for teaching of measurement and continued efforts in ratios and proportions for middle school mathematics teachers. In the area of science, the emphasis was on building teacher understanding of inquiry-based instruction, while engaging teachers in first-hand inquiry that was then extended to student work in the class-

IMPACTS AND OPPORTUNITIES: LEADERSHIP

SCIENCE MATTERS



Network in Michigan

Teacher Leader Networks are Developed

The Michigan M/S Centers Network continues to be a partner in the statewide *Building a Presence in Science*. Through this program, there are “Points of Contact” at most school buildings in Michigan who disseminate up-to-date information about science assessments, student programs, Grade Level Content Expectations, and PD opportunities.

Teacher Leaders Using Assessment Data

Jackson County M/S Center Math Recovery – Add+VantageMR. During the previous year, a consultant was trained to be a one-on-one interventionist for struggling 1st grade students as well as becoming a trainer for the classroom-based assessment used to determine students’ skills and strategies for early numeracy. During 2011-2012, the focus turned to training a K-3 staff on the assessments and providing support for two teacher leaders. The focus of the work centered on having information for all students, using the information to form small groups, implement strategy used for computation, and use classroom discourse to encourage mathematical thinking.

In the first year, the teachers who had embedded support saw 86% of students at or above grade level in their strategy development, compared to 40% of a random sampling of students in a control environment. Sample sizes were relatively small; however, the strategy development assessed is in direct alignment with the Common Core State Standards use of strategies. We also see the potential for good growth in other classrooms. Moreover, the data showed that a student’s computation is not always in relationship to their strategy use. This was further cause to move toward inquiry instruction.

Centers Support Quality Teaching Experiences and Professional Development for Pre-Service Teachers

Centers take a leadership role in ensuring that new teachers entering the field have relevant experiences and are well prepared to meet Michigan’s standards for teaching as well as the Grade Level Content Expectations and High School Content Expectations.

- CMU pre-service teachers planned and carried out content and pedagogy for the Center’s Saturday Science sessions.
- At the Western UP Center, Family Engineering and Science nights were led by Michigan Tech students, faculty, and community professionals. The Michigan Tech student presenters were trained in an MTU Department of Education 2-credit semester-long course titled “Communicating Science.”
- At the Seaborg Center, pre-service teachers, under the supervision of Northern Michigan University staff, taught the “College for Kids.” Over 300 K-8 students participated.

Centers have been collaborating with Michigan universities and colleges to develop professional development workshops, seminars, and courses for teachers, developing instructional units, and providing summer institutes for both students and teachers.

Universities and Colleges involved have included: Adrian College, Albion College, Andrews University, Baker College, Bay Community College, Central Michigan University, Delta College, Eastern Michigan University, Ferris State University, Finlandia University, Grand Valley State University, Jackson Community College, Kalamazoo College, Kettering University, Lake Superior State University, Lansing Community College, Lawrence Technological University, Macomb Community College, Madonna University, Michigan State University, Michigan Technological University, Muskegon Community College, Northern Michigan University, Northwestern Michigan College, Oakland University, Saginaw Valley State University, Sienna Heights College, Spring Arbor University, St. Clair County Community College, University of Michigan, University of Michigan-Dearborn, Wayne State University, West Shore Community College, and Western Michigan University.

CURRICULUM SUPPORT

Michigan Department of Education Reform Priorities:
“Support ‘any time, any place, any way, any pace’ initiatives that help schools personalize learning for every student.”

Mathematics and Science Centers Network Goal:
“Support principals in identifying the professional development needs of teachers, analyze MEAP data to identify instructional needs of students, and work with school improvement and curriculum development teams to align programming and instruction with state and national standards.”

ASSISTING THE MDE WITH MATH AND SCIENCE INITIATIVES

- Local schools are more aware of state mathematics and science initiatives, changes in state assessment, and policy changes because Centers disseminate information to teachers and administrators.
- Project PRIME and SaM³ are statewide projects impacting hundreds of Michigan teachers and thousands of middle and high school students. The projects ensure teachers in Michigan are “speaking a common language” and have access to research-based, current professional development.

CURRICULUM SUPPORT FOR HIGH PRIORITY SCHOOLS

More than half of the Centers in the Network have been key partners in Michigan’s Math/Science Partnership Grants. These grants focus on preparing teachers from high priority districts (under-achieving, disadvantaged, or extreme rural) to teach curricula aligned with the GLCEs and High School Content Expectations.

SUPPORT OF MICHIGAN’S GRADE LEVEL CONTENT EXPECTATIONS (GLCEs), HIGH SCHOOL CONTENT EXPECTATIONS, AND NEXT GENERATION SCIENCE STANDARDS

- Multiple professional development sessions were provided to assist teachers in their understanding of Michigan’s GLCEs.
- In addition, many Centers facilitated Next Generation Science Standards (NGSS) draft standards review sessions for teachers and administrators.

PROFESSIONAL DEVELOPMENT SUPPORTING COMMON CORE STATE STANDARDS

Centers around Michigan are helping teachers navigate the Common Core State Standards (CCSS). Centers held professional development sessions for K-12 teachers, curriculum specialists, and administrators. The primary outcomes were to:

- Investigate the CCSS at specific grade levels for deeper understanding.
- Interact with the CCSS document and support materials in order to become familiar with the standards.
- Explore the processes and proficiencies of the CCSS Mathematical and Science Practices and their implications for classroom instruction.
- Investigate the Literacy in Science Standards in order to make decisions concerning curriculum, assessment and instructional practices.
- Identify appropriate next steps at the district level.

IMPACTS AND OPPORTUNITIES: CURRICULUM SUPPORT TO LOCAL SCHOOL DISTRICTS

Offering Professional Development in Formative Assessment

More Centers offer professional development based on formative assessment in the classroom.

- In Macomb, formative assessment trainings continued previous support of mathematics teachers throughout the county. These professional development offerings have utilized classroom video to analyze opportunities for improvement and also take advantage of available TI-Navigator technologies to gather data on student learning.
- Two 4-day professional development sessions, based on the work of the Michigan Association of Intermediate School Administrators (MAISA) in collaboration with a statewide Mathematics Leadership Team, were held in conjunction with the CASM Center. This series was based on a trainer-of-trainers model and teachers had the opportunity to pilot units, lessons and formative assessments as designed in the MAISA Units.

Using Student Assessment Results to Improve Instruction and Curriculum

- The Michigan Mathematics and Science Centers Network's Assessment Committee implemented a graduate-level course "*Implementing the Keys to Quality Assessment*" as a pilot course in July 2012 at the Eastern UP ISD with 33 participants (mostly K-12 classroom math and science teachers). A three-part evaluation was conducted with statistically significant gains from pre to post tests.
- The GLMSC worked to support underachieving schools in the region through professional development aimed at developing a greater knowledge of science and math and to increase the effective use of formative assessment.

Support science and mathematics achievement in identified high priority/persistently lowest achieving schools

- Huron M/S/T Center area schools are small, rural districts with high poverty levels and limited resources. The Student Achievement Model (SAM) and Battle Creek Science Units have helped to address the unique needs of local schools. Center staff, in collaboration with area superintendents and special education administrators, implemented a Student Achievement Model (SAM) aimed at improving learning so that at least 80% of students demonstrate mastery without intervention.
- The Macomb M/S Center's most aggressive work with high-priority schools was again a focused partnership with districts to provide 60 hours of math and science summer school for all students that did not score in the top two categories of the 2011 MEAP. The Center provided money for materials and salaries, training, software and resources for the program.

Facilitate the integration of technology into the math and science curriculum

- All Centers are supporting the integration of technology into math and science lessons. St. Clair RESA M/S Center hosted the "21st Century Symposium" in August 2011. Over 600 teachers and administrators attended. Participants in the symposium were able to see and hear students talk about the innovative ways they use technology. Post-event surveys revealed that 94% of respondents agreed or strongly agreed they would implement the knowledge and skills gained at this conference in their current position.
- The Regional M/S Center offered two one-day workshops on the free dynamic software, GeoGebra. Participants learned to use the software and find resources for using it in the classroom and explored how dynamic representation deepens students' understanding.

Assist districts with statewide math and science test alignment and analysis

- Centers around the state are supporting districts in aligning curriculum, instruction, and assessment to state standards.
- The EUP Center conducted monthly district level work with high school and mathematics teachers on alignment of curriculum, balanced assessment systems, common assessments, as well as course placement for students entering high school.

COMMUNITY AND PARENT ENGAGEMENT

U.S. Department of Education goal:
“Partnering with parents and communities.”

Michigan Mathematics and Science Centers Network goal:

“Engage businesses, universities, museums, governmental agencies, and parents in supporting and providing quality mathematics and science education and experiences.”

Partnerships with Other Institutions and Organizations

- Centers have collaborated with over 34 Michigan universities and colleges to plan teacher and student programming, write grants, and share resources.
- Over 14 museums and planetariums have shared programming with Centers.
- Centers have provided programming and consultation to environmental/outdoor education centers across the state.
- The Central Michigan SMT Center, for example, has partnered with:
 - ◆ CMU’s Cultural and Natural History Museum
 - ◆ Mount Pleasant Discovery Museum
 - ◆ Michigan Geographical Alliance
 - ◆ CMU’s School of Engineering
 - ◆ Michigan Economic Development Corporation

Business/Industry/Agencies have collaborated with Centers to provide:

- “Teacher in Industry” internship experiences
- Student internships in technical fields such as food science, medicine, information technology, website design, engineering, architecture, aviation, pharmacy, dentistry, veterinary medicine, and forensic science
- “Real-World” application of research projects such as water monitoring
- Mentoring and job shadowing experiences for students
- Used office furniture, scientific equipment, and supplies for schools
- Career talks by business professionals

Through Centers’ efforts, professionals in the community are assisting with student research projects, Science Olympiads, science fairs, career presentations, and mentoring.

Examples of Partnerships with Foundations

- Huron M/S/T Center’s environmental stewardship event “Embracing Our Earth” is in its eighth year. The event is supported by the Detroit Edison Energy Foundation, ITC Holdings, Consumers Energy, Geronimo Wind Energy, the Huron County Community Foundation, Square One Education Network, Michigan Department of Natural Resources, National Oceanic and Atmospheric Administration (NOAA), Huron Intermediate School District, and others.
- The Western UP Center is part of the Lake Superior Stewardship Initiative (LSSI), a project to prepare K-12 students to become knowledgeable citizens, concerned about the quality of life in their community, and actively engaged in the stewardship of Lake Superior and its watershed. The initiative provided sustained professional development for teachers, mini-grants to fifteen schools, assistance with stewardship projects, facilitation of school-community collaborations and community events. LSSI is one of eight funded hubs that comprise the Great Lakes Stewardship Initiative (GLSI) funded by the Great Lakes Fishery Trust and the Wege Foundation.

EXAMPLES OF ENGAGING PARENTS AND OTHER COMMUNITY MEMBERS

Many Centers organize Family Math and Science Nights and community education classes designed to engage parents and students in hands-on, inquiry-based activities. These programs build parents’ awareness of and familiarity with inquiry-based teaching and learning that students are participating in at school.

IMPACTS AND OPPORTUNITIES: ENGAGING PARENTS AND COMMUNITIES

M/S Centers collaborate with community groups to co-sponsor math and science programs

- Through the efforts of the Kalamazoo Community Foundation and local philanthropists, the community rallied around students from low-income families, providing financial aid for these students to participate in KAMSC's tuition-based *Sizzlin' Summer Math and Science* enrichment program.
- Genesee M/S Center partnered with the Flint Cultural Center and Longway Planetarium to offer "Young Astronauts", "Girls in Science", and "Brains and Braids".
- Jackson County M/S Center's TiViTz Tournament benefited when members of the Toy House, Jackson Area Manufacturers Association, Spring Arbor University, CP Federal Credit Union and Consumers Energy acted as volunteers/referees and scorers, as well as funded lunch and gave students games. Consumers Energy hosted the tournament at their headquarters.
- Huron M/S/T Center is a partner in Michigan Green Schools, a statewide initiative that provides information schools can use to become more environmentally conscious. Schools meeting at least 10 out of 20 energy-saving criteria are recognized as official "Green Schools." The majority of Huron County schools are and continue to be "Green."

Community groups are involved in planning and implementing programs

- Friends of Sprinkler Lake Education Center, a nonprofit organization, has partnered with AMA/IOSCO M/S Center, to become an integral part in the revising and development of activities. They have provided funding support and prizes for student activities and have brought back our community day when it could no longer be supported within the Center's budget. They have worked to find transportation support and scholarships for the summer science program.
- The Macomb County Center became involved with a committee that was formed to establish a children's science center in Macomb County. The Center director serves on the organization's board.

Parents are more engaged and involved in M/S Center and school activities

- PRISM, Partnership for Renewing Involvement in Science and Mathematics, is comprised of parents who support the BCAMSC. Their work involves opportunities for students to build relationships, support for building administrative tasks, and creating forums to educate families on college preparation.
- At the Jackson M/S Center, parents attend math and science activities on their own time and ask where they can purchase tools that are used.
- The Macomb M/S Center's Symposium for Middle School Girls, robotics programs, and partnerships with industry (PVS/Nolwood Chemistry Challenge, Macomb Service Learning Project) are excellent examples of the impact the Center is having on the community. Students, parents and community volunteers have drawn together to serve over 1000 individuals.

Financial and human resources are acquired to provide Centers' six basic services

- Centers across the state are receiving financial and in-kind support from area businesses, organizations, and agencies because of increased awareness of the importance of math and science. For example, at the Allegan/Van Buren Center M/S Center, the Perrigo Company partnership makes each district in Allegan AESA eligible to receive \$2,000-\$5,000 annually in education funds and \$1,000-\$3,000 annually in scholarships for math/science. .

Public understanding of the goals and issues of math and science education is promoted

- Centers maintain working relationships with their area news media. Frequent newspaper articles describe M/S Center programs and keep the community aware of the Centers.
- Individual Center websites and the Michigan Mathematics Science Centers Network website (www.mimathandscience.org) communicate math and science activities with a world-wide audience.
- Several thousand people in the Huron M/S Center service area participated in a day-long learning event focused on environmental science and renewable energy.

RESOURCE CLEARINGHOUSE

Examples of how Center resources are used to support best practices in mathematics, science, and technology education

M/S Centers support schools in the use of technology by:

- Allowing teachers to copy materials and borrow printed resources, videos, kits, and manipulatives required for classroom activities in particular science and/or mathematics curricula.
- Developing partnerships with industries to secure equipment such as graphing calculators, scientific probes, and other lab equipment that would otherwise be cost-restrictive.
- Providing training for integration of technologies.*

*Detailed numbers of hours, enrollments, and technology-focused sessions can be found in the Appendix, pages 33-35.

Maintenance and expansion of resources for local school districts

- Resource libraries are maintained by Centers, many of which are accessible through M/S Center websites.
- M/S Centers are a dissemination point for several organizations including MCTM, MSTA, and MDSTA.
- M/S Centers play an active role in the development, distribution, and maintenance of inquiry-based mathematics and science kits statewide. In addition, M/S Centers provide training and in-classroom support for using the kits or other equipment and instructional materials available on-loan from the Centers.

Centers create and sustain an Internet presence to support mathematics and science education

Many Mathematics and Science Centers use new technology platforms such as: social networking sites, MOODLE, Learnport and other online sources for delivering professional development.

Oakland Schools MTech mathematics and science consultants continue embedding online resources in professional development offerings, including identifying free or low cost applets organized around content themes for teachers to use in the classroom. By embedding applets and other online tools within coherent and connected units, the consultants hope to create learning opportunities for the use technologies in the context of a school environment. The consultants also view technology use as a strategy to open access for all science and mathematics students.

Centers actively recruit businesses and industries to support mathematics, science, and technology education through donation of equipment, facilities, and supplies. Some of these are used in Center programming but a major focus is the loaning and distribution of these materials and equipment to area schools. Financial resources are often used to support special events such as science fairs, academic competitions, and mathematics and science camps. Some examples of the businesses and industries that have supported Centers in the past year include: American Electric Power, AT&T, BACCO Construction Company, Blue Granite, Borgess Hospital, Bronson Hospital, Cadillac Mercy Hospital, Champion Incorporated, Coleman Engineering, Consumers Energy, Cook Nuclear Power Plant, CP Federal Credit Union, Dahlem Conservancy, DENSO, Detroit Edison Energy Foundation, Dow Midland, Enbridge, Flint Cultural Center, Flint River Watershed Coalition, Geronimo Wind Energy, HARSCO, ITC Holdings, Jackson Area Manufacturers Association, Kalamazoo Community Foundation, Kalsec, Kellogg Company, Martin Marietta Magnesia Specialties, Michigan Economic Development Corp., Michigan Geographical Alliance, Mt. Pleasant Discovery Museum, New Page Corporation, Nordland and Associates, Occidental Chemical, Perrigo Company, Pfizer, PVS/Nolwood Chemicals, Sandcastles Children Museum, Skanska, Stewart Inc., Thumb Electric Cooperative, Tower Pinkster, Toy House, US 131 Motor Sports Park, USDA Forest Service, Verso, Wal-Mart, We Energies, WK Kellogg Foundation.*

* Not a complete list.

IMPACTS AND OPPORTUNITIES: RESOURCE CLEARINGHOUSES MAINTAINED AND COORDINATED BY M/S CENTERS

Communities have access to resources provided for and developed by Centers

- Families have access to high-quality accelerated mathematics and science programs for students that often are only available in wealthy areas. Five accelerated high school programs are facilitated by Centers across the state (Battle Creek, Berrien County, Kalamazoo, Macomb, and Mecosta-Osceola).
- Communities have access to outdoor education centers supported by M/S Centers. Outdoor education centers include Stubnitz Environmental Education Center (Hillsdale-Lenawee-Monroe M/S Center), SEE-North Center for Outdoor Studies, AMA Sprinkler Lake Outdoor Center, Huron Nature Center, Northwoods Clear Lake Education Center, and Flint Ligon Outdoor Education Center.
- The Macomb equipment loan program has provided direct material support to schools throughout Macomb County. Schools can borrow StarLabs, Lego robotics kits, classroom GPS sets, data collection probes, as well as numerous other types of equipment to support classroom instruction.

Battle Creek Area M/S Center kits provide access to quality materials and equipment for the classroom that otherwise would not be available

- School districts across the state use the K-7 Science Curriculum/Kit program developed by the Battle Creek Area Mathematics and Science Center. The BCAMSC units provide instruction for ALL of the science GLCEs and provide the units to over 30% of the State's public school districts as well as schools in Iowa, Indiana, Minnesota, and Dubai. The mandatory professional development that accompanies the program included a pilot live-stream of PD and taped PD for those districts too far away to attend a regional PD session. The Science Units are completely aligned with the Michigan science and ELA standards and will be revised when the future Next Generation Science Standards are adopted in Michigan.

Technology and Engineering

- Manistee, Wexford-Missaukee M/S Center sponsored its seventh year of a LEGO/Robotics competition for local districts. In May, over 30 students participated in the competition or the exposition. This year's competition was created by career tech center students in the robotics program, who chose "PacMan" as a theme.
- Graphing Calculators, Robotics & Shadows/Silhouettes StarLab Workshops: Three Seaborg Center workshops were held for educators at the Action in Education Summer Institute, focusing on Shadows & Silhouettes in Astronomy which included NASA educator materials and equipment; another for training robotics educators/leaders how to teach using robotics; and a third on graphing calculator use in math/science classrooms. The Center serves as a NASA Education Resource Center, providing NASA information, posters and teaching materials to U.P. educators.

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★ **StarLab throughout Michigan** ★

★ Several Centers trained teachers to use StarLab in their schools and districts. StarLab is an interactive portable planetarium that creates an ideal environment for hands-on activities. After training, teachers have free use of the StarLab for their school. Thousands of students are able to learn about the solar system through this service. Centers involved with the StarLab program include Northwoods, CMU, Lapeer, Macomb, Wayne RESA and Seaborg. ★

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Other Resources

- Many Centers have an equipment loan program that has provided direct material support to schools throughout the state. Schools can borrow StarLabs, LEGO robotics kits, classroom GPS sets, data collection probes, as well as numerous other types of equipment to support classroom instruction.
- Centers have facilitated the donation (and dissemination) of lab equipment and supplies to districts from other agencies and industries.
- NASA resources and workshops provide in-service and pre-service teachers access to resources and strategies for integrating math, technology, and social studies with science are available through Centers.

LEVERAGED RESOURCES

Severe Funding Cuts: For the eighth year in a row, the Michigan Mathematics and Science Centers have experienced a major funding set-back. The reduced foundation grant from the State of Michigan, cut 75% by the Legislature in the 2002-2003 school year, experienced an additional 25% cut in 2009-10. The Centers are now operating at 82% reduced funding. Never before has the leverage of funds from other sources been so important. To compound the problems, grant acquisition has become more challenging with reduced staff and lack of available matching funds required by many funding agencies. In addition, local school districts have fewer funds available to support teachers to attend professional development or support other services of the Centers. Many Centers are only holding on "by a thread." Leveraged resources have prevented several Centers from closing completely.

Examples of Resources Leveraged Through Collaborations with Business, Industry, Universities and Colleges

- Students have the opportunity to visit university campuses during science Olympiads, science fairs and other activities.
- Teacher Quality Grants (Title II, Part A) are developing science leaders in under-achieving schools and building teachers' science content knowledge.
- Partnership with universities and school districts result in proposals for the Mathematics and Science Partnership Grants (Title II, Part B).
- Collaborations with state universities to sponsor full-day regional mathematics and science conferences for teachers.
- Inclusion of pre-service teachers in science, mathematics and technology content professional development courses offered to districts.

In the past year, Michigan Mathematics and Science Centers have leveraged an additional \$5,575,671 from grants and community contributions.

Intermediate School Districts and Universities have contributed approximately \$2,993,974 toward salaries and \$442,957 toward Centers' general funds. A large portion of these contributed funds represent Title II, Part B funds or payment for general education services.

EXAMPLES OF LEVERAGED SUPPORT

- In 2011, The Kellogg Company and W. K. Kellogg Foundation donated 14 million dollars to relocate the BCAMSC to downtown Battle Creek. The relocation is part of BCU's downtown redevelopment plan. The new facilities include a state of the art Learning Center for BCAMSC Outreach services and the BCAMSC High School and Middle School Programs, and a new Distribution Center to house the Science Unit Program. The additional space will allow for program growth in all BCAMSC program areas. Staff and community members continue to work on the design and construction of the new Distribution Center (opening in December 2012) and the Learning Center (opening in fall 2013.)
- Partnership with the Kalamazoo Community Foundation has allowed KAMSC to provide college scholarships to KAMSC seniors, and has identified local philanthropists who support some of KAMSC's enrichment programs for students, most notably and recently, the providing of need-based scholarship support for children attending KAMSC's Sizzlin' Summer Math and Science Program.

APPENDIX

MEETING STATE AND NATIONAL GOALS

The M/S Centers Network serves as a catalyst and resource for improvement of the teaching and learning of mathematics and science. Centers provide services within their region that enhance and extend beyond those available to local districts. A major focus of their work is supporting schools in meeting the strategic goals of the State Board of Education, the priorities of the Michigan Department of Education, and national education goals.

The table below illustrates the correlation of the Michigan Mathematics and Science Centers Network goals with state and national goals.

Michigan Department of Education School Improvement Framework Performance Indicators	U.S. Department of Education Goals	Michigan Mathematics and Science Centers Network Goals
Highly qualified personnel who continually acquire and use skills, knowledge, attitudes, and beliefs necessary to create a culture with high levels of learning for all.	Preparing high quality teachers.	Provide professional development opportunities that enable and sustain effective teaching in mathematics and science, by keeping teachers current in the field and able to develop positive learning environments for all students.
Staff participates in learning teams; professional learning is conducted with colleagues across the school/district on improving staff practices and student achievement.	Preparing high quality principals.	Provide leadership development in mathematics and science, both within the Center and within targeted K-12 Local Education Agencies (LEAs), with focus on high priority schools.
Staff has the professional technology skills to be effective in their positions.	Maximize technology's contributions to improving education.	Facilitate and model the integration of technology into the mathematics and science curriculum.
Best practice instructional methods are used to facilitate student learning.	Requiring schools to use research-based instructional programs.	Facilitate the integration of research-based instruction and best practices into the content areas of mathematics and science.
The school and community work collaboratively and share resources in order to strengthen student, family, and community learning.	Partnering with parents and communities.	Engage businesses, universities, museums, governmental agencies, and parents in supporting and providing quality mathematics and science education and experiences.

**Michigan Mathematics and Science Centers Network
Data Tables 2011-2012**

PROFESSIONAL DEVELOPMENT

Table 1: Professional Development Participants

			Reported Gender**		Position					
Partici- pants	Different No. of Individ.	Total Hours	Males	Females	Admin.	Math Tchrs.	Science Tchrs.	Tech Tchrs.	Com- bined Subject	Other or Un- known*
Pre-K	257	3,140	9	247	8	2	0	0	140	107
Elemen- tary	5,060	61,808.2	508	4,491	136	101	75	10	4,341	397
Middle/Jr. High	2,024	35,430.8	533	1,444	59	738	667	16	149	395
High School	2,447	44,820.2	994	1,394	54	966	670	35	106	616
Mixed Levels	1,183	17,064	332	832	179	156	205	25	221	397
Other*	1,452	17,807.4	378	925	35	70	105	3	43	1,196
Total	12,423	180,070.8	2,754	9,333	471	2,033	1,722	89	5,000	3,108

*Other includes persons who are not teachers or administrators, or did not indicate position.

** 2.7% of individuals did not indicate gender.

Teachers averaged 14.5 hours of participation in Center programming during the 2011-12 academic year.

WHAT WERE THE NATURE AND EXTENT OF THE PROFESSIONAL DEVELOPMENT ACTIVITIES?

Professional development was delivered in many ways, depending on the identified needs in the service area. Two primary formats included: 1) single events, lasting from a portion of one day to several consecutive days, and focused on a particular topic, skill, or issue, or 2) series—a series of sessions with a single focus, conducted periodically over a several week/month period.

Table 2: Professional Development Activities

		Math	Science	Technology	Integrated M/S/T	Other	Total
Pre-K	Events	3	0	0	0	0	3
	Hours	37.5	0	0	0	0	37.5
	Participants*	87	0	0	0	0	87
Elementary	Events	243	383	15	0	17	658
	Hours	1,448.5	1,415.25	33.7	0	36.75	2,934.2
	Participants*	4,342	3,038	237	0	237	7,854
Elementary & Middle/Jr. High	Events	70	49	6	0	5	130
	Hours	517	339.25	52.75	0	11.7	920.7
	Participants*	1,117	582	80	0	51	1,830
Middle/Jr. High	Events	104	69	6	0	13	192
	Hours	729	333	26.2	0	32.5	1,120.7
	Participants*	1,427	550	101	0	189	2,267
Middle/Jr. High & High School	Events	191	73	20	0	27	311
	Hours	1,387.9	382.25	88.5	0	114.25	1,972.9
	Participants*	3,159	942	217	0	376	4,694
High School	Events	78	77	13	0	24	192
	Hours	621	379.5	54.5	0	74	1,129
	Participants*	1,446	894	210	0	336	2,886
Other (includes K-12 Mixed Levels and non-responses)	Events	96	101	74	0	111	382
	Hours	479.5	582.91	208.25	0	459.4	1,730
	Participants*	1,652	2,028	2,193	0	2,922	8,795
Total	Events	785	752	134	0	197	1,868
	Hours	5,220.4	3,432.16	463.9	0	728.6	9,845
	Participants*	13,230	8,034	3,038	0	4,111	28,413

*Includes duplicate counts (individual participants enrolled in more than one program).

Table 3: Student Services Activities

		Math	Science	Technology	Integrated M/S/T	Other	Total
Pre-K	Events	2	10	0	0	0	12
	Hours	10	54	0	0	0	64
	Participants	35	321	0	0	0	356
Elementary	Events	34	557	21	0	10	622
	Hours	229.75	2,690.5	100	0	46	3,066.25
	Participants	2,092	27,178	313	0	1,266	30,849
Elementary & Middle/Jr. High	Events	10	46	11	0	9	76
	Hours	48	475.25	158	0	69.25	750.5
	Participants	1,571	2,575	163	0	436	4,745
Middle/Jr. High	Events	6	99	12	0	31	148
	Hours	76	852	184	0	66	1,178
	Participants	239	4,366	131	0	964	5,700
Middle/Jr. High & High School	Events	3	9	2	0	2	16
	Hours	13	2,569	50	0	4.75	2,636.75
	Participants	334	4,094	19	0	318	4,765
High School	Events	23	77	44	0	32	176
	Hours	181.75	702.25	247	0	415.25	1,546.25
	Participants	1,266	4,399	862	0	2,559	9,086
Other Mixed Levels	Events	1	22	0	0	3	26
	Hours	2	51.75	0	0	8	61.75
	Participants	92	5,969	0	0	158	6,219
Total	Events	79	820	90	0	87	1076
	Hours	560.5	7,394.75	739	0	609.25	9,303.5
	Participants	5,629	48,902	1,488	0	5,701	61,720

For more descriptive information regarding individual Center programming, see individual Center Reports. These can be obtained by contacting individual Center Directors (see page 41). The Network website also gives additional information: www.mimathandscience.org.

Table 4: Twelve Year Summary Data

SUMMARY OF PROFESSIONAL DEVELOPMENT ACTIVITIES 1999-2012

School Year	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007*	2007-2008*	2008-2009*	2009-2010	2010-2011	2011-2012
Total PD Programs Offered	2,549	2,765	3,436	3,239	1,705	1,928	1,725	2,036	1,849	2,304	2,265	1,748	1,868
Total PD Program Hours	14,059	13,067	14,757	14,563	10,507	11,057	11,109	11,933	10,254	12,049	12,592	10,825	9,845
Total PD Enrollments	43,655	47,210	21,904	51,527	28,540	34,237	26,484	30,271	28,998	35,419	30,838	25,085	28,413
Percent PD Science-Focused Programs	42%	40%	43%	36%	41%	31%	41%	40%	36%	49%	35%	47%	40%
Percent PD Math-Focused	17%	21%	23%	27%	30%	41%	45%	45%	42%	36%	54%	40%	42%
Percent PD Technology-Focused	9%	11%	7%	8%	15%	7%	4%	5%	6%	3%	4%	6%	7%
Percent PD Integrated M/S/T	19%	18%	15%	13%	1%	0%	1%	1%	1%	1%	0%	0%	0%
Percent PD Other	13%	11%	12%	15%	14%	21%	9%	9%	15%	11%	7%	7%	11%

*Total PD activities were positively impacted by a special earmarked allocation from the Michigan Legislature to fund a statewide PD effort.

SUMMARY OF STUDENT ACTIVITIES 1999-2012

School Year	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Outreach Sessions	6,763	6,514	6,990	5,024	1,252	1,579	1,112	1,119	960	1,296	1,205	1,085	1,076
Outreach Hours	46,403	52,879	159,952	109,816	37,893	19,151	15,983	17,940	13,877	11,282	7,683	7,358	9,304
Outreach Participants	251,251	263,292	309,716	374,813	239,984	206,906	287,047	160,220	108,875	176,421	103,310	62,169	61,720

NOTE: The program data above represent a significant decline in the level of activities offered to teachers and students, the number of programming hours offered, and the number of enrollments in programs beginning in 2003-04. This was the year that Centers received a 75% reduction in their base funding from the Michigan Legislature. **This clearly suggests that the reduction has significantly impacted the quantity and accessibility of mathematics and science programming for Michigan's students and teachers.**

However, Math and Science Centers have focused their efforts on providing high quality professional development to ensure teachers are highly qualified and using best practices. Due to leveraged grant monies and a special allocation from the Legislature, professional development programming hours have only been reduced by 32% since 2002-03 despite the 75% cut in core funding. **Unfortunately, the number of DIRECT student programming hours since 2002-03 have been reduced by 92% due to funding cuts. In collaboration with the Michigan Department of Education, the Centers decided to focus their primary efforts on providing professional development to improve teacher knowledge, skills, and instructional practices, with the intent of improving student learning.**



Annual Pre/Post Teacher and Student Participant Assessment Data Vignettes

Select Examples of PROGRAM IMPACTS—2011-12

Centers submitted data showing impacts of selected programming that occurred during the 2011-2012 school year. The following pages are vignettes based on that impact data.

Example of
PROGRAM IMPACTS—2011-12

Centers submitted data showing impacts of selected programming that occurred during the 2011-2012 school year. This is one of a set of vignettes based on that impact data.

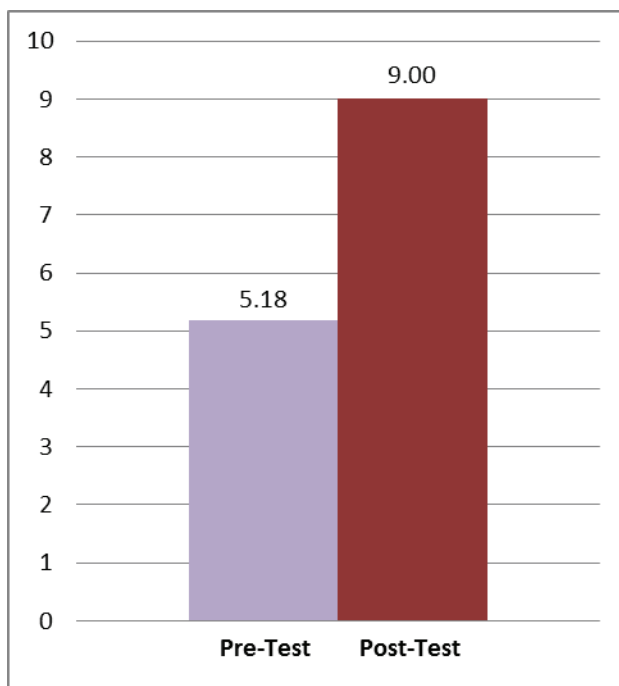


Central Michigan Science, Mathematics, and Technology Center

Teacher Astronomy Content Knowledge Improved

The Central Michigan Science, Mathematics, and Technology Center facilitated a project to improve teaching and learning of astronomy/earth science-related Michigan grade level content expectations through an Improving Teacher Quality grant. Teachers from various rural schools in the central lower peninsula participated in this professional development effort. Developed by CMU science faculty, the teachers were asked to complete a science content test related to topics addressed in the program. The test was administered at the beginning and end of the program. The graph below shows changes in mean scores from pre-to-post.

Results: An analysis of test scores from the eleven upper elementary and middle school teachers who completed both pre- and post-tests showed improved total mean scores on the earth science assessment on a 10-point scale. Mean gains pre-to-post were 3.82.



Data supplied by the CMU SMT Center 6-2012
Vignette prepared by Science and Mathematics Program Improvement (SAMPI)—WMU 9-2012

Example of
PROGRAM IMPACTS—2011-12

Centers submitted data showing impacts of selected programming that occurred during the 2011-2012 school year. This is one of a set of vignettes based on that impact data.

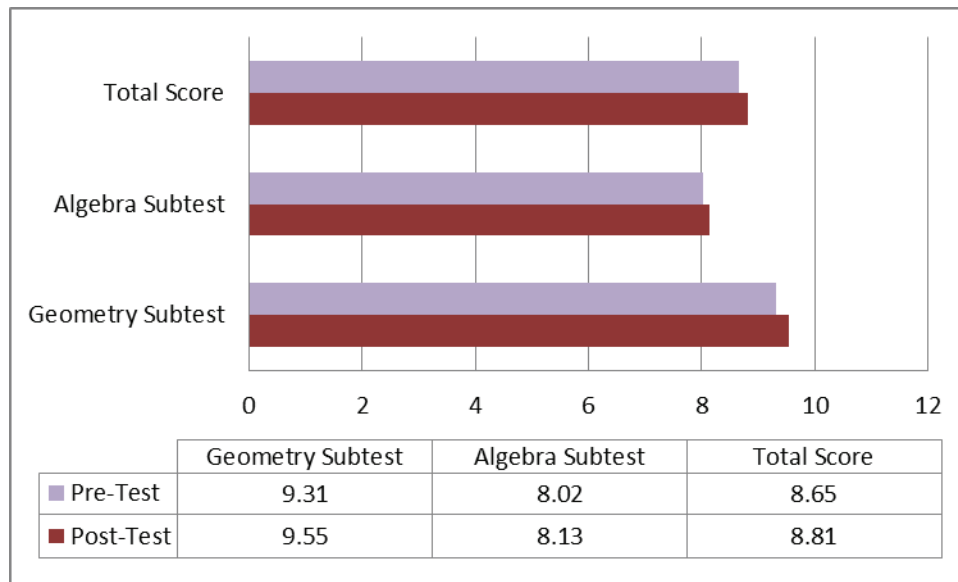


Western Upper Peninsula Center for Science, Mathematics, and Environmental Education

Teacher Mathematics Content Knowledge Improved

The Western Upper Peninsula Center for Science, Mathematics, and Environmental Education provided mathematics teacher professional development through a statewide Mathematics and Science Partnership (MSP) grant called Project PRIME. The purpose of PRIME was to improve teacher content and pedagogical knowledge in the areas of algebra and geometry. Participating teachers, from various schools in the Center’s service area in the Western UP, were asked to complete a modified version of the University of Michigan Learning Mathematics for Teaching (LMT) content test at the beginning and end of the Project PRIME programming. The graph below shows changes in mean scores from pre to post.

Results: An analysis of test scores from the sixteen middle school teachers who completed both pre- and post-tests showed improved mean scores for the algebra item subset, geometry item subset, and total score on a 10-point scale. Mean gains pre-to-post were 0.24 on the geometry subtest, 0.11 on the algebra subtest, and 0.16 on the total score.



Graph prepared and data supplied by the Center for Evaluation Research 6-2012
 Vignette prepared by Science and Mathematics Program Improvement (SAMPI)—WMU 9-2012

Example of
PROGRAM IMPACTS—2011-12

Centers submitted data showing impacts of selected programming that occurred during the 2011-2012 school year. This is one of a set of vignettes based on that impact data.

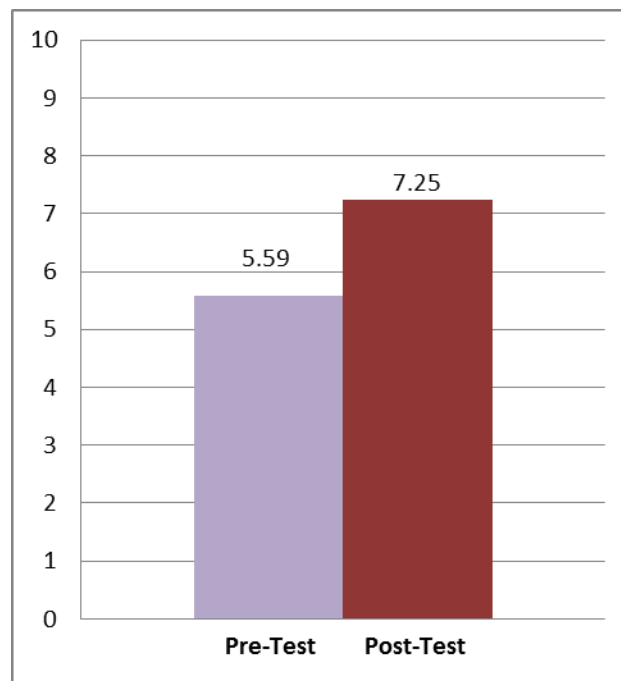


Muskegon Area ISD Regional Math and Science Center

Student Knowledge about Physics and Related Math Concepts Improved

The Muskegon Area ISD Regional Math and Science Center coordinates an Amusement Park Physics (APP) Day program each year. The purpose of the program is to provide a real-world hands-on physics/mathematics experience for middle school students. In May 2012, four schools participated in a special assessment related to the APP Day activities. A student test was devised by the Center focusing on ratios/proportions and geometry related to the physics of amusement park rides. It was administered before teachers began their formal instruction related to the APP Day program began and when they returned to their classrooms after the event. Seventy-five (75) students completed both pre- and post-tests. The graph below shows changes in mean scores from pre-to-post.

Results: An analysis of test scores from the 75 students who completed both pre- and post-tests showed improved total mean scores on the physics assessment on a 10-point scale. Mean gains pre-to-post were 1.66.



Data supplied by the MAISD M/S Center 6-2012
Vignette prepared by Science and Mathematics Program Improvement (SAMPI)—WMU 9-2012

Example of
PROGRAM IMPACTS—2011-12

Centers submitted data showing impacts of selected programming that occurred during the 2011-2012 school year. This is one of a set of vignettes based on that impact data.

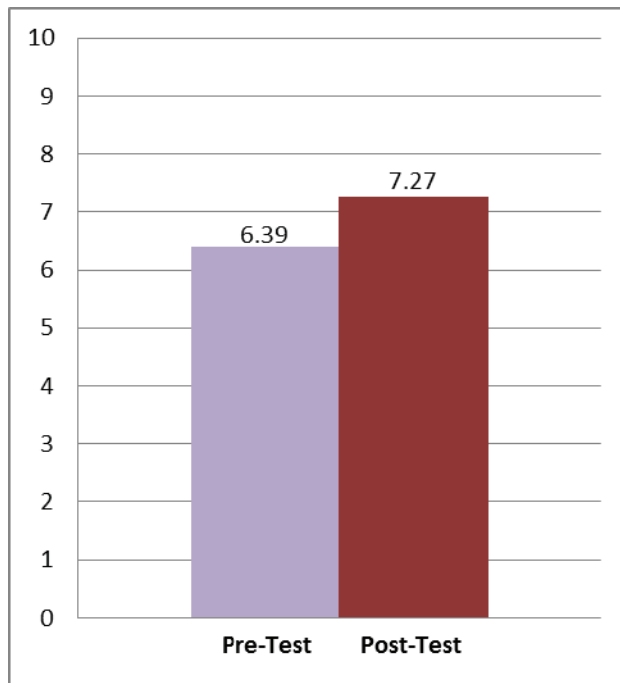


Regional Mathematics and Science Center at Grand Valley State University

Student Knowledge About Health Science Improved

The Regional Mathematics and Science Center at Grand Valley State University conducted Health Professions Day Camps in summer 2012 for 7th and 8th grade students from the Grand Rapids metropolitan area. The purpose was to familiarize and increase knowledge about human anatomy/physiology, healthy lifestyles, and health professions. At the beginning and end of the sessions, students completed a test focused on these topics. Thirty-three students completed both pre- and post-tests. The graph below shows changes in mean scores from pre-to-post.

Results: An analysis of test scores from the 33 students who completed both pre- and post-tests showed improved total mean scores on the health-related assessment on a 10-point scale. Mean gains pre-to-post were 0.88.



Data supplied by the GVSU 6-2012

Vignette prepared by Science and Mathematics Program Improvement (SAMPI)—WMU 9-2012

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