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## LEARNING NETWORK CONFERENCE

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## 2011 Student Achievement

WISCONSIN DEPARTMENT OF PUBLIC INSTRUCTION  
Tony Evers, PhD, State Superintendent

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# Mathematics & Science Partnerships



## 2008

Green Bay Area Public School District  
St. Norbert College  
Mathematics

University of Wisconsin-Milwaukee  
Milwaukee Public Schools  
Science

## 2009

University of Wisconsin-Milwaukee  
Milwaukee Public Schools  
Mathematics

University of Wisconsin -Oshkosh  
Neenah School District  
Mathematics

Sparta Area School District  
University of Wisconsin -Stout  
STEM

## 2010

Beaver Dam School District  
University of Wisconsin -Oshkosh  
Science

Madison Metropolitan School District  
University of Wisconsin -Madison  
Mathematics

New Lisbon School District  
University of Wisconsin -Platteville  
STEM

Marquette University  
West Allis School District  
Mathematics



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# Contents

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Introduction.....	4
Mathematics & Science Partnership Program Locations .....	5
Mathematics & Science Partnership Programs .....	7
2008 Programs.....	7
2009 Programs.....	9
2010 Programs.....	15
Resources .....	19
Vertical Teams.....	20
Additional Pages for Taking Notes.....	21

# Introduction

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With the reauthorization of the Elementary and Secondary Schools Act in January of 2002 (also known as the No Child Left Behind Act, NCLB) introduced the Improving Teacher Quality Grant Programs (Title IIB). These programs encourage scientifically based professional development as a means for improving student academic performance in all 50 states.

Each state's department of education is responsible for administering the program on a competitive basis. The program is a formula grant program, with each state's funding determined by student population and poverty rates. The program is commonly known as the Mathematics and Science Partnership Program (MSP).

Wisconsin's MSP *strives to improve teacher quality* through partnerships between state education agencies, institutions of higher education, local and regional education agencies, and school districts; *And to increase student academic achievement in mathematics and science.* The program supports partnerships between one or more of Wisconsin's high-need Local Educational Agencies (LEA) and at least one institution of higher education department of science, mathematics, and/or engineering.

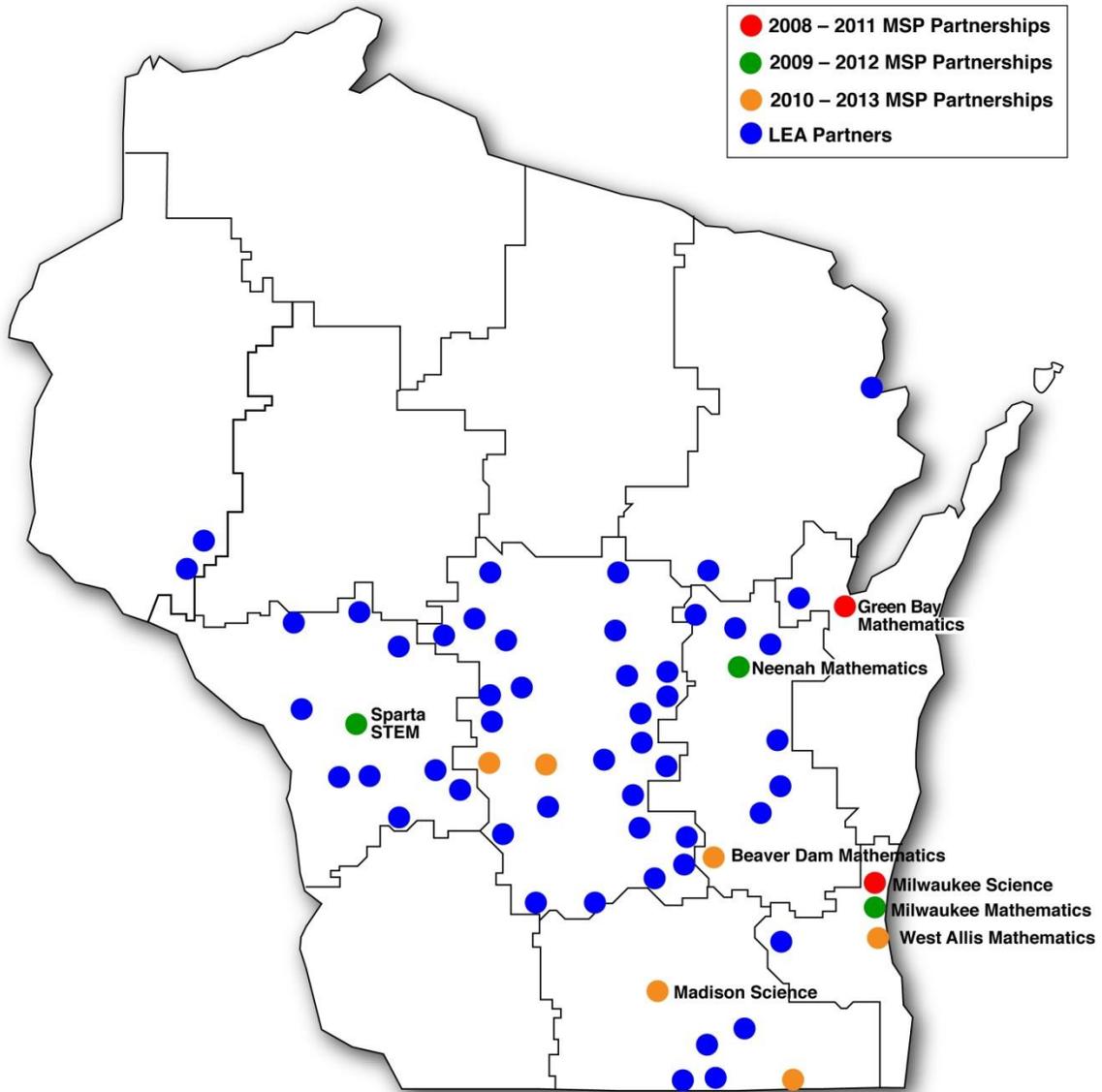
Partnerships between these high-need school districts and the science, technology, engineering, and mathematics (STEM) faculty in institutions of higher education are at the core of each MSP. Each individual partnership focuses on increasing and enhancing the content knowledge and teaching skills of classroom teachers of mathematics and science; are typically for two to three years in duration, and includes face-to-face instruction and a continual electronic dialog among participants.

\*A high need LEA is any district where mathematics or science student proficiency scores do not exceed 65 percent, based on disaggregated Wisconsin Knowledge & Concept Examination (WKCE) scores, and where there is no currently active Title II, Part B grant, in the same content area, and one of the following:

1. At least 10 percent of the student population is from families with income below the poverty line as identified by the Census 2005, or
2. Schools/districts having Rural Education Achievement Program (REAP) or meeting local codes of 6, 7, or 8, or
3. Not achieving Adequate Yearly Progress (AYP) in mathematics based on 2008/09 data.

# MSP Program Locations

## Mathematics and Science Partnership Program





# Mathematics & Science Partnerships

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District

School District of  
Wausaukee

St. Norbert College

## Northeast Wisconsin (NEW) Mathematics Partnership

The Green Bay Area Public School District, the School District of Wausaukee, and St. Norbert College are in the third and final year of their current partnering. Our purpose has been to provide the opportunity for 34 elementary and middle school mathematics teachers to work together with mathematics professors from St. Norbert College to increase their content knowledge and work on best practices in teaching mathematics. During this professional development partnership, participating teachers have taken a series of three graduate level courses, for a total of six credits. During this current school year, teachers have participated in monthly full-day follow-up sessions to concentrate on strengthening comprehension and building proficiency with standards-based instructional practices.

Teachers in the Green Bay Area Public School District, teachers from two Green Bay parochial schools, and teachers from the School District of Wausaukee are continuing to deepen their mathematical content knowledge and increase their repertoire of successful mathematics instructional strategies as well as begin to investigate the Common Core State Standards in Mathematics. The three graduate level courses were developed to meet the needs of the participating teachers. Throughout the project and upon completion, these teachers will share the knowledge learned with their colleagues in their respective schools and work to assure that students benefit through improved academic achievement.

# Mathematics & Science Partnerships

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UW-Milwaukee

## The Better Elementary Science Teaching (BEST) program

The Better Elementary Science Teaching (BEST) program will engage 60 elementary level teachers [K-8, regular, exceptional education, and English as a Second Language (ESL)] from the Milwaukee Public School District (MPS). In partnership with the University of Wisconsin-Milwaukee (UWM) College of Letters and Science (L&S), College of Engineering and Applied Sciences (CEAS) and the School of Education (SOE), MPS teachers will engage in a sustained and rigorous program (nine semester sessions over a three year period) to increase their science content knowledge and improve their ability to teach science effectively. As a result of the building of their own knowledge base of science content and teaching pedagogy, the teachers will then serve in science leadership roles at their schools.

Three goals provide the framework for obtaining the vision of the BEST program:

- increasing the science content knowledge of MPS elementary grade level teachers (K-8) and improve student achievement in science;
- increasing teacher pedagogical content knowledge (PCK) and use of effective standards-based science teaching methodologies, curriculum and assessments (i.e. PCK; standard-based instruction, use of inquiry-based activities, formative and summative assessments, inclusion of the nature of science, use community-based resources for teaching science content, establishing linkages between science and language art instruction, adaptations for exceptional students; and
- improve the quality of science teaching through sustained professional development and the establishment of the program's participants as science instructional leaders at their schools.

# Mathematics & Science Partnerships

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## **Alliance for Teaching Mathematics to Special Education Learners: Strengthening Content Knowledge and Collaboration of General and Special Education Teachers**

The Alliance for Teaching Mathematics to Special Education Learners is a partnership of the Milwaukee Public Schools (MPS) and the University of Wisconsin-Milwaukee (UWM). The Math Alliance, over three years, engages approximately 40 teachers of grades 3 through 9 who work with students with mathematics learning difficulties and disabilities. About half of the participants are special education teachers and the others are general education teachers. The instructional team is comprised of university faculty and school district specialists that bring expertise and experience in mathematics content, mathematics education, and special education.

The goals of the Math Alliance are threefold:

1. To strengthen the mathematics content knowledge of general and special education teachers.
2. To enhance mathematics instructional and assessment practices, focusing on appropriate accommodations and modifications for students with special education needs.
3. To increase collaboration on math instruction between general and special education teachers.

An expected outcome is that general and special education teachers increase and improve their collaborative efforts in meeting the needs of all students in mathematics.

The teachers engage in a sustained and rigorous program to increase their mathematics content knowledge and improve their teaching practices, with emphasis on the needs of special education and struggling learners.

Three program strands are closely integrated and aligned throughout the project:

- mathematics content,
- pedagogical content knowledge, and
- differentiation for students with special needs.

The participants enroll in a total of seven university courses over three years. Nine credits are in mathematics and eight credits are in curriculum and instruction or exceptional education.

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UW-Milwaukee

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## **Alliance for Teaching Mathematics to Special Education Learners: Strengthening Content Knowledge and Collaboration of General and Special Education Teachers - continued**

A selected mathematics strand is a focus for each year of the project:

- number and operations in the first year;
- geometry and measurement in the second year; and
- statistics and probability in the third year.

The education courses focus on the development of mathematical knowledge with differentiation for students with special needs and curriculum planning for differentiation in mathematics.

Participants were recruited in Fall 2009. Project sessions began in January 2010 with participants meeting nearly weekly until August. During the 2010-2011 and 2011-2012 school years, participants meet approximately every other week on Tuesday evenings. In summer 2011, participants take part in a two-week institute. The project is taking an integrated approach in that participants are deepening their mathematics content knowledge while studying ways to meet the needs of students who struggle in mathematics. Project sessions are co-developed and co-facilitated by the instructional team representing mathematics, mathematics education, and special education.

In addition, the project promotes teacher leadership for collaborative practices centered on needs of special education learners. During the first year of the program, the participants begin by examining their own teaching experience with and collaborative practices for special education learners. Then they begin conversations with the school's Mathematics Teacher Leader and another special education teacher in the school to examine student achievement data and begin considering implications for actions. During the second and third years, the participants take on further leadership for mathematics special education in their schools by designing and carrying out grade-level and school-based projects for building school capacity in teaching mathematics to all students.

# Mathematics & Science Partnerships

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Manawa School District

Menasha School District

Neenah School District

New London School District

North Fond du Lac School  
District

Wildrose School District

UW - Oshkosh

## Making Mathematical Connections

Making Mathematical Connections is a partnership between UW Oshkosh and seven northeastern Wisconsin school districts to provide intensive professional development in mathematics content for mathematics teachers in grades 4 through 8, supported by a Mathematics and Science Partnerships Program grant through the U.S. Department of Education.

The goals of this project are to improve student achievement in mathematics through a deepening teachers' mathematics knowledge. Project activities will focus on mathematical thinking, conceptual understanding of fundamental concepts in the curricula, the relationships between these concepts, and multiple representations and strategies for solving problems. The project will prepare teachers to actively engage their students in solving problems with a high level of cognitive demand, press their students for conceptual understanding, and prepare teachers to evaluate and respond to student reasoning and multiple ways of thinking.

### Project Objectives:

- Increase student achievement in mathematics
- Increase teachers' mathematics content knowledge for teaching
- Shift teachers attitudes and beliefs about mathematics and what it means to know and do mathematics
- Change teachers' instructional practices to focus more on mathematical reasoning
- Increase teacher professional development, collaboration and discussion of mathematics and mathematics teaching

### Project Activities:

- Two-week intensive summer workshop on mathematics content
- Professional development seminars during the academic year on lesson implementation and mathematics education research
- Content-Focused Coaching. The mathematics faculty will visit classrooms to work with the participants through mathematics content-focused coaching

Participants will receive 4 graduate credits each year for participation in the program.

### Mathematics Content Focus:

- Number and Algebraic Thinking (Year One)
- Geometry and Measurement (Year Two)
- Probability and Statistics (Year Three)

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# Mathematics & Science Partnerships

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Manawa School District

Menasha School District

Neenah School District

New London School District

North Fond du Lac School  
District

Wildrose School District

UW - Oshkosh

## Making Mathematical Connections - continued

Program Workshop Sessions:

**Problem-Based Inquiry (PBI).** Teachers will deepen their understanding of a specific content topic through problem solving. Each workshop day will begin with working in small groups on rich problems designed to spark and sustain conversation about, and exploration of, a specific piece of the school curriculum. Participants will be engaged in analyzing solutions and methods, exploring representations, communicating, and making mathematical arguments.

**Focus on Children's Thinking.** We will then study children's thinking and misconceptions about the specific content topic, as identified in the research literature. Participants will appraise children's methods and discuss whether they are correct and generalizable. We will view video clips of children thinking aloud as they solve problems in order to better understand the ways children reason mathematically. We will also discuss how to respond to common student questions (as established in the research literature) related to the content, and address how to assess student written work (constructed response) in mathematics.

**Connections to the Curriculum.** We will also study how the specific content topic is treated in the various curricula used by the partner districts. We will analyze activities and discuss the underlying concepts and the purpose and motivation for their approach. Participants will present ideas for how to teach the content in the classroom.

**Academic Year Workshops.** Participants will look at an upcoming unit from the curriculum, work collaboratively in teams to identify the key content and concepts underlying the unit, and develop strategies and lessons to implement in the classroom that will have a high level of cognitive demand for student understanding. Participants will be charged with implementing these lessons in their classroom. The next one-day workshop will then begin with sessions where teachers reflect and discuss the mathematical issues arising from the previous lesson implementation.

**Content-Focused Coaching.** Once each year, one of the program leaders will visit teachers' classes for some content-focused coaching. Teachers will identify the goals and strategies of the lesson and some specific focal points of attention for the teacher and coach. The goal of this coaching component of the program is not to evaluate teachers but to help them enrich and refine the mathematical depth and accuracy of their lessons, and increase the level of cognitive demand and press for student understanding in the classroom.

# Mathematics & Science Partnerships

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Melrose-Mindoro School  
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Norwalk-Ontario-Wilton  
School District

Royall School District

Sparta Area School District

UW-Stout

Western Technical College

CESA #4

7 Rivers Alliance

Center for Occupational  
Research and Development  
(CORD)

Fort McCoy

Juneau County Economic  
Development Corporation

Greater Mauston Area  
Development Corporation

## SySTEMically Improving Student Academic Achievement in Mathematics and Science

This project will improve student academic achievement in mathematics and science by improving teachers' content knowledge and pedagogy in mathematics and science. Sixty teachers from nine school districts are working in ten grade band teams (PK-2; 3-5; 6-8; 9-12) to develop STEM Integrated Curriculum Projects.

Six project goals provide the framework for project activities and evaluation measures:

1. Provide teachers with professional development in mathematics and science content.
2. Increase student academic achievement in mathematics and science as measured by WKCE and benchmark assessments.
3. Provide teachers with professional development in evidence-based practices including contextual teaching and learning, differentiated instruction, balanced assessment, and technology integration.
4. Develop integrated curriculum projects for STEM-related Career Clusters using the STEM Transitions model.
5. Align STEM integrated curriculum projects with Wisconsin Model Academic Standards in mathematics and science.
6. Build strong, collaborative relationships among K-12, higher education, and business partners.

In summer 2010, the 60 teachers participated in their first two-week STEM Summer Academy. Higher education faculty from UW-Stout and Western Technical College led the hands-on, field-based activities designed to show the integration and application of mathematics and science in a real-world context. Mathematics topics covered were statistics and probability; science topics covered were Population and Ecosystems and Interdependence. Career Cluster focus was Agriculture, Food, and Natural Resources. Business partners providing these field-based activities were Fort McCoy, Organic Valley, and Burr Oak Winery.

Field-based experiences were followed up with lecture/discussions, large and small group activities, laboratory investigations and journaling. Teachers completed both mathematics and science pre-post tests to assess teacher gain in content as well as pre-post tests to assess teacher gain in pedagogy. Interwoven throughout all of the professional development was the integration of technology into instruction.

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# Mathematics & Science Partnerships

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LaFarge School District

Mauston School District

Melrose-Mindoro School  
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Norwalk-Ontario-Wilton  
School District

Royall School District

Sparta Area School District

UW-Stout

Western Technical College

CESA #4

7 Rivers Alliance

Center for Occupational  
Research and Development  
(CORD)

Fort McCoy

Juneau County Economic  
Development Corporation

Greater Mauston Area  
Development Corporation

## SySTEMically Improving Student Academic Achievement in Mathematics and Science - continued

Data analysis revealed that of the 60 teacher participants, 83% demonstrated significant gains in mathematics content knowledge and 62% demonstrated significant gains in science content knowledge. Disaggregated math data revealed significant differences in both data analysis and probability at the .05 level; combined effect size for mathematics was 1.06 indicating large effect. Additionally, significant differences in three of the four mathematical “types of knowledge” categories were identified at the .05 level. Disaggregated science data revealed significant differences at grade levels; effect sizes were .81 (elementary) and 1.0 (middle/high school).

First-year project successes include the following:

- IHE faculty expertise and caring attitudes;
- on-site field experiences;
- STEM web portal;
- technology integration;
- project leadership team; and
- comprehensive evaluation design.

The 2011 STEM Summer Academy will focus on the mathematics topics of geometry and measurement and the science topics of force and motion. Career Cluster focus will be Manufacturing and Transportation, Logistics, and Distribution.

# Mathematics & Science Partnerships

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## Immersion into Inquiry: i3

Immersion into Inquiry (i3) is a partnership between the Beaver Dam Unified School District (BDUSD), University of Wisconsin-Oshkosh, Marian University, and the Wisconsin Center for Education Research to provide systemic and systematic professional development to teachers of science in grades 3 through 12.

The Goal of i3 is to improve student achievement in science by deepening teachers' knowledge, skills and understandings through four core components. The focus of i3 is to reform the BDUSD science program through professional development that can be replicated, expanded, and sustained. The project will target 2,554 students and 45 teachers of science in grades 3-12.

The Core Components of i3 include widespread implementation of:

- Understanding by Design;
- teaching science as inquiry (Wisconsin Science Standard C);
- using science notebooks; and
- Implementing Lesson Study and Learning Walks.

The four components will be foundational pieces as participants learn to continuously embed them into the content and performance standards of science.

Project Objectives:

- Increase student achievement in science
- Increase teachers' science knowledge, skills and understandings
- Changing teachers' and students' attitudes and beliefs surrounding science
- Increase teacher professional development, collaboration and discussion of science and science teaching.

Project Activities:

- Summer Science Institute
- Professional Development seminars during the academic school year
- Content focused lesson studies and learning walks

Science Content:

- Life Science (year one – Wisconsin Science Standard F)
- Earth Science (year two – Wisconsin Science Standard E)
- Physical Science (year three – Wisconsin Science Standard D)

# Mathematics & Science Partnerships

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## Improving Understanding of Science for Students and Educators

The project brings together a broad partnership created to provide powerful professional development in science to middle level teachers. Two cohorts of 20 teachers each will participate in six content-based modules over the course of three years. One of the cohorts will be in the Madison Metropolitan School District, while the other will be located within CESA 2 and the participating districts. Strong support, in the form of coordination, cognitive coaching, and content knowledge will come from the UW-Madison Wisconsin Leads in Middle School Math and Science Initiative.

The professional development is using the “Making Sense of Science” program developed by WestEd. The six modules are based on the premise that, to develop pedagogical content knowledge, teachers must have opportunities to learn science content in combination with student thinking and instructional strategies for helping students learn that content. There are strong connections to literacy strategies embedded within each course. The courses also provide connections to UW scientists to support teacher understanding and eliminate misconceptions. Critical components of all courses are development and strengthening of ESL strategies and connections to culturally relevant practices.

Topics of the three year program include: Plate Tectonics, Weather and Climate, Force and Motion, Heredity, Selection and Adaptation, Matter and Chemical Change, and Energy. During the course of the school year, the cohorts will gather to more deeply look at student work and how assessments can be improved to more clearly get at student understanding. Cohort members will also be supported through cognitive coaching visits to their classrooms.

The final component seeks to deepen the understanding of building level leadership. As teachers are asked to change and try new practices, it is important that principals both understand and support the changes that are happening. Principals will be involved in an annual day-long professional development experience to support them.

Participants will earn UW credit as they deepen their understanding of science content, connections to literacy, cultural relevance and ESL strategies.

# Mathematics & Science Partnerships

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Lodi School District

Montello School District

Necedah Area School District

New Lisbon School District

Nekoosa Area School District

Pardeeville Area School District

Pittsville School District

Port Edwards School District

Princeton Public Schools

Randolph School District

Reedsburg School District

Rio Community School District

Rosholt School District

Tri-County Area School District

Wild Rose School District

UW-Platteville

Wautoma Area School District

Westfield School District

Wisconsin Dells School District

Wisconsin Rapids School  
District

## STEM Connects: Enhancing Teacher Quality and Student Proficiency

STEM Connects is a partnership between UW-Platteville and 23 CESA 5 school districts to improve student achievement in mathematics and science by improving the content knowledge and pedagogy of teachers in grades 3-10.

The goals of the project are to:

- Provide 30 teachers with professional development in evidence based practices.
- Increase student's achievement in mathematics and science as measured by WKCE data and benchmark assessments
- Develop one STEM integrated curriculum unit each year focused on a career cluster aligned to the standards
- Build strong collaborative relationships among K-12 teachers, higher education faculty and career cluster business partners to foster sustainability.

Project Objectives:

- Build skills that teachers in small rural districts need to address the disproportionate performance of students with disabilities and those from low-income families
- Help prepare all students with 21st Century Skills

Project Activities:

Year 1

- Action Research
- Develop career cluster
- STEM Summit, a collaboration between teachers and students on Action Research findings

Year 2

- STEM Connects Summer Academy
- Professional Development Networking Sessions
- Classroom observations and follow-up sessions
- Study Groups
- Online Learning
- Peer Coaching
- Technology Integration Coaching

Participants will receive six graduate credits if they are involved in both summer institutes and subsequent networking sessions.

# Mathematics & Science Partnerships

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West Allis  
Est. 2010

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West Allis-West Milwaukee  
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## Raising Achievement in Mathematics through Fostering Algebraic Thinking (RAM t-FAT)

The West Allis-West Milwaukee School District and Marquette University are partnering to provide an opportunity for approximately 30 teachers of grades 6 – 10 to grow collaboratively as they engage in professional development activities.

The foundation for the Raising Achievement in Mathematics through Fostering Algebraic Thinking program is based on three assumptions:

1. Good mathematics teaching is more about seeing and interpreting than it is about doing.
2. Many teachers find it challenging and problematic to facilitate problem-solving in their classrooms.
3. An important aspect of teacher learning is collaboration and participation in joint work.

Central to this project are efforts to create and maintain a teacher learning community characterized by trust and respect, as well as by norms for critical dialogue about mathematics teaching and learning. During the two year program the teachers participate in two week-long summer institutes and evening follow up professional development workshops. The expected outcomes of the program relate to an increase in teachers' mathematics content knowledge for teaching, changes in classroom practices as evidenced by emphasis on problem-based collaboration among the students, and a focus on students' mathematical thinking and reasoning. The project also fosters teachers' on-going professional collaboration.

Teachers engage in four major types of activities:

- solving mathematical problems;
- examining students' thinking;
- reading and discussing current literature; and
- reflecting on one's own teaching.

The teachers work collaboratively with their colleagues throughout the institute as they address a wide selection of algebra problems, analysis of students' thinking and reflect on their practice.

# MSP Resources

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## U.S. Department of Education/MSP Program:

The website of the U.S. Department of Education offers background and legislative information on the MSP Program: <http://www.ed.gov/programs/mathsci/index.html>.

## Teacher Education Materials Project (TE-MAT):

The TE-MAT site offers a database of resources to support mathematics and science professional development providers as they design and implement programs for in-service teachers: <http://www.te-mat.org>

## National Staff Development Council (NSDC):

The website of the NSDC offers information and resources for professional development providers: <http://www.nsd.org>

## Horizon Research, Incorporated (HRI):

The website of HRI offers a wealth of information related to research and evaluation of mathematics and science initiatives. Some of its tools may be helpful in conducting a professional learning needs assessment: <http://www.horizon-research.com/instruments>

## Learning Mathematics for Teaching (LMT) Project:

The LMT Project website offers information on the assessment instruments required by all funded mathematics MSP projects: <http://sitemaker.umich.edu/lmt/home>

## Project MOSART:

Project MOSART's website offers thorough information, including a tutorial, on the required assessment instruments:

[http://www.cfa.harvard.edu/smgphp/mosart/about\\_mosart.html](http://www.cfa.harvard.edu/smgphp/mosart/about_mosart.html)

# Vertical Teams

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## **What is a Vertical Team?**

Most commonly a vertical team consists of middle school and high school educators who teach in the same academic area. It may also include elementary teachers, school counselors, administrators, department chairs, or curriculum specialists. Through communication and cooperation, teams design curricular change and create support structures necessary to make high achievement by all students a reality.

## **Purpose of a Vertical Team**

In vertical teams, teachers from different grade levels work together to develop a continuum of knowledge and skills that build from one grade level to the next. Team communication leads to a greater understanding of what is taught each year, which helps teachers organize strategies, plan introduction of concepts, and reduce repetition of content. As a result, student achievement and success is enhanced.

## **Goals of a Vertical Team**

- To increase achievement of all students to close the achievement gap
- To bring about coordination and communication between grade levels
- To foster greater inclusion and to build enrollment in advanced coursework
- To introduce skills, concepts, and assessment methods to prepare students for success in advanced coursework
- To encourage innovation
- To stimulate enthusiasm for advanced coursework in the school, family and community

## **Benefits for Students**

A successful vertical team will:

- Prepare students for the next level of challenge by developing skills and strategies necessary for success in advanced coursework
- Promote greater inclusion and progress towards closing the achievement gap
- Improve student achievement

## **Equity and Access**

The concept of vertical teams is based on a philosophy of inclusion; on the notion that all students benefit from experiencing a rich and rigorous curriculum. Research shows that students of color and socio-economically disadvantaged students tend to be under-represented in advanced coursework. The goal of vertical teams is to prepare all students for success in rigorous courses at the secondary level, not only certain groups. This results in an organizational pipeline that promotes equity and access for all.





