

**Michigan Middle School Mathematics  
Reform Project (M<sup>3</sup>RP)**

**Summary of Evaluation Findings  
through Year 03**

2001-02 School Year

**"My ideas about teaching mathematics have grown tremendously. I can now help the kids become better thinkers . . . and help them to apply their knowledge rather than giving them the route to take."**

**"Student learning is not always based on how many problems they complete, but on the quality of problems they do."**

Comments from M<sup>3</sup>RP Teacher Leaders

---

**M<sup>3</sup>RP.** The Michigan Middle School Mathematics Reform Project (M<sup>3</sup>RP), housed at Western Michigan University, has been assisting 90 Michigan school districts since 1999 in aligning their middle school mathematics curriculum and instruction with state and national standards. This is a summary of evaluation findings from their third year of operation--2001-02 school year. A full Year 03 report is available.

**Who is being served?** The original goal of M<sup>3</sup>RP was to recruit 75 school districts in 5 regions. At the end of Year 03:

- 87 participating districts (12 more than the goal) in 7 regions
- 139 middle schools, approximately 22% of all Michigan public schools serving middle school students
- Almost 80,000 students being served, approximately 21% of all Michigan middle school students in public schools
- 8 urban districts, 9 small city districts, 19 suburban districts, and 51 rural districts (this includes the second and third largest school districts in Michigan)

**How many educators are involved?** At the end of Year 03, there were

- 180 Teacher Leaders (TLs); original goal was 150
- 282 District Leadership Team Members--administrators, high school/elementary teachers, parent/community members (not including TLs)

- 878 middle school teachers (non-TLs or DLT members)

**How much professional development (PD) has been provided?** At the end of Year 03:

- 6 DLT sessions conducted, 6 hours each. This represents a total of 13,086 hours of PD received by participants.
- 3 TL Summer Institutes have been conducted, 2 weeks each (60 hours). Across the three institutes, a total of 30,205 hours of professional development was received by participants.
- 8 TL school year training sessions, 6 hours each. This represents 7,068 hours of professional development received.
- Participating districts developed plans for providing professional development for their other middle school teachers, with a goal of providing 32 hours per year. In year 02, 671 teachers in 53 districts participated in school-level PD for a total of 13,804 hours (12,305 hours funded by M<sup>3</sup>RP). In Year 03, 480 teachers from 50 districts participated in a total of 17,759.7 hours (15,705.45 hours funded by M<sup>3</sup>RP).

**Who are the Teacher Leaders?** A profile based on selected indicators follows:

- Average years teaching = 9, Range 1-33 yrs
- Average years as middle school teacher = 9, Range = 0-27 yrs
- Average years as middle school math teacher = 5, Range = 0-27 yrs
- % certified at elementary level = 61%; at secondary = 46%
- % with mathematics major in college = 42%
- % with mathematics minor in college = 45%

**How has the program impacted Teacher Leader mathematics content knowledge?** Two primary measures have been used to determine TL content knowledge.

- As part of the annual survey of TLs, they are asked to rate their preparedness to teach particular topics. At the end of Year 03, average scores on a 4-point rating scale range from 3.1 to 3.8.
- A pre/post content test is administered at the summer institutes based on content strands to be covered in the session. Results for all 3 years show significant gains in knowledge.

**What improvements in teaching practices have been reported by Teacher Leaders?** An analysis of survey responses from TLs in 2000 and 2002 shows a statistically significant difference (at the .05 level) for the following:

***Preparedness to Facilitate Selected Mathematics-Related Activities:***

*Increases in:*

- Problem-solving
- Making connections from mathematics to real-world situations
- Leading a class of students using investigative strategies
- Helping students take responsibility for their own learning
- Use strategies that specifically encourage participation of females and minorities in mathematics

***Frequency of Use of Selected Teaching Activities***

*Increases in:*

- Arrange seating to facilitate student discussion
- Use open-ended questioning strategies
- Require students to explain their reasoning when giving answer
- Encourage students to explore alternative methods for solutions
- Allow students to work at their own pace
- Help students make connections between mathematics and real-world situations
- Embed assessment in regular class activities

*Decreases in:*

- Introduce content through formal presentation
- Assign mathematics homework

***How Often Students Participate in Selected Learning Activities***

*Increases in:*

- Participate in discussion with the teacher to further mathematical understanding
- Work in cooperative learning groups
- Work on solving a real-world problem
- Engage in hands-on mathematical activities
- Design or implement their own investigations
- Make formal presentations to the class
- Follow specific instructions in an activity or investigation
- Use calculators as a tool (e.g., spreadsheets, data analysis)
- Share ideas or solve problems with each other in small groups
- Use calculators to develop conceptual understanding
- Write reflections in a notebook or journal
- Engage in performance tasks for assessment purposes
- Use CBLs and CBRs

*Decreases in:*

- Practice routine computations/algorithms
- Answer textbook/worksheet questions

**Who are the middle school mathematics teachers (non-Teacher Leaders) participating in M<sup>3</sup>RP?** The following is based on a survey of 251 teachers. On average, they have been teaching 10 years and as a middle school mathematics teacher an average of 7 years. Sixty-eight percent are certified at the elementary level, 39% at the secondary level, and 9% at both levels. Thirty-two percent were mathematics majors in college, 36% were mathematics minors, and 34% had neither a major or minor in mathematics.

**How do middle school mathematics teachers (non-Teacher Leaders) assess their content knowledge and teaching practices?** Below is a summary of survey responses.

- On a 4-point scale (1 = not adequately prepared, 4 = very well prepared), these teachers rate their preparedness to teach mathematics topics as follows: number sense = 3.8, number operations = 3.8, measurement = 3.7, proportional reasoning = 3.5, algebra = 3.5, geometry = 3.4, probability = 3.3, and statistics = 3.2.
- On a 5-point scale (1 = never, 2 = rarely (a few times per year), 3 = sometimes (once or twice a month), 4 = often (once or twice a week), 5 = all or almost all math lessons, teachers rated how often they have their students participate in selected learning activities. Below are selected items:
  - Review homework/worksheet assignments (4.5)
  - Participate in discussions with the teacher to further mathematical understanding (4.4)
  - Answer textbook/worksheet questions (4.3)
  - Work independently (4.1)
  - Work in cooperative learning groups (4.0)
  - Practice routine computations/algorithms (3.9)
  - Share ideas or solve problems in small groups (3.9)
  - Work on solving a real-world problem (3.8)
  - Follow specific instructions in an activity or investigation (3.8)
  - Use calculators for learning or practicing skills (3.8)
  - Engage in hands-on mathematical activities (3.6)
  - Use calculators to develop conceptual understanding (3.2)
  - Play mathematics games (3.1)
  - Engage in performance tasks for assessment purposes (2.7)
  - Make formal presentations to the class (2.7)
  - Work on extended mathematics investigations or projects (2.4)
  - Design or implement their own investigations (2.3)
  - Use computers as a tool for learning mathematics (1.8)
  - Use calculator-based labs (CBLs) (1.4)

**What is the nature of professional development being provided at the district and school level by Teacher Leaders?**

- Based on observations of district- and school-level professional development sessions, the following elements were essential components of the sessions (number in parenthesis is the % of sessions with that element).
  - Session was organized to encourage collaborative approach to learning (89%)
  - Adequate time was provided for reflection about concepts and issues (87%)
  - There was adequate time for participants to share experiences/ideas (87%)
  - Facilitators understood the content being presented (87%)
  - Participant interactions reflected collaborative working relationships (89%)
  - Interactions among participants and facilitators reflected willingness to take risks with ideas (83%)
- Primary emphases of the sessions were as follows (some had more than one major focus; number in parentheses is number of sessions with that focus).
  - Mathematics content/conceptual development (26)
  - Reviewing mathematics teaching materials (24)
  - Pedagogy/methodology (23)
  - Planning improvement activities (6)
  - MEAP/student assessment (5)
  - Other (graphing calculators, CABRI software) (3)

**To what extent are M<sup>3</sup>RP schools using standards-based, investigation-focused mathematics curricula?** 61% of districts are using one of the standards-based inquiry-focused mathematics programs. When M<sup>3</sup>RP began, 13 districts (15%) were using a standards-based mathematics program.

NSF-Funded Reform Math Program	No. Districts Using the Program at End of Year 02	No. District Beginning to Use in Year 03	No. Districts Beginning to Use in Year 04
<i>Connected Math</i> (2 or 3 grade levels)	14	4	10
<i>Connected Math/Addison Wesley</i> combination	0	0	1
<i>Math Thematics</i>	5	3	6
<i>Math Thematics/MathScape</i> combination	1	0	0
<i>MathScape</i>	4	2	3
Totals	24	9	20
		Grand Total	53

**How are students being affected by M<sup>3</sup>RP?** Students in a high proportion of participating schools are receiving daily opportunities to engage in high quality, in-depth mathematics activities as teachers implement standards-based, inquiry-focused mathematics programs.

M<sup>3</sup>RP will administer a mathematics test based on the Third International Mathematics and Science Study (TIMSS) in Spring 2003. This same test was administered in the first year of the project. Pre/post data will be compared. Additionally, an in-depth analysis of MEAP test scores is underway. Results of both these analyses will be available in Fall 2003.

**What benefits of M<sup>3</sup>RP have been identified by principals and Teacher Leaders?** The following beneficial impacts were identified by teachers and administrators from 48 different districts:

- M<sup>3</sup>RP enhanced the working relationship among teachers (56%). One principal said, "Teachers are working and talking as a team and are willing to work with the new material."
- Teachers learned new teaching/learning methods and implemented them (38%).
- M<sup>3</sup>RP is seen as a vehicle for on-going staff development (29%).
- Participation in the program facilitated selection, adoption, or implementation of a reform mathematics program (25%).
- M<sup>3</sup>RP served as a catalyst for reforming/changing mathematics program (21%).
- Students' showing better understanding and more interest in the mathematics being taught; students better prepared for the next grade (19%).
- M<sup>3</sup>RP aided and encouraged the process for curricular alignment (14%).
- M<sup>3</sup>RP improved teachers' mathematics content knowledge (14%).

**What barriers and issues have been identified as affecting their mathematics improvement efforts?** Barriers and issues affecting improvement efforts identified by District Leadership Team Members from 48 different districts (number in parentheses is the number of districts identifying that issue):

- Issues around time: not enough time to meet with colleagues, not enough class time to develop concepts, not enough time for PD, too much time away from classroom, etc. (26)
- Issues around funding: not enough funding for materials, professional development, release time for teachers (26)
- Resistance to change/Lack of support for improvement effort: In general (34), Among high school teachers (15), Among elementary teachers (7),
- Teacher-related issues: Teachers with inadequate mathematics knowledge (5), Teacher turnover (3), Inadequate teacher professional development (10), Teachers unwilling to participate in PD (11), Teacher burnout (1), Lack of staff diversity (1)
- Parent-related issues: Parents lack understanding of investigative mathematics (6), Inadequate support from parents for mathematics improvement (7), Challenges of keeping parents informed about the improvement effort (4)
- Students lacking basic skills (3)
- Inadequate administrative support (5)
- Difficult to meet needs of ALL students (5)
- No K-12 alignment of curriculum (5)
- Not enough communication across grade levels (5)
- Unmotivated students/student behavior problems (5)
- Not enough focus on mathematics in the school (2)

**What do project operations look like?** The management team continues to provide direction for the project, meeting regularly to plan and problem-solve. The fourteen Regional Directors implement DLT and TL sessions at the regional level and meet periodically for planning and training in preparation for upcoming activities. An Advisory Board made up of representatives of the collaborating organizations meets twice each year. An expert in mathematics education conducted an external review of the project in Year 03. His full report is available from project directors.

More information is available about M<sup>3</sup>RP at: [www.wmich.edu/nsfm3rp](http://www.wmich.edu/nsfm3rp)

This report was prepared by SAMPI--Western Michigan University (269-387-3791) 1/03