



Milwaukee Mathematics Partnership

Year 3 Annual Report

2005 – 2006

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Principal Investigator**

May 2006

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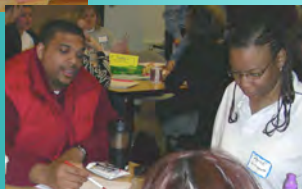
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Annual Report Year 3, 2005–2006 Milwaukee Mathematics Partnership





Milwaukee Mathematics Partnership Year 3 Annual Report, 2005–2006

The *Milwaukee Mathematics Partnership* (MMP) aims to substantially improve mathematics achievement for the 90,000 students in the Milwaukee Public Schools (MPS) and to increase students' success in transitioning to college mathematics. In this third year of the MMP, the University of Wisconsin-Milwaukee, the Milwaukee Public Schools, and the Milwaukee Area Technical College have enhanced their commitment as core partners to this unique collaboration among a large urban district, a four-year urban university, and a two-year technical college.

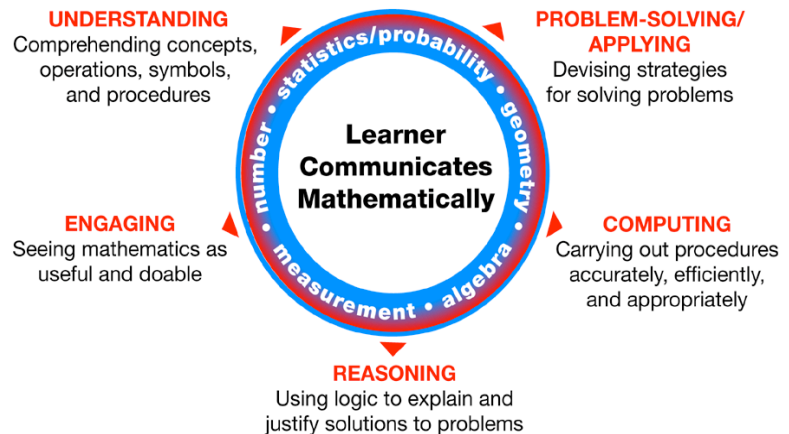
“Momentum” is the word chosen to characterize Year 3 of the MMP. We have established a powerful base from which we will continue moving strategically and forcefully forward over the next two years in achieving our goals and our vision of challenging mathematics for all learners (shown at right).

In reflecting on Year 3, we highlight significant aspects of our implementation activities and draw attention to progress we have made in reaching our benchmarks. We begin by highlighting the momentum

established by the Assessment Pilots and the use of the Wisconsin Assessment Framework to focus teaching and learning in support of Goal 1 on the Comprehensive Mathematics Framework. For Goal 2 on Distributed Leadership, we discuss ways Math Teacher Leaders and Learning Teams built capacity for progressive improvement in the teaching and learning of mathematics. For Goal 3 on the Teacher Learning Continuum, we note the energy generated throughout the district from the content focus on algebra. We then draw attention to the movement of the design team work on the new university courses for the mathematical preparation of teachers. In addition, we summarize the constant motion of professional learning of teachers through school-based work and university courses. Finally, for Goal 4 on the Student Learning Continuum, we discuss our work on transition to college mathematics and present MPS student achievement results on the new state tests.

Appendix A displays the MMP organizational chart. Appendix B provides a list of MMP related publications and presentations. Appendix C contains a list of Year 3 accomplishments.

Comprehensive Mathematics Framework



Mathematics Proficiency For All Students

Goal 1. Comprehensive Mathematics Framework

Implement and utilize the comprehensive mathematics framework to lead a collective vision of deep learning and quality teaching of mathematics across the Milwaukee Partnership.

Classroom Assessments for Learning Drive Teaching and Learning

What we are doing here is really helping me to be a better math teacher and affording me the opportunity to go back to my school and dialog and energize others. ... The feedback piece really helped me to realize what is more helpful to students to improve their work. I'm trying to get others in my building "on board" with formative assessment. --Grades 2–7 Assessment Leaders

The “assessment pilots” that began last year emerged in Year 3 with new directions and purpose and focused on formative assessments as a system that uses assessments for learning. Assessment issues, particularly as developed by Richard Stiggins (e.g., Stiggins, Arter, Chappuis & Chappuis, 2004), are embedded in the instructional initiatives of the district. Yet, assessments that give meaning to the district Learning Targets often did not exist outside of individual schools and were often a loose collection of summative assessments. The MMP work centered on developing, revising, and identifying assessments to provide direction toward our formative assessment goals. The pilots included the Grades 2–7 Assessment Pilot, Grade 8–9 Assessment Pilot, and High School Assessment Pilot, which are discussed here, as well as the Transition to College Assessment Pilot, which is discussed under Goal 4.

GRADES 2-7 ASSESSMENT PILOT

The Grades 2 -7 Assessment Pilot consisted of 64 assessment leaders representing 31 schools. The committee met monthly and was facilitated by two Math Teaching Specialists and two Teachers-in-Residence. The charge to the pilot committee was to provide leadership in the use of “Classroom Assessments Based on Standards” (CABS) to monitor and improve the teaching and learning of mathematics. The committee was to (1) pilot CABS in their own classrooms and collect benchmark papers, (2) learn ways to provide descriptive feedback to students, and (3) use the MMP Protocol to facilitate school-based meetings with teachers at their school sites in analyzing student work from the CABS.



Collect Benchmark Papers. Each month leaders brought student work samples on designated CABS. Their task was to create a set of benchmark papers that exemplified the levels of learning defined in the *Everyday Rubric* (Stutzman & Race, 2004). Teachers identified the key features in student work that would indicate whether the work: (1) Exceeds Expectations, (2) Meets Expectations, (3) Needs Revision, or was (4) Fragmentary. Leaders found this tool generated a focused discussion on expectations for student learning, required math content within the task, and effective instructional strategies to increase student understanding.

Descriptive Feedback for Learning. One article that spurred much discourse amongst the assessment leaders was *Helping Students Understand Assessment* by Jan Chappuis (2005). Based on the work of Chappuis and Black and Wiliam (1998), teachers noted that in order to improve the use of formative assessment, a shift needed to be made from evaluative feedback to descriptive feedback. Leaders studied descriptive feedback to both inform and improve

student achievement. They collaboratively practiced how to provide this type of feedback being explicit on how it would impact student learning. Leaders from the committee are beginning to transfer this concept of feedback to their school based meetings as teachers continue to meet and examine student work.

Use the MMP Protocol. The MMP produced a DVD, *Analyzing and Learning from Student Work: A Protocol* in Year 3. The purpose of this DVD was to (1) model a collegial conversation that pushes deep thinking on the teaching and learning of mathematics, (2) to create a common district vision that supported a collaborative process, (3) to provide a venue for professional development that supports teachers, leaders, and school administrators in their work to improve student achievement. The DVD was distributed during the December Learning Team Training and Assessment Pilot meeting. These leaders learned to use the protocol to examine and discuss student work and then during school learning team meetings defined how implementation of the protocol would be infused into their school practice.

GRADES 8-9 MATH ASSESSMENT PILOT

During the past two years, the MMP studied the transition of students from grade 8 to grade 9 which is one of the most challenging grade level transitions students face. The group was comprised of 22 teachers from 17 schools (6 high schools, 8 middle schools, and 3 K-8 schools), along with math specialists and UWM faculty. During its inaugural all-day meeting the group reviewed the Wisconsin Assessment Framework and developed a “shared responsibility for student learning.” Wisconsin students are tested at the beginning of Grade 8 and then not again until the beginning of Grade 10. Thus the descriptors for tenth grade reflect the learning of students in grades 8 and 9. The group identified which descriptors should be developed and studied in which grades. The group established four subcommittees to deal with the scope of work before them. The Pilot broke ground on many goals this year, goals that will clearly require the remaining two years of this grant to complete.

Grade 8 Math Proficiency Subcommittee. This committee was the “first step” in tackling the challenge of bridging the gap from eighth to ninth grade as it looked at defining “proficiency and promotion” for eighth graders within the MPS Student Promotion System (SPS). The committee goals were to (1) survey Learning Teams from the 56 schools with eighth graders on how they determine SPS levels and to write case studies from their responses, (2) identify, create, align, and field test proficiency assessment items, and (3) share findings of the work.



The survey was sent to the 56 schools and had a 50 percent response rate. From those replies, the committee wrote four representative case studies to encourage professional dialog among the stakeholders at the school level. The committee members also studied released TIMSS and NAEP items to guide work on developing and selecting proficiency assessment items aligned with the Wisconsin Framework. The committee reviewed items with a UWM mathematician. At the time of writing this report, 22 of the 56 schools had registered to attend May workshops in which a resource guide will be disseminated detailing the findings and work of this subcommittee. Use of the resource guide will be continued next year.

Grade 8 Summer School Subcommittee. This subcommittee continued the work the MMP began in summer 2004 in taking a more active role in developing the summer Eighth Grade

Literacy Program. This program provides a reading, writing, and mathematics curriculum for students who are at risk of not being promoted to ninth grade. Prior to the MMP involvement, the summer program made heavy use of the PLATO computer program and other curriculum programs focused on basic skills. The MMP launched a unit entitled “The Country Data Project” as the mathematics component for the students which embodies the goals of the Comprehensive Mathematics Framework.

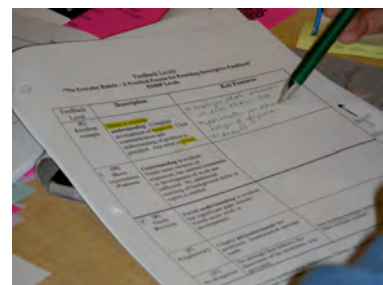
All 10 teachers piloting the new material in summer of 2004 signed up to teach again in summer 2005 due to the strong engagement of students and themselves with the new material. The program served over 400 students in summer 2005. The teachers identified the areas of greatest student improvement: calculating means and percents from population data, developing a constructed response, reading information from a graph, interpreting mean as a balance point, setting up a ratio, and interpreting information from a graph. The transition of these students to high school is being studied. Of those who passed the summer course, 42% of the summer 2004 students were in 10th grade (on track) and 91% of summer 2005 students were in 9th grade this year. We are still compiling math achievement based on WKCE data.

Grade 9 Summer School Subcommittee. The Math Curriculum Specialist and this committee worked with the district Summer School Office. They developed a course specifically for 9th graders who were identified as not meeting mathematical proficiencies. This course was endorsed by the Superintendent and passed by the Board of Directors as part of the summer school program. It added a new twist, namely providing a course that was not intended for “credit recovery,” but one that addressed deficiencies in students’ math achievement. This course is being offered for the first time in Summer 2006.

Grade 9 Math Proficiency Subcommittee. The ninth grade teachers developed a set of “Ninth Grade Proficiency” assessments aligned to the content and process standards of the Wisconsin standards and descriptors. They also developed guidelines for ways algebra teachers could use the assessments to summarize the achievement levels of their students and to advise and encourage students to enroll in the new summer course for ninth grade students.

THE HIGH SCHOOL MATH ASSESSMENT PILOT

The High School Assessment Pilot was composed of 12 high school mathematics teachers, with 10 of them providing consistent leadership in the development of the goals of this pilot. This group expanded the number of CABS for the Foundation Level Learning Targets. These targets primarily address the ninth and tenth grade students through courses such as Algebra and Geometry, or the Integrated Mathematics Program, Courses 1 and 2. The assessments are to be used to create a team approach in looking at the student achievement in these courses.



The committee compiled CABS, rubrics, scoring guides, student work, and other documents into a substantial (over 600 pages) *Resource Guide for Foundation Level Mathematics*. The committee showcased in an all day in-service opportunity for 25 high school teachers this spring. Each teacher in attendance received the *Resource Guide* and was provided training to develop a team approach in examining students’ work at their respective schools.

The intent for next year is to incorporate these 25 teachers into a larger Assessment Pilot committee. We are planning for two levels of participation. The Level 1 schools will be those

just beginning to consider structured and common use of performance assessments. The Level 2 schools will be those who have already begun the process of using common performance assessments. These schools will identify a particular strand (e.g., algebraic thinking, geometry) and will develop an assessment portfolio around that strand.

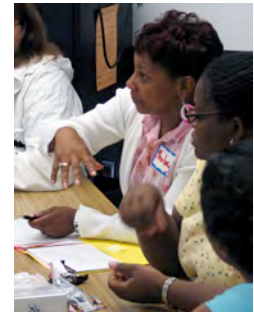
Wisconsin Assessment Framework and Descriptors Focus Instruction

The descriptors have made it clear as to what students are expected to know. Lately at every meeting we refer to them. We use them to help plan our lessons and activities. We all agreed to teach geometry and measurement together. We sat down with our textbooks and the descriptors to make a school wide plan. For the first time I really felt like I was making an impact on the entire school at all levels. ---Math Teacher Leader

The Wisconsin Assessment Framework (Wisconsin DPI, 2005) includes descriptors of the mathematics students need to know for the WKCE-CRT test in grades 3-8 and grade 10. The descriptors became a constant MMP theme throughout this year. Discussion of the descriptors promoted a focus on (1) clarifying the mathematical concepts identified in the Learning Targets, (2) analyzing performance assessments (CABS) and student work samples, and (3) revealing the specific mathematical ideas needed to support effective descriptive feedback. Each time teachers engaged in conversations using the descriptors it was clear that they were deepening their own knowledge around specific mathematical ideas.

STRENGTHENING THE LEARNING TARGET—STATE DESCRIPTOR CONNECTION

Given that the district developed its learning targets prior to the release of the Wisconsin Assessment Framework, we re-examined the targets this year. This process began by asking the MTLs to analyze the targets and identify elements in the descriptors that were not in the targets. Collectively, the MTLs gave input to revise, collapse, or write new targets to accommodate the missing elements. Then a subcommittee of 20 teachers from 8 schools met weekly to revise the targets using the input from the MTLs. This was truly a challenge! They found themselves in deep discussions regarding math concepts expressed in the descriptors and the development of the concept as it grew across grade level bands. University faculty provided guidance to ensure coherence of mathematical ideas across grade levels. This work will be finalized this summer and the revised targets utilized next year.



USING DESCRIPTORS IN ANALYZING CABS

The development and use of performance assessments or CABS gained momentum driven by a charge from the superintendent to all principals in the district during the 2005-06 Principal Kick-Off meeting. The superintendent's charge was:

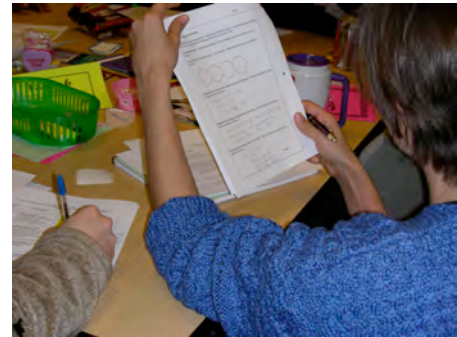
- How would your staff articulate ways their CABS show what students are expected to learn and be able to do?
- What is the plan to ensure the CABS in your building provide continuous feedback to support the learning process?

Because of the charge from the superintendent, CABS were written into School Education plans as a way to monitor student achievement. The Math Specialists involvement in review of Education Plans revealed that schools were unclear as to the purpose and use of CABS. It was clear from the perspective of the MMP that our charge as school leaders of mathematics was two-fold: (1) learn ways to assess the CABS being used in schools and (2) learn how to

use student work to impact classroom practice and provide continuous feedback. The questions we asked ourselves to ensure consistency across the district and to help MTLs connect the work of CABS to the Learning Team Continuum were:

- How can schools ensure CABS are aligned with Targets and State Descriptors?
- How can schools ensure CABS ask questions ranging in depth of knowledge?
- How are CABS used to provide continuous feedback for the student and the teacher?
- How do schools monitor consistent school-wide implementation of CABS?

CABS became a cornerstone of MMP work this year. A tool entitled “Assessing the Assessment Guide” was developed to guide the process to review CABS. First, teachers align the items directly to the state descriptors. Next they scrutinize and modify CABS to ensure questions reflect thinking from knowledge to analysis to application. As MTLs analyzed a sample of CABS being used in schools, they were surprised at the lack of alignment to targets and descriptors and use of higher level thinking. One Math Teaching Specialist reported that after an examination of CABS at one school, the Learning Team discovered that it tested students on one descriptor 17 times! Another MTL reported that this activity was finally the tool she needed to convince her learning team that CABS at her school needed more rigor to push student thinking.



LEARNINGS, CHALLENGES, AND NEXT STEPS

Infusing the state descriptors into all aspects of MMP work has provided a coherent set of mathematical expectations leading to a better understanding of grade level accountability. Teachers can no longer say they are “giving standards-based instruction” when analysis of their CABS indicates otherwise. MTLs have full knowledge of a crucial piece of information that when combined with any of the tools on the continuum will improve teacher content knowledge and student learning. We have noticed that is not until teachers interact with the descriptors that they realize they need to improve their content knowledge. It is through the conversations connected with these tools that teachers begin to realize the limitations of their knowledge. This insight has led many MTLs to question and clarify their knowledge building a network of support that spans all grade levels K-12.

The state descriptors will play an enormous role next year in analyzing school data results from the 2005-06 administration of the WKCE-CRT. Results are reported according to sub-skill categories within each content strand (Number and Operation Concepts, Measurement, Geometry, Statistics and Probability, and Algebraic Relationships) and for mathematical processes. When first introduced, the descriptors were seen as the “optimal” list of math skills that needed to be taught. This mindset continues to be a challenge. However, we are confident that the MTLs are gaining the “big picture” as to how to use the descriptors along with the targets. Another challenge we face is how much of the information is being transferred to teachers within the schools so that all teachers in our district understand the state descriptors and know how to use them to improve student achievement.

Goal 2. Distributed Leadership

Institute a distributed mathematics leadership model that engages all partners and is centered on school-based professional learning communities.

Math Teacher Leaders Continue Leadership Journey

The MMP has positively impacted my school (teachers and students) in many ways. One way is that they have made it very easy for the Math Teacher Leaders to share information with the rest of their staff. Through their example, modeling, and providing valuable content information, I was facilitated an in-service on the importance of the equal sign. MMP made this task easy because they modeled it and provided a script on their website. Feedback from the in-service I facilitated was positive since the activities were focused and meaningful. --Math Teacher Leader

Math Teacher Leaders (MTLs) are continuing their leadership journey, recognizing the development of their own leadership skills, and understanding what it takes to lead a school staff. This year, MTLs concentrated on (1) understanding the big picture, (2) recognizing the needs of their school staff, and (3) sharing knowledge with other teachers.

UNDERSTANDING THE BIG PICTURE

During monthly training sessions, MTLs were introduced to MMP tools to help them understand the Learning Team Continuum (see Table 1). The tools were not separate activities but rather a journey for engaging school staffs intertwined with and leading to student achievement. The tools supported understanding of the targets, descriptors, and levels of thinking, and gave meaning to the CABS. Examining model CABS engaged teachers in discussing how questions aligned with targets and descriptors measure students' understanding of key mathematical ideas. This insight pushed MTLs to look deeper at the targets and descriptors to understand the mathematics and consider how the ideas were developed in their math program. As MTLs practiced the process of moving through the Continuum they began to feel the power in analyzing student work and developed their skills in providing descriptive feedback based on the Everyday Rubric. For them, learning through each tool during training sessions and using the tool at their school furthered credibility and helped them grow in their leadership role.

Table 1. MMP Learning Team Continuum and Tools for Mathematics

Stage 1: Learning Targets	Stage 2: Unpack & Align Targets with State Framework	Stage 3: CABS Level 1: Designing CABS	Stage 4: CABS Level 2 Student work	Stage 5: CABS Level 3 Formative Feedback
Understand importance of identifying and articulating big ideas in mathematics to bring consistency to a school's math program.	Develop meaning for the math embedded in the targets and the alignment to state standards school's math program.	Provide a measure of consistency around student achievement based on the targets.	Examine student work to monitor achievement and progress toward the targets.	Use student work for instructional decisions, and appropriate. continuous, feedback to students.
Tools • Grade level lists of 9-11 big ideas per grade • Horizontal list of targets by content across grades	Tools • Target-descriptor alignment worksheets • Thinking Levels Framework	Tools • CABS Clarification Statements • Assessing the Assessments Guide • Model CABS	Tools • Protocol for analysis of student work • DVD of the protocol in use	Tools • Feedback Types worksheet • Everyday Rubric

SHARING KNOWLEDGE WITH TEACHERS BEYOND THE DISTRICT

This year the Milwaukee Public Schools (MPS) was well represented at the Wisconsin Mathematics Council Annual State Conference. Prior to the MMP, very few MPS teachers attended the state conference, much less presented at it. In May 2006, 88 Math Teacher Leaders attended the conference and approximately 50 MTLs, Math Teaching Specialists, Teachers-in-Residence, and other teachers from MPS presented at approximately 40 sessions. It was evident from the titles of these sessions, that MTLs were excited and confident in sharing what they have learned from the work of the MMP (see Exhibit D for a list of presentations). The conference promoted professional learning and professionalism for MPS teachers and allowed them to network and learn from others across the state.

LEARNINGS, CHALLENGES, AND NEXT STEPS

It is apparent that Math Teacher Leaders find their monthly professional development meetings invaluable. During the three years of the MMP, attendance has not decreased with averages of 110 leaders each month. The MTLs have developed as a community of learners. Each month this year, they continued developing Algebraic ideas and worked together to support each other in their learning. They engaged in discussions using the MMP tools of the Continuum and shared successes and challenges of the work they do with their staffs on the learning and teaching of mathematics.



The challenge remains as we continue our search to answer the question, *Is the learning in the room during MTL meetings being transferred to teachers and into classroom practice?* To support the MTL, we started an informational newsletter this year. The purpose of *The MMP Messenger* was to increase communication between MMP leadership and school-based leadership. Our monthly, one-page newsletter offered principals suggestions on how to support the MTL and prompted ideas for school-based professional development. Yet, the challenge remains in supporting and sustaining the varying degrees of math leadership in each school. Some MTLs are moving their schools along at the same pace that they are learning while other MTLs are not able to move their staffs nearly as rapidly. Math Specialists address this challenge through various approaches from intense work sessions at a school to simply discussing plans with the MTL and Learning Team members.

Learning Teams Focus on Mathematics

A powerful MMP impact at our school has been our Learning Team meetings that include the principal and the MTL. These meetings give us the opportunity to take time to focus on our school needs in the area of mathematics. It is also a time for our schools learning team to check in and make sure we are all “on the same page.” have times to reflect and analyze what is and is not working at our school, and have time to plan what needs to be done next. This grant has been so valuable to our school and helped our students as well as our staff show growth and achievement in the area of mathematics. --Math Teacher Leader

The Learning Team continued to be a driving force to focus the work of mathematics at school sites in Year 3 of the MMP. Teams were provided with the opportunity to write Math Action Plans and submit Math Mini-Grants again this year to support their work. The external evaluation team conducted case studies of 11 schools this year which included

observations of Learning Team meetings. Results of the evaluation will provide greater insights into the work of these teams across schools sites.

RESOURCES FOR SCHOOL FOCUS: MMP MATH ACTION PLAN AND MINI-GRANTS

The mini grants have been a binding force in our small school. With one class at each grade, it is hard to create grade level teams. At our mini-grant sessions, our staff had more opportunities to build a cohesive unit, to support each other and to relate student needs, developmental levels, and expectations across the grades. --Math Teacher Leader



The primary purpose of the action plan was to support the mathematics work of the Learning Team. Schools were eligible to receive compensation for 25-100 hours of professional development, depending upon the number of math teachers in the school. Of our 162 target schools, 122 (75%) of them submitted approved plans; 84% (112/133) of K–8 schools and 35% (10/29) of high schools. For many schools this amount of money was enough to leverage important conversations that engaged teachers in collaborative learning to improve mathematics teaching and learning. Many schools compensated teachers for studying the district learning targets, Wisconsin Assessment Framework, and classroom assessments.

The purpose of the mini-grants were to support school-based quality professional development on two priority areas: (1) improving teachers’ mathematical content knowledge and (2) using mathematics classroom assessments based on standards to improve classroom practices. A total of about \$130,000 was used to fund 46 Math Mini-Grant proposals. Awards were made to 21 elementary schools, 13 K-8 schools, 3 middle schools, 8 high schools, and 1 high school collaborative. Each award ranged from \$1000 to \$3000.

We were surprised at the interest of the high schools in submitting mini-grant proposals and disappointed in the lack of interest in developing math action plans. In light of this and the continued movement to small high schools, we are considering providing more mini-grants support to high schools and encouraging collaborative proposals across schools.

CONTINUUM OF WORK FOR LEARNING TEAMS

The Learning Team “Continuum of Work for Mathematics” developed in Year 2 continued “to put order” to the professional learning needed at a school level. At their April meeting, we asked the Math Teacher Leaders to reflect on the work within their schools along this continuum. They were asked to indicate the placement of their schools at the end of the 2004-05 school year, and current placement, towards the end of 2005–05 school year. Table 2 shows the results along with the Year 1 results. A progression can clearly be seen with more schools each year moving further along on the continuum.

Table 2. Learning Teams Continuum of Work Number of Schools at Each Stage of Continuum

	n	Stage 1. Awareness of Targets	Stage 2. Unpack & Align Targets to State Framework	Stage 3. CABS Level 1: Designing CABS	Stage 4. CABS Level 2: Examining Student Work	Stage 5. CABS Level 3: Formative Feedback
Year 1, 2003-04	101	38	53	9	0	1
Year 2, 2004-05	97	17	33	37	5	4
Year 3, 2005-06	97	0	8	42	35	12

In Year 3, 24 schools reported moving one stage higher and 7 schools reported moving two stages higher. Even for the 27 schools that reported staying within a specific stage, most indicated movement within that stage. To obtain a more precise indicator of movement along the continuum a “distance” measure was employed. The mean placement at the end of Year 2 was 6.40 (SD=3.06) and at the end of Year 3 was 10.17 (SD=2.79). Thus, the schools on average had a mean growth of 3.77 units indicating a gain in position of just over one full stage on the continuum. In other words, the district moved from the higher end of “Unpacking and Aligning Targets to the State Framework” (Stage 2) to being on the border of shifting from Stage 3 “Designing CABS” to Stage 4 “Examining Student Work” stage.

Goal 3. Teacher Learning Continuum

Build and sustain the capacity of teachers, from initial preparation through induction and professional growth, to deeply understand mathematics and use that knowledge to improve student achievement.

The District Studies Algebra

The equal sign task was done by all math teachers and learning team members and opened everyone’s eyes to the knowledge of our middle school students and the importance of dialogue amongst students and the teachers. --Math Teacher Leader

We posed the same equation: $8 + 4 = \square + 5$ to our classrooms—one second grade and one sixth grade. Both classes had the same percentage of students get the correct answer. The sixth grade teacher was horrified! Many of her students did not know what the equal sign meant. The wrong answer seen the most was 12. This opened her eyes to the fact that she needed to revisit this and other basic algebraic ideas she assumed the students knew already. The second grade teacher realized that she needed to continue with the basic algebraic ideas and encourage other second grade teachers, as well as the grades 3-5 teachers, to teach them. --Math Teacher Leader

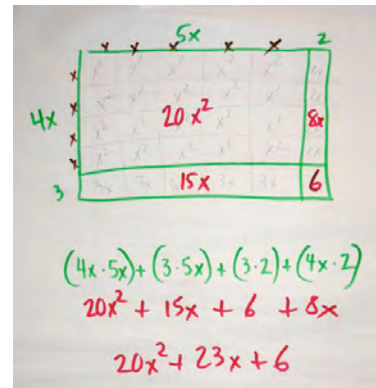
Our planning for the MMP content strand this year began with examination of the district’s WKCE scores. The strands most needing improvement were Algebra and Measurement. We felt Algebra was a natural continuation and reinforcement of last year’s emphasis on Number and Operations. Our work was informed by research on the mathematical knowledge needed for teaching (e.g., Ball, 2003) and the research on children’s development of algebraic reasoning (Carpenter, Franke, and Levi, 2003). The MPS Learning



Targets and the Wisconsin Assessment Framework were used to ensure that our sessions were aligned with state and local standards. Throughout the year, we thought critically about what algebraic reasoning would look like in students, how that reasoning might develop as the children progressed from elementary to middle to high school, and what teachers would need to know in order to recognize and encourage algebraic thinking in students.

ALGEBRA CONTENT DEVELOPMENT

We developed eight Algebra content sessions (see Table 3). Planning for each session included mathematics educators, mathematicians, and teachers-in residence (TIR). Our planning meetings were always lively as the mathematicians vied for more math, the TIRs wanted to keep it engaging and accessible to classroom teachers, and the mathematics educators supported both with research that offered critical insights into teacher learning and student knowledge acquisition. We would draft an agenda for the upcoming session and assign planning tasks. For example, the mathematicians might design examples and exercises that



illustrated the mathematical concepts being explored, while the TIRs might locate relevant passages from the educational literature for the MTLs to read or student work to review during the session. Throughout the planning process, we kept in mind the following goals:

- To develop the MTLs’ content knowledge in algebraic reasoning by actively engaging them in learning mathematics.
- To increase their ability to recognize and develop algebraic thinking in their students.
- To provide them with resources that they could take back to their schools in order to facilitate similar types of learning opportunities with their staff.

Table 3. Algebra Topic Overview

Month	Topic	Key Tasks or Mathematical Ideas
Aug	Beginning the Journey into Algebraic Thinking: Big Ideas	First attempts to answer the question: “What is Algebraic Thinking?” Emphasis on patterns and extending patterns. Toothpick Bridges Task. Big Ideas in Algebra: Patterns, Equivalence, Variable
Sept	Describing Change	Describing qualitative change in situations. Describing quantitative change with pictures, words, tables, and symbolic rules. Dot Problem.
Oct	Equality, Equivalence, and the Meaning of the Equals Sign	Examined student reasoning and misconceptions for $8 + 4 = r + 5$ and $48 + 24 = r + 27$ using student work samples from MPS and video clips from Carpenter et al (2005). Emphasis on the difference between computational and relational reasoning. Balance Tasks.
Nov	Equivalence and the Meaning of the Equals Sign	MTLs brought student work samples from their schools for the two “equals sign” tasks investigated in the previous session. Student work was examined for misconceptions and instructional implications.
Jan	Generalized Properties: Distributive Property Part 1	True or False Equation Task. Are statements such as $13 \times 9 = 130 - 13$ and $6 \times 7 = 6 \times 6 + 7$ true or false? Emphasis on reasoning relationally with the distributive property. Examination of MPS students reasoning with the distributive property to solve multiplication fact problems.
Feb	Generalized Properties: Distributive Property Part 2	Conjecturing principles by examining sets of True or False Statements. Using an area model and applying the distributive property to represent problems such as 43×52 , $(4 \frac{3}{4}) \times (5 \frac{2}{3})$, and $(4x + 3)(5x + 2)$.
Mar	Expressing Relationships	Wrote equations that modeled different types of story problems using variables as unknowns. Examined uses of variables. Matched algebraic story situations to equations with variables as relationships.
Apr	Moving Among Representations	Bathtub task. Emphasis on telling a story for a line graph. Translations among multiple representations with emphasis on graphs, tables, and equations. Examination of linear and non-linear relationships.
June	The Big Picture	Big ideas of algebra. Learning Targets and the Wisconsin descriptors for algebraic relationships. Released WKCE items.

Although the focus of our content planning was for the MTLs, once our sessions were developed we used them in other settings. The sessions were used with members of the Grades 2–7 Assessment Pilots and participants in the *Distributed Leadership in Mathematics* (DLM) project. In each of these settings we worked with groups of teachers who we hoped would be taking on or expanding a leadership role in their schools. By June of this year, we will have provided a total of 17 hours of professional development on algebra to the MTLs; 12 hours at the Assessment Leaders meetings; and 8 hours to DLM participants. On a monthly basis, our sessions have been taught to an average of 215 district leaders (130 MTLs, 60 assessment leaders, and 25 DLM participants). All the materials from our sessions are posted on the MMP Web site: www.uwm.edu/Org/MMP/_resources/math_content.htm

ASSESSMENT OF STUDENT KNOWLEDGE OF EQUALITY

The equality tasks used with the MTLs have radiated throughout the district. The task asks students to determine what number goes in the box for $8 + 4 = \square + 5$ or for $48 + 24 = \square + 27$. Approximately 60% (58/94) of MTLs reported using the tasks with their own students and 62% (57/94) used the tasks with students throughout their schools. Unfortunately, the shocking results reflected those found by Carpenter et al. (2003) in that students across grades view the equals sign as an instruction to perform an operation with most students putting 12 or 72 in the box, respectively. The other most common answer was to write: $8 + 4 = 12 + 5 = 17$. We did not collect student results formally, but a sample of classrooms in which the task was given showed that there were very few correct responses. The tasks and student results were a topic of discussion throughout the district, with 34% (33/94) of school Learning Teams examining the task, 38% (35/94) of schools discussing it at staff meetings, and 36% (35/94) of schools analyzing results at Grade-Level meetings.

We were struck by the power of such a simple task to ignite discussions across the district, as well as at the university. The task was also presented at MPA meetings and to the MMP Steering Committee. The results highlighted the need to better understand student expectations for learning in algebra from K-12 and the need to further develop teacher knowledge. As we select our content strand for next year, we hope to capture the attention of the district and partners again with a seminal task that can be used to focus discussions on student learning and teacher knowledge of mathematics.

ASSESSMENT OF TEACHER KNOWLEDGE IN ALGEBRA

The K-8 MTLs completed a pre-test in September 2005 on algebra using Mathematical Knowledge for Teaching (MKT) items designed at the University of Michigan. The MTLs will complete a post-test in June 2006. The data will be analyzed this summer.

We anticipate significant growth in the MTLs content knowledge based upon our results from last year. The MTLs were assessed on their MKT in the area of Number and Operations. We had 127 MTLs complete the pretest and 99 teachers complete the posttest. Of these 78 had matched pretest and posttest measures. As shown in Figure 1, the MTLs had an average gain of

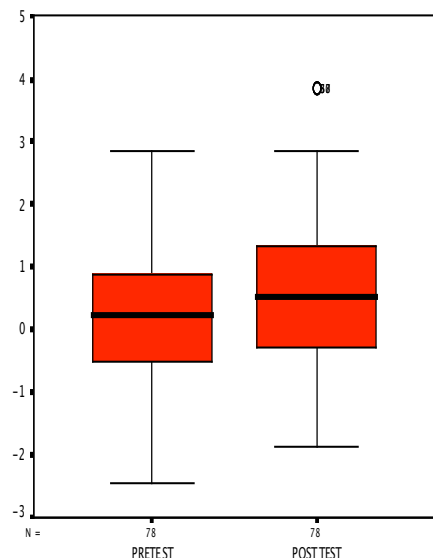


Figure 1. MKT Results for MTLs on Number and Operations

0.42 standard deviations from a pretest mean of 0.17 (SD = 1.07) to a posttest mean of 0.59 (SD = 1.27). The gain in the MKT estimate of ability in the area of Number and Operations for the Math Teacher Leaders was statistically significant ($t= 4.14, p < 0.001$).

While the MKT measure provides a broad summative assessment using a multiple choice format, it became clear that we needed a better understanding of how our leaders were progressing in their content knowledge. In February we administered our first MKT-CABS modeling it after the CABS being developed for students. It was a way for our MTLs to experience a quality assessment based on instruction and gave us the opportunity to model the process of using a CABS. We administered three MKT-CABS and used them as formative assessments to guide our planning and teaching. For example, the MKT-CABS in Figure 2 asked the MTLs to describe a story or context for the given graph.

This individual struggled initially and stated, “I’m drawing a blank. What would start at \$35?” After some learning, growth in understanding was demonstrated on her post-assessment response. We will continue to analyze the results from these teacher performance assessments this summer.

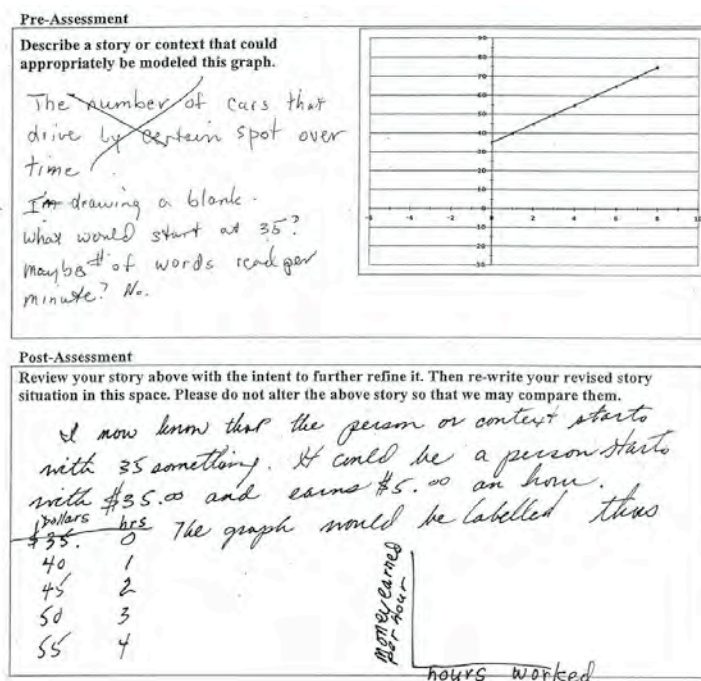


Figure 2. Sample MTL Response on MKT-CABS on Algebra

New Courses Deepen Knowledge of Pre-service and In-service Teachers

I am probably the typical elementary teacher that muddled through high school and college mathematics and complained that none of it really made sense. Once I became a teacher I basically taught math the way it was taught to me—completely procedurally. All of that changed once our district moved away from a traditional approach to teaching mathematics and adopted a reform-based curriculum. Shortly into my first year of the curriculum it became very evident, very quickly, the limited amount of mathematics I actually understood.

Making the commitment to 18 credits of math in 13 months in the Math Fellowship program was overwhelming for those of us that are not recent college graduates. We knew that we would need to work hard to dust off the cobwebs from the math we once knew and relearn it. Perhaps the biggest initial challenge was for all of us to realize that we were in an actual mathematics content course and that we needed to be able give ourselves the gift of being students again. Struggling, studying, and learning together lead us to develop our own mathematical community.

Many Fellows formed smaller study groups that met individually outside of class time and our scheduled group study sessions. We found quiet spots in local coffee shops, book stores, and fast food restaurants where we meet to go over notes and help each other clarify any confusions or muddled thinking that may have surfaced from the last class. We collectively learned first hand that your thinking really shuts down if someone just gives you the answer.

We have a renewed sense of confidence in our math abilities! Overall, I am more confident in my abilities to understand my students' thinking, clarify their misconceptions, and push them to delve deeper. Now, when the students pose questions like "Why do we break apart the divisor and not the dividend when we divide?" or "What is the difference between 8/0 and 0/8?" I can guide them to deeper understanding because I am comfortable going into the mathematics myself.

--Math Fellow Participant

The MMP is working to improve the mathematical preparation of teachers through development of new courses and revision of existing courses. Here we discuss four highlights: (1) Teaching the math MCEA minor courses to in-service teachers in the Math Fellowships program, (2) Beginning the process of external review of the course materials, (3) Completing the course sequence by teaching MATH 276, and (4) Offering the capstone course for the first time to prospective high school math teachers.

MATHEMATICS FELLOWSHIP PROGRAM

In December 2005, we were awarded a Title IIB Math and Science Partnership grant from the Wisconsin Department of Public Instruction (DPI) to increase the mathematics content knowledge of middle-grades teachers. With additional support from the MMP, we designed and are offering a program in which teachers can become "Math Fellows" and take all four of the new MCEA math minor courses. Particularly ambitious Fellows have the option to also enroll in algebra and calculus courses (MATH 105 and MATH 211) and receive a MCEA math minor transcript designation that can lead to an additional licensure endorsement.

We had 83 applicants with 58 teachers enrolling for at least one course. Given that some applicants did not have the prerequisite, we added a section of MATH 175 to our first summer offerings. Table 4 summarizes the enrollments in the program to date. The sum of enrollments each semester is greater than the total number of participants, because some teachers enrolled in more than one course. The remaining two courses, MATH 276 Algebraic Structures and MATH 211 Calculus, will be offered in Summer 2006.

Table 4. Course Enrollments in the Math Fellowship Program, 2005–06

	Math 175 Mathematical Explorations	Math 275 Problem Solving	Math 277 Geometry	Math 278 Discrete Prob & Statistics	Math 105 Intermediate Algebra	Total
Summer 2005	18	40	11			50
Fall 2005		6	24	17		38
Spring 2006				22	18	36
Total	18	46	35	39	18	

The Math Fellowship is a demanding program, but the dedication of the teachers has been extremely impressive. Growth in participants' knowledge is being measured using the MKT items from the University of Michigan for Number and Operations, Geometry, and Algebra and using the DTAMS items from the University of Louisville for Probability and Statistics. The data will be analyzed early this fall. The teachers' comments, both orally and on course evaluation forms, have been very positive. They see the connections to their classroom practice, they feel more comfortable with the content, and, in several cases, they indicated they no longer slight topics in the curriculum because they do not understand them.

The Math Fellows program has enabled us to test the relevance of our new courses and content choices with practicing teachers and is providing us with evidence that we can use to guide future modifications for preservice teachers. Teaching the number of sections required

by the Math Fellows program has also been a challenge, especially since the UWM math department is committed to staffing these courses with mathematics faculty to the greatest degree possible. For the first time, each of these courses has been taught by a faculty member not on the original design team. This has furthered the institutionalization of the courses and has served as a spur to the development work. To teach the necessary sections with faculty, we reached out to the IHE Network and enlisted David Ruszkiewicz (MATC) and John Koker (UW-Oshkosh) to teach several sections of the courses.

EXTERNAL REVIEW OF NEW MATH COURSES FOR MCEA MATH MINOR

Of the four focus area courses, Problem Solving (Math 275) and Geometry (Math 277), are developmentally most advanced since the design teams had been formed in the first year of the MMP. This year, we felt that these two courses were ready to be sent to external reviewers, and we finalized a package of review materials in February 2006. For each course, the review package consisted of a CD of course related materials and a DVD containing video clips of several class sessions. The materials generally included a background paper on the development of the course, the syllabus, instructor and student materials, exams, and student work samples. For the Problem Solving course, we also included some reflection papers written by students at the end of the course.

Our external evaluator, Western Michigan University (WMU), is handling the external review of the courses. The reviewer packages were sent to WMU who sent them to anonymous reviewers. We anticipate receiving the results of the review this summer, in time to use the results in further course revision for next year. The materials for MATH 278 have been greatly improved this semester, largely as a result of the pressure resulting from offering the course to the Math Fellows. We plan to build a package of review materials this summer and then send it out for external review either later this summer or early in the fall.

COMPLETION OF THE MCEA MATH MINOR COURSE SEQUENCE

The last of our four new courses for the MCEA Math minor to be developed is MATH 276, Algebraic Structures. This course was taught for the first time in Spring 2006. This offering means that all four courses were taught in the 2005-06 academic year, a major milestone in our course development schedule. It was apparent during the semester that the students were struggling with some of the material in the course. Some of these struggles appeared to be simply due to the abstract nature of the material; others were because students did not always see the relevance of the course material to the middle-grades curriculum. Fortunately, we will teach the course to the Math Fellows this summer, which will give us an immediate opportunity to make and test modifications. Comments from the practicing teachers will be particularly useful as we continue to modify the course for our undergraduates.

CAPSTONE COURSE FOR PRESERVICE HIGH SCHOOL TEACHERS

The UWM mathematics department is committed to developing a capstone course for pre-service high school teachers. We offered this course for the first time in Spring 2006 with an enrollment of 12 students. The Design Team included Kevin McLeod, Henry Kepner, and Dan Lotesto. One major theme of the course was the importance of clear definitions of mathematical concepts, emphasizing the historical development of definitions and concepts, and the possibility of alternative definitions of a given concept. A related theme was the exploration of proof. The third theme was the interconnections between different parts of mathematics. Course topics included: number systems; the Peano axioms and induction;

development of the function concept; sequences and series; and connections between geometry, algebra, and trigonometry. Students engaged in conversations in which they explored the appropriateness of definitions, attempted to construct proofs using a suggested definition, and often in the process uncovered some gap in the definition. The discussion of the Peano axioms, for example, was designed to deepen the students’ knowledge of induction and to show them how deeply imbedded it is in the structure of the natural numbers.

Professional Learning for Teachers

SCHOOL-BASED PROFESSIONAL LEARNING FOR TEACHERS

The MMP supports school-based professional development to build the capacity of schools for continuous improvement in mathematics. The learning at school sites flows directly from the training of the Math Teacher Leaders during their monthly meetings. Each MTL was asked to indicate, “Of the topics emphasized this year, which have become a focus of work in your school?” The topics are listed in Table 5 from the highest to the lowest mean rating. Of greatest emphases across schools were writing and using common CABS and examination of the Wisconsin descriptors. The next greatest emphases were a continued focus on unpacking the learning targets, using the district model CABS, and using the thinking levels framework. Also given significant emphasis in schools was algebraic thinking, reflecting the district-wide content focus for the year. The least emphasized topics, as expected, were feedback which is at Stage 5 of the Continuum; this will be a focus of work next year.

Table 5. Topics of Focus for School-based Professional Development (Percent of schools)

Topic	n	Mean Rating	SD	(1) Not Yet	(2) Beginning Conversations	(3) Some Emphasis	(4) Major Emphasis
Writing and using common CABS in math	99	3.29	0.85	4%	13%	32%	51%
Wisconsin Assessment Framework	95	3.18	0.84	4%	15%	40%	41%
Unpacking Math Learning Targets	84	3.07	0.85	7%	11%	50%	32%
Using district model CABS in mathematics	97	2.96	0.90	8%	18%	44%	30%
Thinking Levels Framework	93	2.78	0.97	6%	33%	31%	28%
Protocol for student work	99	2.62	0.88	11%	31%	42%	15%
Assessing the Assessment guide for CABS	99	2.60	0.96	13%	34%	32%	20%
Algebraic Thinking	98	2.56	0.92	13%	34%	37%	16%
Think Aloud as a problem solving strategy	96	2.47	0.96	19%	30%	36%	15%
“Descriptive Feedback” to students in math	99	2.27	0.93	21%	42%	24%	12%
Everyday Rubric and Feedback Levels	96	2.09	0.91	28%	43%	21%	8%

UNIVERSITY COURSES FOR TEACHERS

The MMP continued to offer professional development courses for MPS teachers (see Table 6). Ten course sections were enrolled with 270 participations from 90 different schools, with waivers of approximately \$81,000 in tuition during the 2005-06 academic year. Seven courses are planned for the summer with anticipated enrollment of 175 participations. The “Communication and Reasoning in Mathematics” courses first offered last year continued to be in demand. Courses were offered this year to reflect the MMP content foci on rational numbers from Year 2 and algebraic relationships this year. We chose to offer a trial course in Spring 2006 for kindergarten teachers, particularly for four-year-old kindergarten teachers, and we were so overwhelmed with the response that we are offering it again this summer.

Table 6. UWM-MMP Professional Development Courses, 2005–2006

Course or MMP district event	Credits	Semester	Number Participants	Number Schools
Algebraic Relationships & Reasoning (560-104)	1	Spring	27	19
Communication and Reasoning in Mathematics Part I (Fall 560-102 & 104) (Spring 560-106 & 107)	1	Fall & Spring	112	59
Communication and Reasoning in Mathematics Part II (Fall 560-103) (Spring 560-102)	1	Fall & Spring	45	30
Lenses on Learning: Instructional Leadership in Math (579-103)	3	Spring	15	14
Standards-based Mathematics: Kindergarten (560-105)	1	Spring	34	22
Teaching Fraction Concepts and Computation (560-103)	2	Spring	37	28
Algebraic Relationships & Reasoning Part 1	1	Summer		
Algebraic Relationships & Reasoning Part 2	1	Summer		
Developing Mathematical Ideas: Working with Data	2	Summer		
Standards-based Mathematics: Measurement	1	Summer		
Number and Computation: Special Education Focus	1	Summer		
Standards-based Mathematics: Kindergarten	1	Summer		
Teaching Fraction Concepts and Computation	2	Summer		
Total Participations (2005-06 school year)			270	172
Number of Distinct Schools across Courses (2005-06 school year)				90

In addition, we obtained Wisconsin ESEA funding to support programs in collaboration with the MMP. Through the Title IIA program we developed additional MPS teacher leaders. The three-semester *Distributed Leadership in Mathematics* project had 33 participants. We anticipate another 30 teachers joining the new three-semester “Assessment Leadership for Mathematics” project that begins this summer. Through the Title IIB MSP program we have the four-semester *Math Fellows Program* to increase the content knowledge of middle grades teachers (as discussed above). A total of 54 teachers have taken at least one mathematics content course and 37 teachers have taken from 2 to 4 math content courses.

Goal 4. Student Learning Continuum

Ensure that all students from PK-16 have access to, are prepared and supported for, and succeed in, challenging mathematics.

Transition to College Initiative Develops Supports

Increasing the number of students who make a successful transition in mathematics from K-12 to post-secondary education is a major goal of the MMP. This work includes a goal of reducing the numbers of students needing remedial mathematics courses in post-secondary institutions. The MMP work involves collaborative interactions of MPS high school teachers and university/college mathematics faculty and development of support materials. UWM has also been involved in two new efforts to reduce the numbers of students in remedial mathematics courses by more appropriate placement or by acceleration. In addition, MATC and UWM are analyzing placement data to better inform efforts across institutions.

MPS TRANSITION TO COLLEGE MATHEMATICS PILOT

The Transition to College Mathematics Pilot met five times during the academic year. Ten high schools regularly attended the meetings. Dr. Eric Key from UWM provided leadership and direction to the meetings. The Transition Pilot work included the following:

- Piloted practice problems in two resource books developed by Key (UWM) and David Ruszkiewicz (MATC). Each book (one with a focus in algebra and one in geometry)

represented a collection of problems aligned with the UW-System and the Accuplacer placement items by mathematics topic. The books were distributed to all high schools and placed online (http://www.uwm.edu/Org/MMP/_activities/transition.html).

- Developed a prototype of a “student portfolio” to be used next year to monitor student progress with respect to the problems in the resource books.
- Revised the MPS Intermediate Level Learning Targets designed to outline the mathematics topics for the high school junior and senior level courses.
- Investigated the use of the computer program ALEKS at the Milwaukee School of Entrepreneurship in preparing students for the UW-System Math Placement Exam.



ACCELERATION PILOT: MOVING STUDENTS THROUGH REMEDIAL COURSES

This year, UWM initiated a program in which the computer-adaptive learning system ALEKS was used to enable students to complete remedial coursework more quickly. In both the Fall and Spring semesters, UWM ran combined sections of MATH 090/095 and MATH 095/105. Math 090/095 are non-credit remedial courses. Math 105 is intermediate algebra. A student enrolled in the lower numbered course at the beginning of the semester and worked with ALEKS at his or her own pace. Students who complete the work for the lower course were automatically re-registered for the higher one and could therefore possibly finish two courses in one semester. The Fall 2005 outcomes were promising. Of the 38 students who enrolled, 36 students successfully completed both courses during the semester. The campus intends to increase the number of combined sections to six in Fall 2006.

RE-TESTING INITIATIVE

Last year, the MMP persuaded UWM to release math placement test results to students in time for them to retake the test should they choose to do so, and criteria were developed to identify students who had potentially been misplaced. Those students were sent letters inviting them to retest in Summer 2005. Of 1052 students who were contacted, 220 (20.9%) chose to retest. (Note that these data are for all students, not just MPS.) Despite the relatively low response rate, we consider the program to have been a success. Consider, for example, the following results from the 220 students who retested: 153 had higher placements (69.5%) and 46 had placements that did not change (20.9%) (Key & O’Malley, 2005).

The gains were particularly impressive for those 83 students who originally tested into the remedial math courses MATH 090 or MATH 095. Of these, 62.7% moved from a remedial to a credit course in mathematics. In fact, based on the results of this study, we recommend that any student who tests into a non-credit course at UWM should be retested. The re-testing also allowed more appropriate placement into higher-level courses. Of the 220 students, 102 tested into MATH 105 Intermediate Algebra. After retesting, 102 of these 220 students tested higher than MATH 105, a gain of more than 96%. Before retesting, only 6 of these 220 students tested into calculus. After retesting an additional 29 students tested into calculus.

Unfortunately, the program had minimal effect on MPS students, since only 17 of them met the criteria for misplacement—a mismatch between ACT scores and math placement scores. Very few MPS students had a high enough ACT score to raise a flag. On the positive side, 7 MPS students (41%) chose to retest with 71.4% retesting higher, similar to the percentage

from the general pool (i.e., 69.5%). All 4 students who originally tested into MATH 090 retested into MATH 095. Of the 3 students who tested into Math 095, one retested higher, one stayed at the current level, and one retested lower. It seems that we need to make a concerted effort to convince MPS (and other) students to retake the placement test and to convince more of them to join support programs. In an initial attempt, UWM is running a new bridge program in Summer 2006 targeted exclusively towards MPS students. Students are identified by MPS teachers involved in the Transition Pilot Committee. At the time of writing, approximately 80 students have been contacted and 20 have submitted applications to the program. (For more information, <http://www.uwm.edu/~erickey/MATHPEP/MMP06.html>.)

ANALYSIS OF PLACEMENT DATA

UWM and MATC, through the MMP, are establishing the capability to analyze math placement data in greater depth, including comparison of MPS to non-MPS students. The baseline data (see Tables 7 and 8) on placement levels of new freshmen in 2004-2005 show a clear need for work in this area: 77% MPS versus 41% non-MPS at MATC and 72% MPS versus 25% non-MPS students placed into remedial level courses. Even with the proviso that these data are not a description of the entire MPS high school graduating class, but only of those who chose to enter MATC or UWM, the results are not encouraging.

Table 7. MATC Placement into Mathematics Courses, 2004-2005

MATC Course Level	MATC Number	UWM Equivalent	MPS		Non-MPS		Total	
Math Fundamentals (Remedial)	Math 150	Math 090	348	67%	103	19%	451	43%
Applied Algebra (Remedial)	Math 141	Math 095	51	10%	118	22%	169	16%
Total Remedial			399	77.3%	221	40.6%	620	58.4%
Intermediate Algebra	Math 200	Math 105	98	19%	257	47%	355	33%
Pre-calculus			19	4%	67	12%	86	8%
Calculus								
Total Combined			516		545		1061	

Table 8. UWM Placement into Mathematics Courses, 2004-2005

UWM Course Level	UWM Number	MATC Equivalent	MPS		Non-MPS		Total	
Basic Mathematics (Remedial)	Math 090	Math 150	160	52%	393	11%	553	15%
Essentials of Algebra (Remedial)	Math 095	Math 141	62	20%	487	14%	549	15%
Total Remedial			222	71.8%	880	25.4%	1102	29.2%
Intermediate Algebra	Math 105	Math 200	55	18%	141	40%	1465	39%
Pre-calculus			26	8%	826	23%	852	22%
Calculus			6	2%	349	10%	355	9%
Total Combined			309		3465		3774	

The MMP investigated the relationship between the number of years of high school math and college math placement scores. MPS, as well as the State of Wisconsin, has a two-year math requirement for high school graduation, even though some schools require three years for graduation. Since the UW-System requires three years of mathematics for admission, it is expected that the two-year policy will have relatively little effect on those freshmen accepted by UWM (though it may reduce their number), but the difference was sufficiently obvious at MATC to prompt an analysis of Accuplacer data. A statistically significant difference was found between MPS graduates entering MATC in Fall 2005 with two years versus three

years of high school mathematics (see Table 9). Even amongst MPS graduates with three years of math, however, 97% placed into remedial mathematics courses (Ruszkiewicz, 2006).

Table 9. Relationship of Years of Mathematics to Placement Level at MATC, Fall 2005

Level	2 Years HS Math		3 Years HS Math		Total	
Basic Skills (Remedial)	254	71%	253	59%	507	65%
Math Fundamentals (Remedial)	72	20%	103	24%	175	22%
Applied Algebra (Remedial)	29	8%	60	14%	89	11%
Intermediate Algebra (Low Level)	3	1%	11	3%	14	2%
Total	358		427		785	

NEXT STEPS

The MMP will continue its work on several fronts: (1) increase students' degree of preparation for college placement tests, (2) work with students after they have tested to improve their initial placement, and (3) enable students to complete the necessary remedial coursework in a timely fashion. As UWM Chancellor Carlos Santiago said in his first plenary address, "We must guarantee, before students enroll at UWM, that they have the necessary educational tools to succeed. We must guarantee, after students enroll, that they have access to all the tools they need to succeed."

K-12 Student Achievement Remains Steady with New State Assessments

STUDENT ACHIEVEMENT

In response to NCLB, the State of Wisconsin shifted from testing students in Grades 4, 8, and 10 to testing students in Grades 3–8 and 10 this school year. The new test was administered in November 2005. Unfortunately the scale scores are not comparable across test versions and we will need to establish a new baseline and work out the impact on our HLM analysis. The State is endorsing the comparison of proficiency percentages across versions and set the new cut scores so as to maintain approximately the same number of proficient students from last year. Thus, little change was noted throughout the State and in Milwaukee as expected. These results for MPS are shown in Figure 3 for Grades 4, 8, and 10.

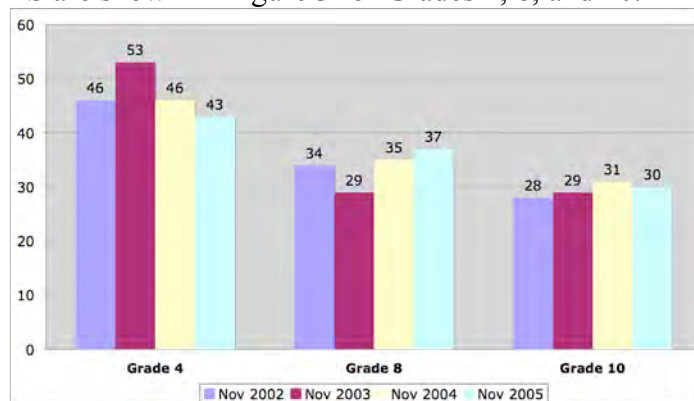


Figure 3. Percent of MPS Students Proficient on the WKCE, 2002–2005

PERFORMANCE BY STANDARDS

The new test changed in significant ways. The test was constructed for Wisconsin, included teachers from the state in its development, and assesses all of the Wisconsin standards. Of particular importance to our work is that the number of items is more equally distributed across each content strands. In other words, about 15%-20% of the items at each grade level assess each of the six standards. The results in Figure 4 show that the areas of greatest need

in MPS are mathematical processes and measurement. As these results were just released the third week of May, we will further examine the data to focus the work of the MMP work next year.

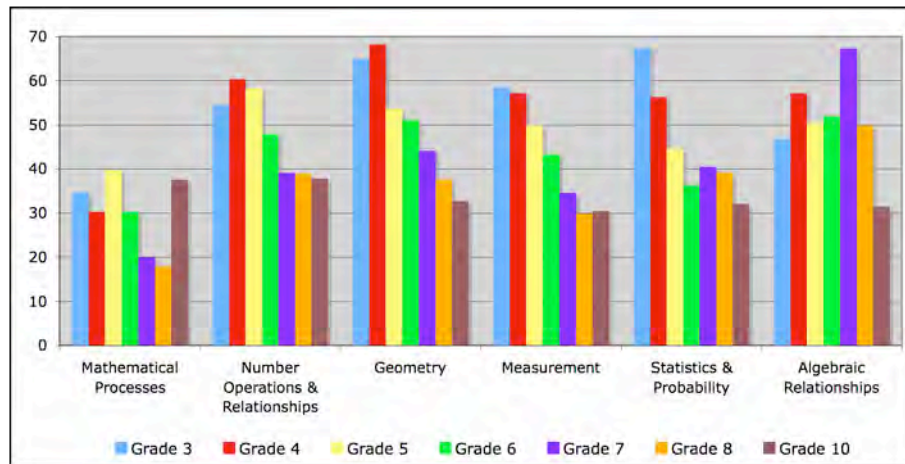


Figure 4. Standard Performance Index (SPI) of MPS Students, WKCE November 2005

Closing Comments

The work of the MMP generated increased momentum in Year 3. We made strides toward each of our goals. The concerted effort on performance assessments across grades K-12 brought deeper meaning to the Comprehensive Mathematics Framework (MMP Goal 1). Teachers are understanding what it means to interweave the five strands of the CMF to produce student mathematical proficiency as a result of using common CABS, unpacking the mathematics in the targets and assessment descriptors for the CABS, and collaboratively analyzing student work.

The biggest change I find in the teachers in my school is that they now talk about mathematics. They plan together and discuss the big math ideas and how to meet them. They discuss lesson sequencing and how to meet the Learning Targets and descriptors with those lessons. They are beginning to discuss student work and look for ways to improve student reasoning and communication.

–Math Teacher Leader



The continued and expanded development of the Math Teacher Leaders and the Assessment Leaders enhanced distributed leadership for mathematics (MMP Goal 2). Learning Teams utilized these leaders and MMP resources to strengthen teacher learning within their schools toward improved student achievement.

The action plan has allowed our staff to collaborate together to look at, discuss, score, and give feedback to students on constructed response problems. All students in grades 1–8 were given two constructed response problems each month. At the end of the month teachers get together and participated in what we called “scoring sessions.” After all of the staff being inserviced by our Math Teaching Specialist on the “secrets” of the WKCE constructed response scoring, we do not score our students work in the same fashion as before. We have now started working on feedback. We read articles on the importance of feedback and distinguish between descriptive and evaluative feedback. Now in our “scoring sessions” we work in groups to first find benchmark papers, second we score the work in the fashion of the WKCE-CKT to collect school wide data, and third we provide our students with good descriptive feedback. –Math Teacher Leader

With the offering of the algebraic structures course and the math capstone course, we reached a major milestone in our course development schedule on the Teacher Learning Continuum (Goal 3). All of the proposed new courses for the mathematical preparation of teachers have now been offered at least once to our prospective teachers. A certain highlight and challenge this year was making the four new MCEA math minor courses available to MPS teachers through the Math Fellowship Program. This opportunity brought unanticipated insights to the design teams that will strongly influence further course development in terms of appropriateness of content for middle grades teacher, selection of engaging activities for class sessions, and more practice-based connections. Another highlight was the district content focus on Algebra. Not only did the Math Teacher Leaders and the Assessment Leaders study algebra, but there was a pervasiveness throughout the district. This was evident in school action plans and mini-grant projects, as well as in the interest in the UWM professional development courses on algebraic reasoning.

When deciding to enter Math Fellows program I was scared to death. I knew my math content knowledge was not as well defined as others. I had done fine as an elementary teacher but the thought of returning to college courses that I hadn't thought about for 20+ years was scary. The courses as promised have been rigorous and full of important content. But most of all, the courses have helped me to make connections within content areas and improved my understanding of mathematics.... In particular, the Problem Solving course offered me the opportunity to experience "struggle." Problem solving wasn't about finishing a story problem once a day, but it was about interacting in a mathematical situation that pushed my thinking and helped me connect many branches of mathematics. –Math Fellow Participant

The momentum generated is moving us toward improved student learning (Goal 4) along the continuum of PK-12 mathematics to post-secondary mathematics. While we are still far from reaching our goal of high levels of mathematics achievement for all students, we are making progress in implementing steps leading to improved student learning. Teachers and administrators have a clearer



and deeper understanding of the mathematics students need to know and be able to do (i.e., targets and descriptors). They are able to assess that knowledge with common CABS within a school. They are beginning to reach Stages 4 and 5 in the Continuum of Work for Mathematics as they collaboratively use student work to make instructional decisions and provide students with descriptive feedback. In addition, through the efforts of the MMP, a number of students either did not have to take remedial math courses at UWM this year or accelerated through such courses. The Transition Pilot also has materials ready for teacher use next year to support improved success of students in making that transition from high school to college mathematics.

In closing, the MMP has established momentum on many fronts through the collaborative efforts of mathematicians, mathematics educators, teachers, and administrators. Over the next two years, our momentum will continue to grow as we strive to establish capacity toward continuous improvement in the teaching and learning of mathematics.

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Appendices

Appendix A. Organizational Chart

Appendix B. Publications and Presentations

Appendix C. Year 3 Accomplishments





Milwaukee Partnership Academy
 MPA Partners
 MPA Implementation Team

MMP Steering Committee
 Henry Kranendonk Aquine Jackson
 Kim Farley Kevin McLeod
 DeAnn Huinker Dennis Oulahan
 Kathy Williams Henry Kepner
 David Ruskiewicz Alan Rank

**IHE Mathematics Network
 Coordinating Council**
 Henry Kepner, Co-Chairperson
 Kevin McLeod, Co-Chairperson
 Tom Geil, Co-Chairperson
 John Moyer
 Kent Kromarek
 Susan Pustejovsky

Principal Investigator
 DeAnn Huinker
Program Manager
 Alan Rank

Milwaukee Teachers Education Association
Milwaukee Public Schools

University of Wisconsin-Milwaukee

Milwaukee Area Technical College

Co-Principal Investigators
 Henry Kranendonk
 Aquine Jackson

Co-Principal Investigator
 Kevin McLeod
Senior Faculty
 Henry Kepner

Co-Principal Investigator
 Kim Farley

Math Teaching Specialists
 Pandora Bedford
 Angela Ford-Patton (to March)
 Janis Freckmann
 Rosann Hollinger
 Beth Schefelker
 Lois Womack (to October)

Mathematics Department
 Fredric Ancel Jay Beder
 Allen Bell Karen Brucks
 Craig Guilbault Kelly Kaiser
 Eric Key Kevin McLeod
 Robert Moore Richard Stockbridge
 Gary Luck
School of Education
 Henry Kepner Meghan Steinmeyer
 DeAnn Huinker Marleen Pugach

Mathematics Department
 David Ruskiewicz
 Thomas P. Geil
 Michele LaSalva
CUTEP
 Eva Baez

Math Teacher Leaders

Research & Evaluation
 Deborah Lindsey
 Cindy Raven
 Tim McElhatton

Teachers-in-Residence
 Sharonda Harris Melissa Hedges
 Daniel Lotesto Bernard Rahming

Evaluation
 Carl Hanssen, Western Michigan University
 Cindy Walker, UW-Milwaukee
 Razia Azen, UW-Milwaukee



Appendix B Publications and Presentations, 2005–2006

MMP Publications

- Hollinger, R. (2006). Reading and mathematics. *Wisconsin Teacher of Mathematics*, 56(2), 9-18.
- Huinker, D., & Freckmann, J. (2005). *Analyzing and learning from student work: A protocol*. (DVD and CD). Milwaukee, WI: University of Wisconsin-Milwaukee.
- Key, E., & O'Malley, R. (2005). University of Wisconsin-Milwaukee mathematics placement examination 2005 retesting effort. Milwaukee, WI: University of Wisconsin-Milwaukee. Retrieved May 5, 2006 from http://www.uwm.edu/Org/MMP/_activities/transition.html.
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- Walker, C., Gosz, J., & Huinker, D. (2005). *Measuring the effect of the Milwaukee Mathematics Partnership on student achievement*. Paper presented at the MSP Evaluation Summit, Minneapolis, MN. Retrieved May 5, 2006 from <http://hub.mspnet.org/index.cfm/12694>.

Related Publications

- Kranendonk, H., & Peck, R. (2006). A statistical study of generations. In G. Burrill (Ed.), *Thinking and reasoning with data and chance* (pp, 103-116). Reston, VA: National Council of Teachers of Mathematics.
- Post, L., Pugach, M., Harris, S., & Hedges, M. (2006). The Teachers-in-Residence program: Veteran urban teachers as teacher leaders in boundary spanner roles. In K. Howey & N. Zimpher (Eds.), *Boundary spanners* (pp. 213-236). Washington, DC: American Association of State Colleges and Universities and National Association of State Universities and Land-Grant Colleges.
- Pugach, M. C., Post, L. M., & Thurman, A. (2006). All-university engagement in education reform: The Milwaukee Mathematics Partnership. In S. L. Percy, N. L. Zimpher, & M. J. Burkardt (Eds.), *Creating a new kind of university* (pp. 149-169). Boston, MA: Anker Publishing.
- Howey, K., Post, L. M., & Zimpher, N. L. (2006). *Recruiting, preparing, and retaining teachers for urban schools*. Washington, DC: American Association of Colleges for Teacher Education.

National Presentations

- Bedford, Pandora, and Bernard Rahming. (2006, April). *Milwaukee Mathematics Partnership (MMP) Protocol for Examining Student Work*. Presentation at the annual meeting of the National Association of Supervisors of Mathematics, St. Louis, MO.
- Brenner, Cheryl, Janice Udovich, and Laura Maly. (2006, April). *Working Toward Equity: Using Superballs, Food Coloring, and Rice*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.
- Hedges, Melissa, DeAnn Huinker, Jennifer Bay-Williams, and Kevin McLeod. (2006, January). *Decompressing Teacher's Mathematical Knowledge: The Case of Division*. Presentation at the annual meeting of the Association of Mathematics and Teacher Educators, Tampa, FL.
- Hedges, Melissa, Sharonda Harris, and Meghan Steinmeyer. (2006, April). *Dad, Mom, Sister, Brother, Dog; There Has to Be a Better Way to Divide*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.
- Hollinger, Rosann, and Marie Schimenz. (2006, April). *Problem, Protocol, and Practice: Learning from Analyzing Students' Work*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.
- Huinker, DeAnn, and Melissa Hedges. (2006, January). *The Mathematical Knowledge Needed for Teaching: An Inquiry into the Knowledge of Pre-service and Practicing Teachers*. Presentation at the annual meeting of the Association of Mathematics Teacher Educators, Tampa, FL.
- Huinker, DeAnn, and Janis Freckmann. (2006, April). *The 'Coaching' Spirit Is Catching On in Professional Development and in Classroom Practice*. Presentation at the annual meeting of the National Association of Supervisors of Mathematics, St. Louis, MO.
- Kepner, Henry. (2005, November). *A District-University Partnership to Upgrade Mathematical Content Knowledge of Middle-Grades Teachers of Mathematics*. Presentation at the annual meeting of the School Science and Mathematics Association Annual Convention, Fort Worth, TX.
- Kepner, Henry, Kevin McLeod, Gary Luck, Sharonda Harris, and Bernard Rahming. (2006, January). *Mathematical Knowledge for Teaching Mathematics: Teams of Mathematicians, Classroom Teachers, and Math Educators Construct Sequenced Mathematics Content Courses and Methods Courses for Prospective Elementary/ Middle Grades Teachers*. Presentation at annual meeting of the Association of Mathematics Teacher Educators, Tampa, FL.
- Kepner, Henry, Kevin McLeod, Henry Kranendonk, and DeAnn Huinker. (2006, April). *A District-University Partnership to Upgrade Mathematical Content Knowledge of Middle-Grades Teachers of Mathematics Through Fellowships*. Presentation at the annual meeting of the National Association of Supervisors of Mathematics, St. Louis, MO.
- Kepner, Henry, Dan Lotesto, Kevin McLeod, and Angela Ford. (2006, April). *Mathematical Rigor: From Exploring Connections to Reasoning to Proof*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.
- Kranendonk, Henry, and Roxy Peck. (2006, April). *A Curriculum Framework for Statistical Education*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.
- Moranchek, Laura J., and Beth Schefelker. (2006, April). *High-Stake State Mathematics Assessment: CRs and BCRs—the Secrets Unveiled*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.

- Patton, Angela, and Sherrie Akinsanya. (2006, May). *The Use of Students' Work to Support Classroom Standards Using Assessment*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.
- Rahming, Bernard, and Sharonda Harris. (2006, May). (2006, May). *An Urban District Uses the Thinking Skills Classification Framework to Push Teachers and Address Standardized Assessments*. Presentation at the annual meeting of the National Association of Supervisors of Mathematics, St. Louis, MO.
- Schefelker, Beth, and Lee Ann Pruske. (2006, May). *Mathematics Learning Walks: Focused Observations, Collaborative Conversations, and Effective Feedback Leading to School Improvement*. Presentation at the annual meeting of the National Association of Supervisors of Mathematics, St. Louis, MO.
- Schefelker, Beth, and Laura Morancheck. (2006, May). *WKCE-CRT Constructed Response: The Secrets Revealed*. Presentation at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.
- Walker, Cindy, Jacqueline Gosz, and DeAnn Huinker. (2005, September). *Measuring the Effect of the Milwaukee Mathematics Partnership on Student Achievement*. Presentation at the MSP Evaluation Summit, Minneapolis, MN.

State Presentations

- Allen, Shunda, and Rosann Hollinger. (2006, May). *Problem, Protocol and Practice: Learning From Analyzing Student Work*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Bedford, Pandora, and Sharonda Harris. (2006, May). *Mathematics and Children's Literature: The Natural Connection*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Bedford, Pandora, Bernard Rahming, and Ingrid Henry. (2006, May). *Milwaukee Mathematics Partnership (MMP) Protocol for Examining Student Work*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Brenner, Cheryl, Laura Maly, and Janice Udovich. (2006, May). *Working Towards Equity: Using Superballs, Food Coloring and Rice*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Cuellar, Cynthia, Jodene Schlueter, and Rosann Hollinger. (2006, May). *Teaching Reading in Mathematics: Strategies You Can Count On!* Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Das, Ibha. (2006, May). *Computational Fluency—Cross Cultural Practice*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Dean, Susan. (2006, May). *Assessing The Assessment*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Fossum, Astrid. and Amy Fitzgerald. (2006, May). *Does Your Assessment Measure Up?* Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Freckmann, Janis. and Angela Ford-Patton. (2006, January). *Using Problem Solving to Support Basic Skills in Mathematics*. Presentation at the New Wisconsin Promise Conference, Madison WI.
- Greco-Carr, Judy and Barbara Rehagen. (2006, May). *Collaboratively Looking at Student Work*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.

- Huinker, DeAnn. and Janis Freckmann. (2006, May). *The 'Coaching' Spirit Is Catching On in Professional Development and in Classroom Practice*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Kepner, Henry, Kevin McLeod, Sharonda Harris, Melissa Hedges, Bernard Rahming, and Daniel Lotesto. (2006, May). *Designing and Evaluating Courses for Prospective Teachers of Mathematics—Collaborations of Mathematicians, Classroom Teachers and Mathematics Educators—An Update*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Kepner, Henry, Kevin McLeod, John Moyer, and Melissa Hedges. (2006, May). *Research on the Mathematical Knowledge Needed for Teaching and the Role of Definition in Mathematics Instruction*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Kraczyk, Penny. (2006, May). *Navigating Through Problem Solving and Reasoning Grade 2*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Kranendonk, Henry. (2006, May). *Answering the 'Why?' and 'For What Purpose?'* Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Kranendonk, Henry. (2006, May). *Navigating Through Probability Grades 9-12*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Lotesto, Daniel. (2006, May). *Integrating BC Calculus Topics Into an AB Course*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Mooney, Mary, and Sue Dean. (2006, May). *Preparing Students for College Placement Tests*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Patton, Angela Ford. (2006, May). *Navigating Through Data Analysis Grades 6-8*. Presentation at the Wisconsin Mathematics Council Annual Green Lake Conference, Green Lake, WI.
- Patton, Angela Ford, and Rosann Hollinger. (2006, May). *Reading in Mathematics: Research to Practice*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Patton, Angela Ford, and Delores Cole-Stewart. (2006, May). *Surprise! You're a Reading Teacher!* Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Patton, Angela Ford. (2006, May). *Using Problem-Solving to Support Basic Skills in Mathematics*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Peters-Freeman, Nicol, & Debbie Kuether. (2006, May). *Think Aloud: A Problem Solving Strategy in Mathematics*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Pruske, Lee Ann. (2006, May). *Mathematics Learning Walks Lead to School Improvements*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Schefelker, Beth. (2006, May). *Algebra? For Little Kids? You Betcha!* Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Schefelker, Beth and Laura Morancheck. (2006, May). *WKCE-CRT Constructed Response: The Secrets Revealed*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.
- Steinmeyer, Meghan, Melissa Hedges, and Sharonda Harris. *Dad, Mom, Sister, Brother, Dog (Divide, Multiply, Subtract, Bring Down): Is This The Only Way To Divide?* Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.

Wagner, Astrid, and Penny Krafczyk. (2006, May). *How to Help Students Work Through Problem Solving*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.

Wallace, Doris. (2006, May). *Practical Ways to Teach Mathematics to Students Who Say They Don't Like or UNDERSTAND Mathematics*. Presentation at the Wisconsin Mathematics Council Annual Green Lake Conference, Green Lake, WI.

Wolter, Susan, Mary Beth LaHaye, and Joanie Marchillo. (2006, May). *Writing Balanced CABS in Math*. Presentation at the annual meeting of the Wisconsin Mathematics Council, Green Lake, WI.

Local Presentations

Bass, Hyman, and Deborah Ball. (2005, August). *Mathematical Knowledge Needed for Teaching in K-12 and Collegiate Mathematics and The Role of Definition in Mathematics Instruction*. Presentation at the MMP Institutions of Higher Education Math Network Conference, Waukesha, WI.

Harel, Guershon. (2006, March). *What is Mathematics? A Pedagogical Answer to a Philosophical Question*. Presentation for the MMP Institutions of Higher Education Math Network, Marquette University Department of Mathematics, Milwaukee, WI.

Hughes-Hallett, Deborah. (2005, October). *Designing a Challenging Calculus Course*. Presentation for the MMP Institutions of Higher Education Math Network, Marquette University Department of Mathematics, Milwaukee, WI.

Huinker, DeAnn, Henry Kepner, and Melissa Hedges. (2006, March). *Teacher Preparation and Professional Development: The Mathematical Knowledge Teachers Need*. Presentation at the annual UWM School of Education Research Conference, Milwaukee, WI.

Keynes, Harvey, and Simon Morgan. (2006, May). *Engaging Mathematics: Connecting Your Students to Learning Mathematics: Middle School Focus*. Presentation for the MMP Institutions of Higher Education Math Network, University of Wisconsin-Milwaukee, Milwaukee, WI.

Paterson, Judy. (2006, May). *Engaging Mathematics: Connecting Your Students to Learning Mathematics: High School Focus*. Presentation for the MMP Institutions of Higher Education Math Network, University of Wisconsin-Milwaukee, Milwaukee, WI.

Paterson, Judy. (2006, May). *Using Mathematics to Open Up Windows in Teachers' Minds: Encouraging Teacher Talk About Learning and Teaching*. Presentation for the MMP Institutions of Higher Education Math Network, University of Wisconsin-Milwaukee Mathematics Department Colloquium, Milwaukee, WI.

Weeks, Jeff. (2006, April). *The Shape of Space*. Presentation for the MMP Institutions of Higher Education Math Network, University of Wisconsin-Milwaukee Department of Mathematics Marden Lecture, Milwaukee, WI.

Weeks, Jeff. (2006, April). *Exploring the Shape of Space*. Presentation for the MMP Institutions of Higher Education Math Network, Milwaukee Public Schools, Milwaukee, WI.



Appendix C Year 3 Accomplishments

August 2005

- Institutions of Higher Education (IHE) Mathematics Network Conference was held on August 25–26, held at Carroll College, Waukesha, WI. Attended by approximately 80 participants from 22 four-year and two-year colleges and universities, three school districts, and two State agencies. Featured speakers were Dr. Hyman Bass and Dr. Deborah Ball from The University of Michigan on the “Mathematical Knowledge Needed for Teaching in K-12 and Collegiate Mathematics and The Role of Definition in Mathematics Instruction.”
- Math Teacher Leader (MTL) Kick-Off Institute was held on August 24–25 at Bradley Technical and Trade High School. The Kick-Off was attended by 142 MTLs, grades K-12, along with university faculty, mathematics specialists, and MPS central services staff.

September 2005

- The first issue of “The MMP Messenger” is disseminated. The Messenger is a one-page, one-side, newsletter that serves as a link from the MMP leadership to school-based leadership, particularly to principals. It summarizes the topics examined at the monthly MTL meetings and provides professional development ideas and follow-up suggestions to schools. The first issue focused on the August MTL Kick-Off topics of analyzing WKCE data, using CABS, and beginning the this year’s content journey on algebra. The Messenger continued to be published monthly throughout the school year for a total of 10 issues.
- Mathematics faculty, Mathematics Education faculty, Teachers-in-Residence and graduate students reconvened a weekly Math Education seminar in the UWM Department of Mathematical Sciences. Various topics about mathematics education will be discussed throughout the semester.
- MATC offers Math 275, Mathematical Explorations for Elementary Teachers I, this fall as a new course developed by MATC and UWM to assure alignment of MATC’s course with UWM’s course Math 175, providing a seamless math transition for MATC students entering UWM.
- UWM offers MATH 277 Geometry for Elementary Education Majors in Fall 2005. Design team includes Ric Ancel (Mathematics Department), Hank Kepner (Curriculum and Instruction), and Melissa Hedges (TIR). They met throughout the semester to continue revising and evaluating course activities. The class explored similarity, spheres, geometry as a measuring tool, the basic techniques used in geometry, rigid motions, and symmetry.
- UWM Math 278 Discrete Probability and Statistics for Elementary Education Majors course in Fall 2005. Design team includes Richard Stockbridge and Gary Luck (Mathematics Department), Hank Kepner (Curriculum and Instruction), and Bernard Rahming (TIR).
- A math study group was established as one of the offerings at the monthly MPS Principal meeting. A group of approximately 20 principals are meeting for about 1.5 hours each month. The study group is facilitated by Henry Kranendonk, MPS Mathematics Curriculum Specialist.
- Math Teacher Leader meetings were held September 27 and 29 for elementary and middle school MTLs. Approximately 115 MPS Math Teacher Leaders attended seminars that focused on algebraic thinking and reasoning aligned with MPS Targets and Descriptors, problem solving, developing and assessing CABS, unpacking the WKCE, networking and school leadership.
- Approximately 20 high school math department chairs met on September 27 to discuss upcoming MMP projects for the 2005-2006 school year. These projects include Learning Target revisions, a

transition assessment pilot designed to prepare students for college placement testing, and continuing development of the 8th/9th Grade Assessment Pilot activities.

- A High School Mathematics Assessment Pilot meeting was held on September 21 to establish goals for the school year. Goals include revisions of Learning Targets, creation of intermediate level Learning Targets, revisions of the resource guide, creation of geometry CABS and mentoring new math teachers in the district. MPS school visits were conducted and will continue throughout the school year.
- MATC established a math internship program in MPS schools for its prospective teachers and has recruited and hired seven TEP students as math interns.
- MATC hired UWM students with MCEA math teaching minors to tutor teacher education students at MATC.
- David Ruszkiewicz (MATC) began mentoring an MPS teacher at the Carver Academy of Mathematics. Site visits were conducted and will continue throughout the school year.
- The *Math Fellowship Program* offered the following courses in Fall 2005 to its participating teachers: MATH 275 Mathematical Problem Solving and Critical Thinking, MATH 278 Discrete Probability and Statistics, and MAH 277 Geometry.
- The *Distributed Leadership in Mathematics* Project began in June 2005 with a summer institute and continues throughout the school year approximately meeting twice per months. Designed for K-8 teachers, the project is facilitated by MPS Math Teaching Specialists Janis Freckmann, Lois Womack, Pandora Bedford, and UWM Professor DeAnn Huinker.
- The Master's Cohort in Mathematics Education continued their coursework in the areas of CURRINS 626 Principles and Practices of Teaching Geometry and Geometric Thinking and CURRINS 705 Curriculum and Instruction as a Field of Inquiry.
- The MMP has initiated relationships with two NSF-funded Research, Evaluation, and Technical Assistance (RETA) grantees. MPS principals have been recruited to participate in *A Study of Elementary and Middle School Principals' Leadership Content Knowledge* in mathematics sponsored by the Education Development Center. The MMP is also collaborating with the University of Michigan's *Motivation Assessment Project* utilizing its motivation-related scales for use in evaluating math improvement interventions.
- The MPA Implementation Team met on September 12. DeAnn Huinker previewed the work of the MMP for the year and reported on the August MTL Kickoff and IHE Network conferences.
- The MPA Partners quarterly meeting was held on September 19. Kevin McLeod reported that significant gains were shown in fractions content knowledge following the focus in that area during the past year among the Math Teacher Leaders, that algebra will be the content focus for this year, and that work on high school to college transition will continue.

October 2005

- During Fall 2005, UWM offered professional development courses for MPS teachers to deepen their knowledge and improve their teaching practice in mathematics. Tuition is waived for teachers through the MMP. The courses began in October: *Communication and Reasoning in Mathematics: Part 1* (2 sections) and *Communication and Reasoning in Mathematics: Part 2* (1 section) for K-8 teachers. Approximately 79 MPS teachers and administrators gained insight on practices that support students' ability to communicate mathematical reasoning that are aligned with the comprehensive literacy and mathematics frameworks.
- The *Lenses on Learning: Instructional Leadership in Mathematics* course began in October with 15 MPS principals. The course is being offered through UWM and continues throughout the school year. Tuition is waived for participants. The course is part of the collaboration with the EDC study of principals leadership content knowledge for mathematics. It is being taught by Sharonda Harris, Teacher-in-Residence, and Astrid Fossum, MPS Teacher. The focus of the

course is on developing the capacity to discern the features of a classroom that are central for student learning.

- On October 5, the MMP goals for Year 3 were discussed at the MPS Principals Meeting. DeAnn Huinker and Henry Kranendonk (MPS) shared plans to expand and develop the leadership roles of the Math Teacher Leaders. The presenters also covered the goals of this years MTL meetings as well as issues related to mathematical content on standardized testing.
- On October 7, the MMP Steering Committee met to review plans and priorities for the year.
- On October 14, the IHE Math Network co-hosted a Math Colloquium with Marquette University featuring Dr. Deborah Hughes-Hallett, University of Arizona, as the featured speaker. Sessions included a calculus lesson demonstration, a question and answer session and discussion on the topic calculus teaching from a reform perspective.
- The MPA Implementation Team met on October 10.
- On October 12, approximately 20 eighth and ninth grade MPS teachers met for the inaugural meeting of the Grades 8-9 Assessment Pilot. The meeting focused on goals for the assessment project in upcoming months, including revising the 8th grade summer school course, creating a 9th grade summer school course, matching the 10th grade state math descriptors to the teaching priorities for 8th and 9th grade math, as well as defining math proficiencies for both grades.
- Approximately 46 MPS teachers met for the Grades 2-7 Assessment Pilot Committee on October 17. Meeting topics included facilitation of CABS at individual schools, writing assessments, and algebraic understanding. Work will continue throughout the year.
- On October 18, approximately 16 MPS high school math departments chairs and math teacher leaders met for their monthly meeting. Meeting topics included WKCE preparation and the reorganization of the Learning Targets to more closely align them with the new state standards.
- MTL meetings were held on October 18 and 20. The meeting was attended by 108 Math Teacher Leaders. Meeting topics included algebraic thinking, Learning Targets, and state descriptors.
- The Transition to College Mathematics Pilot met on October 19. MPS high school teachers with Eric Key (UWM) and Dave Ruskiewicz (MATC) worked on revisions to placement exam problem booklets. Work will continue into the upcoming months.
- The High School Mathematics Assessment Committee met on October 20 to continue revisions to the resource guide they are developing for all high schools. Work will continue into the upcoming months.
- An informational poster explaining the MMP work was prepared and presented at the UW-Milwaukee Open House on October 27-29.
- Assessment writing committees were established for Grades 2–7. These committees will continue to meet throughout the year to write and revise model district CABS.

November 2005

- The MMP produced a professional development package comprised of a DVD and CD on “Analyzing and Learning from Student Work: A Protocol.” The DVD features MPS teachers discussing student work using the protocol. 400 copies were made for dissemination.
- The MMP Steering Committee met on November 4.
- High School teachers attended the “Mathematical Rigor” workshop. Dr. Kevin McLeod, UWM Mathematics Professor, presented *Completing the Square* at Riverside High School on Saturday November 5. The session included strategies and mathematical connections for teaching the topic in the high school classroom.
- Henry Kepner presented on “A District-University Partnership to Up-Grade Mathematical Content Knowledge of Middle-Grades Teachers of Mathematics” at the School Science and Mathematics Association annual meeting on November 11-12 in Fort Worth, Texas.

- On November 14, approximately 43 MPS teachers met for the Grades 2-7 Assessment Pilot meeting. The group continued working on the facilitation and alignment of CABS at individual schools, writing assessments, and developing a work plan.
- Henry Kepner, UWM Professor, and Melissa Hedges, Bernard Rahming, and Dan Lotesto, Teachers-in-Residence, participated in the Realistic Mathematics Education Conference in Madison, Wisconsin on November 14-15.
- The MPA Implementation Team met on November 14. DeAnn Huinker shared plans for the math focus at the Learning Team seminars being planned for December.
- Math Teacher Leader meetings were held on November 15 and 17. Topics for discussion included district initiatives, WKCE testing, and algebra, and CABS.
- The High School Math Department Chairs meeting was held on November 15. Approximately 22 MPS teachers attended to discuss the analysis of student work using a rubric, individual school assessment teams, action plans, and participation in the high school transition to college pilot.
- On November 16, the Transition to College Pilot met and continued to work on revisions to problem booklets produced. Work will continue into the upcoming months. Eric Key and Dave Ruszkiewicz offered resources and input to increase student success.
- A workshop was held on November 29 for middle and high school teachers on *Searching for Graphing Calculators*. The session helped teachers develop skill in using graphing calculators and examined productive classroom content connections.

December 2005

- Learning Teams in each school are eligible to receive MMP funds to promote the professional learning of teachers in mathematics. Learning Teams receive approximately \$1000-\$4000 depending on the number of mathematics teachers in the school for approved plans. Learning Teams have been working with their Math Teaching Specialists to develop and receive approval for their Math Action Plans. Many plans were submitted in this fall. Schools may continue to submit plans throughout the year.
- The MMP Steering Committee met on December 4. David Ruszkiewicz presented the results of his study on the mathematics placement of MPS and Non-MPS students at MATC.
- A “Mathematical Rigor” workshop was held on Saturday December 5. Dr. Kevin McLeod, presented on *Finding a Square Root* at Riverside High School.
- The MMP sponsored five full-day Learning Team training sessions on December 5, 6, 10, 12, and 13. The sessions were attended by 570 teachers and administrators representing Learning Teams from 132 schools. The focus of the sessions were on “Bringing Together Classroom Assessments and Student Work.” Each team was trained on using the protocol for analyzing student work and received a copy of the DVD/CD professional development package to use at their schools.
- On December 7, Pandora Bedford, Math Teaching Specialist, and Sharonda Harris, Teacher-in-Residence, gave a presentation at the math study group at the MPS Principal meeting. The presentation addressed the topic of incorporating literature into the teaching of mathematics.
- On December 8, about 50 MPS teachers came together for the Grades 2-7 Assessment Pilot meeting. Participants continued work on “Assessing the Assessments” to review and evaluate CABS and on using descriptive feedback to improve student achievement through CABS.
- The MPA Implementation Team met on December 12. DeAnn Huinker presented on the fall accomplishments of the MMP and previewed activities for the spring semester.
- On December 15, DeAnn Huinker participated in the Milwaukee Metro Area Deans of Education (MMADE) meeting, Milwaukee, Wisconsin. The fall accomplishments of the MMP were highlighted and issues of concern to the IHE Math Network were discussed, in particular

procedures across institutions for elementary/middle level teachers adding on a Wisconsin licensure mathematics endorsement.

- The MPA Partners quarterly meeting was held on December 16. Kevin McLeod and DeAnn Huinker presented an update on the work of the MMP.
- On Saturday December 17, another “Mathematical Rigor” workshop was held at Riverside High School. Dr. Kevin McLeod, presented *What are the Area and Circumference of a Circle*.
- On December 14, the High School Assessment Pilot met to work on revisions to a mathematics resource guide and to develop plans for dissemination to all high schools.

January 2006

- UWM course on *Algebraic Relationships and Reasoning* began in January with 27 MPS teachers enrolled. The course emphasizes the big ideas of equivalence and generalization as well as algebraic thinking and reasoning. Teachers examine student work, video clips, instructional strategies and assessment items. Tuition is waived through the MMP.
- UWM course on *Teaching Fraction Concepts and Computation* began in January with 37 MPS teachers enrolled. Course topics included understanding fraction concepts, comparisons, and equivalencies, and developing computational strategies for adding, subtracting, multiplying, and dividing fractions. Participants learned ways to use representations, such as number lines and area models, to enhance their instruction of fractions. Tuition is waived through the MMP.
- UWM course on *Communication and Reasoning in Mathematics Part 2* began in January. The course examines development of the mathematical processes of reasoning and communication in problem solving that are aligned with the comprehensive literacy and mathematical framework. Tuition is waived through the MMP.
- MATC offers two sections of MATH 276, Mathematical Explorations for Elementary Teachers II, in the spring. This is a new course developed by MATC and UWM to assure alignment of MATC’s course with UWM’s course MATH 176, providing a seamless math transition for MATC students entering UWM. MATC also offered another section of MATH 275 this spring.
- UWM offers MATH 275 Mathematical Problem Solving and Critical Thinking for Elementary Education Majors in Spring 2005. Design team includes Allen Bell and Kevin McLeod (Mathematics Department), Hank Kepner (Curriculum and Instruction), and Sharonda Harris (TIR). Dr. Bell was the lead instructor with this being the first time he taught this course.
- UWM Math 299 Algebraic Structures for Elementary Education Majors is offered for the first time as an experimental course. Design team includes Kevin McLeod (Mathematics Department), Hank Kepner (Curriculum and Instruction), and Connie Laughlin (teacher).
- The MMP Steering Committee met on January 6.
- The MPA Implementation Team met on January 9. DeAnn Huinker distributed the MMP Messenger and information on the UWM courses for teachers being offered in the spring.
- Janis Freckmann and Angela Ford Patton, Math Teaching Specialists, presented “Using Problem Solving to Support Basic Skills in Mathematics” at the New Wisconsin Promise Conference in Madison, Wisconsin on January 11-12.
- Henry Kepner, UWM professor, and Dan Lotesto, Teacher-in-Residence, attended and participated in the MAA/AMS Joint Mathematics Meeting in San Antonio, Texas, January 12-15.
- Math Teacher Leader meetings were held on January 17 and 19. Discussion topics included textbook adoption, generalized properties of algebra, and mini-grants guidelines.
- On January 23, the Grades 2-7 Assessment Pilot continued work on CABS, analyzing student work with the protocol, and descriptive feedback.
- On January 24, approximately 31 High School Math Department Chairs met. Meeting topics included a new ninth grade summer mathematics proficiency program, upcoming MMP math mini-grants, and continued development of MMP math actions plans.

- On January 25, high school teachers met to continue work for the Transition to College Pilot. Completed copies of geometry and algebra books were distributed. Discussion focused on placement testing as well as revisions of the high school learning targets.
- On January 26-28, the MMP was represented at the annual meeting of the Association of Mathematics Teacher Educators (AMTE) held in Tampa, Florida. The work of the MMP was disseminated through presentations by university faculty and Teachers-in-Residence:
 - Henry Kepner, Kevin McLeod, Gary Luck, Sharonda Harris, Bernard Rahming presented, “Mathematical Knowledge for Teaching Mathematics: Teams of Mathematicians, Classroom Teachers, and Math Educators Construct Sequenced Mathematics Content Courses and Methods Courses for Prospective Elementary/ Middle Grades Teachers.”
 - DeAnn Huinker and Melissa Hedges presented, “The Mathematical Knowledge Needed for Teaching: An Inquiry into the Knowledge of Pre-service and Practicing Teachers.”
 - Melissa Hedges, DeAnn Huinker, Jennifer Bay-Williams, and Kevin McLeod presented, “Decompressing Teacher’s Mathematical Knowledge: The Case of Division.”
- On January 30-31, DeAnn Huinker (PI), Kevin McLeod (Co-PI), Henry Kranendonk (Co-PI), Kathy Williams (MPS Director of Teaching and Learning), and Beth Schefelker (MPS Math Teaching Specialist) participated in the MSP Learning Network Conference in Washington, DC.
- The *Math Fellowship Program* offered the following courses in Spring 2006 to its participating teachers: MATH 278 Discrete Probability and Statistics, and MATH 105 Intermediate Algebra.
- The Master’s Cohort in Mathematics Education at UWM continued their coursework in the areas of CURRINS 730 Mathematics in Elementary Education and CURRINS 714 Analysis of Instruction.

February 2006

- A new UWM course on *Standards-Based Mathematics in the 4-year-old Classroom* began in February with 34 MPS teachers enrolled. In this course, teachers examine strategies for developing a comprehensive standards-based mathematics program in the 4-year-old kindergarten classroom based on Learning Targets, the Wisconsin Early Learning Standards, and the NCTM standards for age-appropriate assessments. Tuition is waived through the MMP.
- UWM course on *Communication and Reasoning in Mathematics Part 1* began in February. It was offered again due to continued interest and demand. Tuition is waived through the MMP.
- The MMP Steering Committee met on February 3.
- On February 6, the Grade 8 Proficiency Committee met. They began work on putting together a teacher resource binder to be used in future pilots and workshops. The work on creating a binder will continue into March and April.
- Math Teacher Leader meetings were held on February 8 and 16. Discussion topics included formative assessment, supporting learner growth, and generalized properties of algebra.
- On February 9, approximately 20 MPS teachers formed the Learning Target committee and began their work to revise the grade K-7 learning targets to form a stronger alignment with the Wisconsin Assessment Framework descriptors.
- The MPA Implementation Team met on February 13. The search process for selecting new TIRs for next year was discussed.
- On February 14, the MMP hosted the Wisconsin Mathematics Leadership Council Meeting (WiMLC). It was attended by approximately 40 math leaders (e.g., curriculum directors, math supervisors) from throughout the State. Speakers included representatives from the Wisconsin Department of Public Instruction and MMP Math Teaching Specialists. Topics included assessment and using the MMP Protocol to collaboratively examine student work.

- On February 15, the High School Assessment Pilot met to continue working on revisions to the mathematics resource guide. Since work is nearing completion, the teachers spent this meeting planning the presentation of the guide to all high school teachers district-wide.
- On February 21, the High School Math Department Chairs met to review formative assessment, assessment pilot projects, and discuss district priorities and needs.
- On February 28, the Grades 2-7 Assessment Pilot met to continue their work on developing CABS and identifying benchmark papers.

March 2006

- The MMP mini-grants were awarded in March. A total of \$130,690 in mini-grants was awarded to 46 schools and one high school collaborative proposal. Each award ranged from \$1,000 to \$3,000. The projects focus on classroom assessments (CABS) and building teacher mathematics content knowledge.
- MATC began a one-credit course offering on preparing for the Praxis Test in mathematics for students in its Teacher Education Program (TEP).
- Janis Freckmann and Angela Ford Patton facilitated the math study group of the monthly MPS Principal meeting on March 1. The goal of the activity was to deepen understanding of instructional strategies that support students' problem solving abilities.
- Math Teacher Leader meetings were held on March 2 and 10. Discussion topics included formative feedback, dipping into the School Education Plan, and expressing relationships in algebra. Mary Diez from Alverno College was a guest speaker on assessment and feedback.
- The MMP Steering Committee met on March 3.
- The IHE Math Network co-hosted with Marquette University a colloquium by Dr. Guershon Harel, University of California-San Diego, on "*What is Mathematics? A Pedagogical Answer to a Philosophical Question.*" The colloquium was held on March 8 at Marquette.
- DeAnn Huinker, Henry Kepner, and Melissa Hedges presented "Teacher Preparation and Professional Development: The Mathematical Knowledge Teachers Need" at the annual UWM School of Education research conference on March 9.
- The MPA Implementation Team met on March 13. DeAnn Huinker reported on the selection process for the MMP Math Mini-grants.
- The MPA Partners quarterly meeting was held on March 17. DeAnn Huinker and Kevin McLeod provided an update on the work of the MMP.
- On March 28, several High school Math Department Chairs attended a monthly meeting. Meeting topics included upcoming in-services and events, and the activities of both the High School Transition to College Pilot and the 9th grade Proficiency Project.
- On March 28, the Grades 2-7 Assessment Pilot met to continue their work.
- On March 29, the High School Math Assessment Pilot facilitated a day-long workshop for 25 MPS high school teachers to learn ways to put the revised mathematics resource binder into action in the classroom.
- The Grades 8-9 Proficiency Committee met weekly during March to continue its work.
- The Learning Target Revision Committee met weekly during March to continue its work.

April 2006

- Math Teacher Leader meetings were held on April 4 and 6. Each MTL was invited to bring a special education teacher to the meeting from his/her school. Discussion topics included special education, understanding the Individualized Education Plan (IEP), and continuing the journey in algebra exploration.
- Beth Schefelker and Bernard Rahming presented on "How to Identify a Goal Related Need from Analyzing WKCE Data" at the math study group of the MPS principal meeting on April 5.

- The MMP Steering Committee met on April 7.
- The MPA Implementation Team met on April 10. DeAnn Huinker distributed a list of the school Learning Teams receiving MMP Math Mini-grant awards.
- On April 11, the MMP sponsored a breakfast meeting for Principals. Over 30 principals and administrators attended. The principals gave input into planning for Year 4 of the MMP. They also received updates on summer activities and the status of the textbook adoption process.
- MMP was well represented at the National Council of Supervisors of Mathematics (NCSM) annual meeting from April 24-26 in St. Louis, Missouri. University faculty, Teachers-in-Residence, Math Specialists, and MPS teachers collaborated to present and disseminate the work of the MMP.
 - Henry Kepner, Kevin McLeod, Henry Kranendonk, and DeAnn Huinker presented “A District-University Partnership to Upgrade Mathematical Content Knowledge of Middle-Grades Teachers of Mathematics Through Fellowships.”
 - Pandora Bedford and Bernard Rahming presented “Milwaukee Mathematics Partnership (MMP) Protocol for Examining Student Work.”
 - Bernard Rahming and Sharonda Harris presented “An Urban District Uses the Thinking Skills Classification Framework to Push Teachers and Address Standardized Assessments.”
 - Beth Schefelker and Lee Ann Pruske presented “Mathematics Learning Walks: Focused Observations, Collaborative Conversations, and Effective Feedback Leading to School Improvement.”
 - DeAnn Huinker and Janis Freckmann presented “The ‘Coaching’ Spirit Is Catching On In Professional Development And In Classroom Practice.”
- MMP was well represented at the National Council of Teachers of Mathematics (NCTM) annual meeting. April 26-29, in St. Louis, Missouri. University faculty, Teachers-in-Residence, Math Specialists, and MPS teachers collaborated to present and disseminate the work of the MMP.
 - Henry Kranendonk and Roxy Peck presented “A Curriculum Framework for Statistical Education.”
 - Henry Kepner, Dan Lotesto, Kevin McLeod, and Angela Ford presented “Mathematical Rigor: From Exploring Connections to Reasoning to Proof.”
 - Laura J. Moranchek and Beth Schefelker presented “High-Stake State Mathematics Assessment: CRs and BCRs—the Secrets Unveiled”
 - Angela Ford Patton and Sherrie Akinsanya presented “The Use of Students’ Work to Support Classroom Standards Using Assessment.”
 - Rosann Hollinger and Marie Schimenz presented “Problem, Protocol, and Practice: Learning from Analyzing Students’ Work.”
 - Melissa Hedges, Sharonda Harris, and Meghan Steinmeyer presented “Dad, Mom, Sister, Brother, Dog; There Has to Be a Better Way to Divide.”
 - Cheryl Brenner, Janice Udovich, and Laura Maly presented “Working Toward Equity: Using Superballs, Food Coloring, and Rice.”

May 2006

- On May 3, the principals in the math study group discussed the new textbook adoption procedures and summer math courses.
- The MMP was extremely well represented on the program of the annual meeting of the Wisconsin Mathematics Council held in Green Lake, Wisconsin. Particularly impressive was the number of Math Teacher Leaders disseminating the work of the MMP in addition to presentations by university faculty, Teachers-in-Residence, and Math Specialists.

- Angela Ford Patton and Rosann Hollinger presented “Reading in Mathematics: Research to Practice.”
- Angela Ford Patton and Delores Cole-Stewart presented “Surprise! You’re a Reading Teacher!”
- Astrid Wagner and Penny Krafczyk presented “How to Help Students Work through Problem Solving.”
- Judy Greco-Carr and Barbara Rehagen presented “Collaboratively Looking at Student Work.”
- Angela Ford Patton presented “Navigating through Data Analysis Grades 6-8.”
- Henry Kepner, Kevin McLeod, John Moyer, and Melissa Hedges presented “Research on the Mathematical Knowledge Needed for Teaching and the Role of Definition in Mathematics Instruction.”
- Susan Wolter, Mary Beth LaHaye, and Joanie Marchillo presented “Writing Balanced CABS in Math.”
- Cynthia Cuellar, Jodene Schlueter, and Rosann Hollinger presented “Teaching Reading in Mathematics: Strategies You Can Count On!”
- Beth Schefelker and Laura Morancheck presented “WKCE-CRT Constructed Response: The Secrets Revealed.”
- DeAnn Huinker and Janis Freckmann presented “The ‘Coaching’ Spirit Is Catching on in Professional Development and in Classroom Practice.”
- Henry Kepner, Kevin McLeod, Sharonda Harris, Melissa Hedges, Bernard Rahming, and Daniel Lotesto presented “Designing and Evaluating Courses for Prospective Teachers of Mathematics—Collaborations of Mathematicians, Classroom Teachers and Mathematics Educators—An Update.”
- Lee Ann Pruske presented “Mathematics Learning Walks Lead to School Improvements.”
- Penny Krafczyk presented “Navigating through Problem Solving and Reasoning Grade 2.”
- Ibha Das presented “Computational Fluency—Cross Cultural Practice.”
- Astrid Fossum and Amy Fitzgerald presented “Does Your Assessment Measure Up?”
- Doris Wallace presented “Practical Ways to Teach Mathematics to Students Who Say They Don’t Like or UNDERSTAND Mathematics.”
- Henry Kranendonk presented “Answering the ‘Why?’ and ‘For What Purpose?’”
- Susan Dean presented “Assessing The Assessment.”
- Meghan Steinmeyer, Melissa Hedges, and Sharonda Harris presented “Dad, Mom, Sister, Brother, Dog (Divide, Multiply, Subtract, Bring Down): Is This The Only Way To Divide?”
- Cheryl Brenner, Laura Maly, and Janice Udovich presented “Working Towards Equity: Using Superballs, Food Coloring and Rice.”
- Beth Schefelker presented “Algebra? For Little Kids? You Betcha!”
- Henry Kranendonk presented “Navigating Through Probability Grades 9-12.”
- Pandora Bedford and Sharonda Harris presented “Mathematics and Children’s Literature: The Natural Connection.”
- Angela Ford Patton presented “Using Problem-Solving to Support Basic Skills in Mathematics.”
- Shunda Allen and Rosann Hollinger presented “Problem, Protocol and Practice: Learning From Analyzing Student Work.”
- Daniel Lotesto presented “Integrating BC Calculus Topics Into an AB Course.”
- Mary Mooney and Sue Dean presented “Preparing Students for Placement Tests- College.”
- Pandora Bedford, Bernard Rahming, and Ingrid Henry presented, "Milwaukee Mathematics Partnership (MMP) Protocol for Examining Student Work."
- Approximately 80 Math Teacher Leaders participated in the annual meeting of the Wisconsin Mathematics Council held in Green Lake, Wisconsin. In lieu of their regular meeting, the MTLs had the opportunity to learn from and network with other teachers from throughout the State.

- Four training sessions on May 9, 13, 17, and 20 were held for middle grades teachers and facilitated by members of the Grade 8 Proficiency Pilot Committee. The purpose of the sessions were to train teachers on use of the proficiency assessment materials developed by the committee. These materials (e.g., assessments and reporting forms) are to be used to guide the evaluation of eighth grade students proficiency in moving to high school mathematics.
- On May 24, the Grades 2-7 Assessment Pilot showcased their final projects on grade level CABS improvements that they had worked on during this year.
- The IHE Math Network sponsored a day-long workshop on “Engaging Mathematics: Connecting Your Students to Learning Mathematics.” Judy Paterson from the University of Auckland, New Zealand, facilitated the high school focus session in the morning. Harvey Keynes and Simon Morgan from the University of Minnesota facilitated the middle school focus session in the afternoon. Over 70 participants attended the workshop on Saturday May 20 at UWM. Participants included university faculty from two-year and four-year colleges/universities workshop, and teachers and administrators from the Milwaukee Public Schools as well as from other public and private schools in southeastern Wisconsin.
- The IHE Math Network hosted a colloquium in the UWM Department of Mathematical Sciences on May 22 featuring Dr. Judy Paterson from the Department of Mathematics at the University of Auckland, New Zealand. She spoke on “Using Mathematics to Open Up Windows in Teachers’ Minds: Encouraging Teacher Talk about Learning and Teaching.”