

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.

Michigan Mathematics and Science Centers Network

STATEWIDE PROJECTS

2008-09

The Michigan Mathematics and Science Centers Network is a collaboration of 33 regional centers throughout the state created by the Michigan Legislature to elevate mathematics and science education for all students in Michigan. Centers provide public and private schools in their regions with a variety of student services, teacher professional development, curriculum, leadership, community partnership, and resource sharing programs and services.

Each year, Centers offer local programming to thousands of teachers and their students, designed to improve the teaching and learning of mathematics and science. There are also statewide projects conducted across Centers, partnering with state agencies, professional organizations, higher education, non-profit programs, and businesses. The major statewide efforts in 2008-09 are highlighted here.

They include:

- HIGH SCHOOL MATH AND SCIENCE SUCCESS (HSMAS-III)
- MICHIGAN MATHEMATICS AND SCIENCE LEADERSHIP COLLABORATIVE (MMSTLC)
- BACK ON TRACK: READY FOR ALGEBRA
- INNOVATIVE STUDENT PROGRAMS

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Value of Statewide Projects

The 33 Michigan Mathematics and Science Centers have functioned as a collaborative Network since their inception in 1988. The past several 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.

Statewide Projects in 2008-09:

- Inquiry in Instruction—HS-MASS III (High School Mathematics and Science Success III)
- MMLA (Michigan Mathematics Leadership Academy)
- MSLA (Michigan Science Leadership Academy)
- MMSTLC (Michigan Mathematics and Science Teacher Leader Collaborative)
- Back on Track: Ready for Algebra!

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
- 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.
- 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



SELECTED FINDINGS FROM THE EXTERNAL EVALUATION OF INQUIRY IN INSTRUCTION -I³ (*HS-MASS III*)

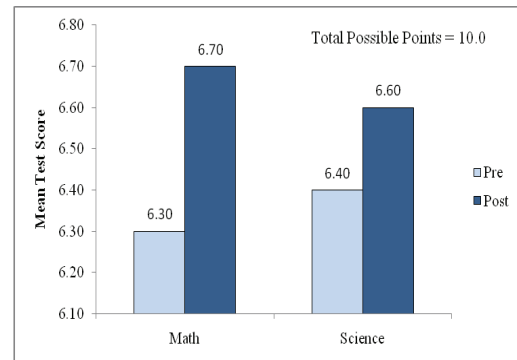
HS-MASS is a statewide collaborative effort of the Michigan Mathematics and Science Centers Network begun in 2006 to provide high school mathematics and science teachers with professional development opportunities designed to help them improve teaching and learning and increase student success. **HS-MASS III**, (Inquiry in Instruction—*I³*) implemented during the 2008-09 school year, was designed to 1) increase awareness and knowledge of key elements of an inquiry-based approach to teaching mathematics and science concepts and 2) development and implementation of lessons and investigations that exemplify the key elements of inquiry. Centers across Michigan conducted a series of workshops for 8th-12th grade mathematics and science teachers in their service areas. Below are summary statements based on an analysis of data collected as part of the external evaluation. Reports based on other evaluation data, as well as detailed information supporting this report, are available.

- In collaboration with the Michigan Department of Education, during the 2008-09 school year, the Network developed professional development materials, trained facilitators, planned and implemented workshops, and conducted a results-oriented external evaluation at Centers across Michigan.
- The Network conducted half and full day workshops, serving 534 high school mathematics teachers and 493 high school science teachers. Over 16,000 math and science middle and high school students were involved.
- Results of a pre/post test of students of participating teachers shows an increase in scores pre to post for both mathematics and science across the Network. In mathematics, 19% of the Centers exhibited a statistically significant increase. In science, 11% showed a statistically significant increase. Students were also asked to report the confidence of their answer. Student confidence increased in both mathematics and science.
- Results of a pre/post assessment/survey of participating teachers show a significant increase in mean score ratings pre to post on all items related to workshop topics and activities.
- Most teachers indicated very little familiarity with the key elements of inquiry-based teaching and learning. By the end of the workshop series, they indicated significantly improved familiarity and understanding. There was a statistically significant positive change pre to post.
- About 80% of science teachers were able to identify the best response to a group of student's inconsistent findings; 70% of math teachers could identify inquiry-based strategies that could be used to help students.
- Center director interview data indicates that inquiry was timely and relevant professional development for high school math and science teachers. Many educators left with an upgraded perspective of how to use inquiry-based instructional strategies.
- Interviews were conducted with 42 teachers that participated in the HS-MASS workshops. Teachers reported that learning new teaching methods, the opportunity to collaborate with other educators, and learning about the new state standards were the best aspects of the HS-MASS training.
- Teachers stated they were using inquiry-based teaching more often in their classroom and they had a better understanding and use of assessment as a result of HS-MASS workshops.

IMPACT ON STUDENTS OF PARTICIPATING TEACHERS

2006-07, 2007-08, 2008-09 School Years

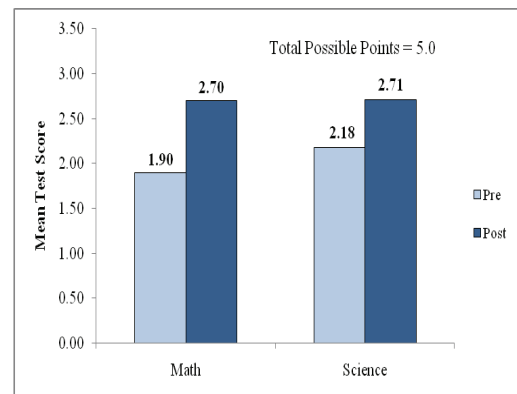
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HS-MASS I

2006-07 (HS-MASS I). Participating teachers administered a test consistent with MME/ACT before and after a classroom intervention developed during HSMASS focused on data interpretation, an area identified as weak among high school students across Michigan. Over 11,000 math students and 13,000 science students were tested.

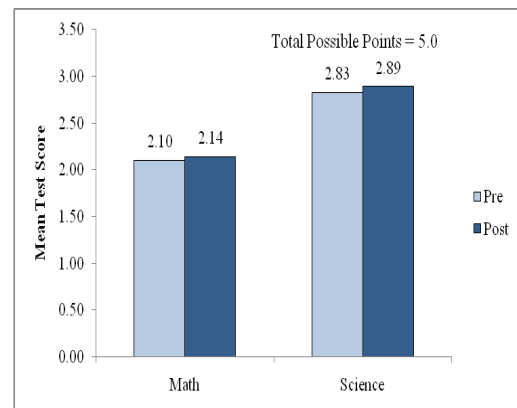
Results: Student data interpretation skills showed a statistically significant improvement as a result of HS-MASS. Statewide mean test scores increased from pre to post in both science and mathematics.



HS-MASS II

2007-08 (HS-MASS II). Teachers administered tests with five specified strands consistent with either state mathematics or science high school expectations before and after a classroom intervention developed during HS-MASS as part of their study of formative (classroom) assessment strategies. Over 10,000 math students and 10,000 science students were tested.

Results: Total statewide student test scores showed a statistically significant improvement as a result of the HS-MASS program. Mean test scores increased pre to post in both science and mathematics.



MAJOR ACCOMPLISHMENTS AND RESULTS SUMMARY REPORT: 2006-2009

Begun in July 2006, the Michigan Mathematics and Science Teacher Leadership Collaborative (MMSTLC) was a statewide partnership among the Michigan Mathematics and Science Centers Network, Grand Valley State University, Saginaw Valley State University, The University of Michigan—Ann Arbor, The University of Michigan—Dearborn, and the Michigan Department of Education. State-level funding for the project ended in August 2009. Purposes were to develop a cadre of Teacher Leaders (TLs); establish collaborations among the TLs, school administrators, Math/Science Centers, and STEM (Science, Technology, Engineering, Mathematics) faculty; and improve math and science teaching and learning in targeted high priority schools.

Internal and external evaluation was conducted to provide evaluative data for program improvement and to determine impact of the program on targeted audiences. What follows is a summary of evaluation findings from the 3-year project. A full MMSTLC report is available from the Michigan Department of Education.

SELECTED OVERALL IMPACTS

MMSTLC increased Teacher Leader (TL) mathematics and science content knowledge.*

Participating STEM faculty refined their understanding of inquiry-based instruction and how it can be applied to their college classrooms, increased their understanding of specific instructional needs of middle school teachers, and provided assistance to TLs and their Core Teams.

TLs increased math and science content knowledge among their home-region colleagues.*

TL capacities to serve as leaders of mathematics and science improvement efforts in their home districts expanded as a result of their participation in MMSTLC through improved math/science content knowledge, understanding of effective pedagogical strategies, and leadership skills.

Many regions of Michigan now have TLs who can serve as leaders in regional and statewide efforts to improve the teaching and learning of mathematics and science; the TLs (and other MMSTLC team members) can now network with each other as a statewide learning community.

SELECTED IMPACTS ON TEACHER PARTICIPANTS

There was a statistically significant increase (at the .05 level) from pre to post in scores on content tests in science for Cadre II and on mathematics content tests among both Cadre I and Cadre II Teacher Leaders.* This provides one measure of improved TL content knowledge as a result of MMSTLC.

Cadre I Teacher Leaders provided professional development and other assistance to their home region teacher colleagues as part of school-level improvement efforts initiated through MMSTLC. Among a subset of these colleagues across the eight Cadre I Math/Science Center sites, there was a statistically significant gain (at the .05 level) from pre to post in scores on both mathematics and science content tests.* This suggests content knowledge among these teachers increased as a result of the PD and assistance provided by Teacher Leaders.

Data in items with an asterisk (*) were supplied by Moore and Associates, Inc., Southfield, MI, MMSTLC External Evaluators.



OPPORTUNITIES TO LEARN

Fifty-eight (58) middle school math and science teachers from across Michigan were provided with sustained inquiry-focused formal professional development opportunities in science and mathematics teaching and learning and leadership development.

Through multi-month sabbaticals, 19 of the Teacher Leaders (TLs) carried out customized personal professional learning plans to build their instructional and leadership capacities, as well as lead math and science improvement efforts in their home schools; other TLs received several days of release time to facilitate professional development and other improvement efforts among their teaching colleagues.

Over 200 math/science teacher colleagues of the TLs have received professional development and other assistance from the TLs as part of school-level math and science improvement efforts.

More than 20,000 students in participating schools had opportunities to learn math and science through inquiry-based approaches, strategies that actively engage them in their own learning.

STEM (Science, Technology, Engineering, Math) faculty had opportunities to learn about the needs of middle school teachers and students, as well as gain new knowledge about inquiry-based learning for integration into their own courses.

PROGRAMMATIC ACCOMPLISHMENTS

Established 19 Math/Science Center-based core teams (Cadre I capacity-building 2007-09 and Cadre II 2008-09).

Prepared 58 mathematics and science Teacher Leaders (TLs) in Cadres I and II to regularly serve more than 200 of their math/science colleagues in about 35 schools and more than 20,000 students. Supported multi-month sabbaticals for 19 TLs and release time for 15 TLs to enhance their capacities to help colleagues improve math/science teaching and learning.

Distributed \$1.6 and \$2.0 million respectively in Cadres I and II to support their work in improving mathematics and science teaching and learning; provided competitive grants for Cadre I teams.

Created a website (www.mmstlc.net) for general audiences, with links to sites for MMSTLC teams to access resource/instructional materials.

Prepared a variety of MMSTLC math/science content and pedagogical instructional, professional development (PD), and leadership materials for Teacher Leaders and other core team members, being made available electronically for future use.

Provided more than 185 hours of state-level PD over 2.5 years to Cadre I teams, including 83 hours devoted to math and science content and pedagogy and 64 hours to building leadership skills.*

Provided 139 hours of professional development to Cadre II teams over 12 months, including 59 hours of math and science content and pedagogy and 52 hours building leadership skills.*

Eight Cadre I teams implemented a total of 534 PD, student, and other MMSTLC activities at the Center/school level over a 24-month period, July 2007-June 2009; a total of 2329 hours provided; attendance of 6833 across all activities.

Eleven Cadre II teams implemented a total of 564 PD, student, and other MMSTLC activities at the Center/school level over a 12-month period, July 2008-June 2009; a total of 4887 hours provided; attendance of 4160 across all activities.

Data in items with an asterisk (*) were supplied by Moore and Associates, Inc., Southfield, MI, MMSTLC External Evaluators.

Back on Track: Ready for Algebra!

A Partnership between the Network and MVU



Michigan
Mathematics and
Science Centers Network
Statewide Project



The *Back on Track: Ready for Algebra!* Program was a partnership between the Michigan Mathematics and Science Centers Network (MMSCN) and Michigan Virtual University (MVU). The program offered a 48 hour afterschool intervention and 20 hour summer math camps to targeted eighth grade students in selected Centers across the state. Students could participate in one or both interventions. They were invited to participate in the program based on their 6th and 7th grade math MEAP scores.

A summary of findings prepared by an MVU evaluator include the following:

Thirteen Centers participated in this effort: Allegan, AMA/Iosco, Berrien County, CASM, Detroit, Dickinson-Iron-Menominee, Eastern UP, Huron, Jackson, Muskegon, Northwoods, St. Clair, and Wayne.

Over 2,200 students initially enrolled in the afterschool program; 223 students attended at least half the sessions.

Over 900 students enrolled in the summer camps; 465 attended at least one day.

Students from 111 organizations including middle schools and Math and Science Centers attended the afterschool program. Each school provided computers and a qualified math teacher.

Students in the afterschool program used Compass Learning, a commercial, online algebra program. 569 students completed enough of the afterschool program to be included in the pre/post test. Of the 569 students that took the tests, 336 students (59%) scored higher on the post-test than the pre-test.

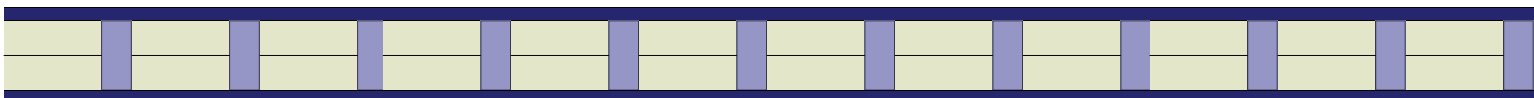
Students in the summer camps used the Michigan Virtual Summer Mathematics Camp, an online program. Of the 921 students enrolled in the program, 262 student completed the pre and post tests. The results of the test show a statistically significant change.

In a survey of parents of students in the afterschool program, respondents appreciated the extra time children had to work on math. They also believed the program helped prepare their children for high school math.

Teachers of the afterschool program identified several obstacles to satisfactory completion of activities by students including afterschool student conflicts, poor attendance, lack of motivation, bored students, and computer issues.

A full summary report of the program is available from MVU.

For more information about the Network-MVU partnership, contact Dee Benjamin, Director, Dickinson-Iron-Menominee Math, Science, and Technology Center (906-779-2609 or dbenjamin@diisd.org) or Jamey Fitzpatrick, Director, Michigan Virtual University (517-336-7733 or jfitz@mivu.org)



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 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.

Innovative Student Services

Many Centers provide innovative outreach programming using local resources to provide opportunities and 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.

- Middle and high school students at the Allegan M/S Center have the opportunity to design, build, and race model solar and battery powered cars. This project engages students and their teachers in a problem-solving, team-building and design-based experience while also meeting the science and math GLCEs and HSCEs.
- The Lake Superior Stewardship Initiative (LSSI) at the Western UP Center focuses on helping students assume the role of contributing citizens in their community. Teachers, students, parents and community organizations partner to address a stewardship need in their community. Students, with the guidance of teachers and community partners, design and implement projects that enhance the quality of life in their community and have a positive impact on the health of the Lake Superior watershed.
- PRO-SOLVE, a 3rd-8th grade, 5 event per year, classroom-based problem solving program completed its 14th year in St. Clair County schools and the school districts across the state. Schools, as well as studies conducted early in its tenure in St. Clair County, attribute increased MEAP performance to this program.
- The Manistee, Wexford-Missaukee M/S Center sponsors a LEGO competition for students which focuses on green energy. The exposition is called “Boogie Bots” and the students program their robots to dance to music.
- The Regional Math and Science Center (GVSU) celebrated its 25th Anniversary Michigan Science Olympiad Tournament in March 2009. The tournament has been the largest regional tournament in the nation for most of the twenty-five years, directly serving approximately 1800 students yearly and impacting the classrooms of thousands of students in Kent and Ottawa counties.

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.

Seven Centers currently provide accelerated high school programs: Battle Creek area, Berrien County, Kalamazoo area, Macomb County, Mecosta-Osceola Counties, Oakland Schools, and Sanilac County.



In the 2008-09 school year, 1,169 students were enrolled in accelerated high school programs. At least 99% entered college programs. Students graduated with ACT scores above state and national averages. For example, seniors at Battle Creek Area M/S Center graduated with an average ACT of 28. At the Kalamazoo Area M/S Center eighty-five seniors and juniors were enrolled in at least one Advanced Placement course during the school year, at Macomb all seniors were enrolled in advanced AP science classes and AP Calculus.