

# WMC Mathematics

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Presented by:

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# Who Are We?

- MSP District Membership
  - Amery, Clayton, Clear Lake, Shell Lake, Plum City, St. Croix Falls, Turtle Lake, Siren

# MSP TEAM GRANT PARTNERSHIPS

- 1. UW – Eau Claire Mathematics Dept./College of Math Education
- 2. School District of Clayton, Clayton, WI

# Our beginnings.....

- When, Where, How, Why.....

2008-2010 MSP Mathematics Grant (65 Regular & Special Education Specialists from 13 districts)

2010-2013 WEITQ Mathematics Coaching Grant (30 Mathematics Teachers from 13 districts)

**2014-2017 MSP Mathematics TEAM Grant (46 Regular & Special Education Specialists from 8 districts)**

# Our Needs.....

- The Science, Mathematics & Technology Consortium (SciMaTech) within CESA #11 developed and conducted a regional needs project. This tool helped to identify what districts were specifically developing mathematics and PLC work and what these districts would commit to within a regional cohort.
- We originally wrote this grant to support 15 districts and 65 teachers of mathematics. Common to many grant projects our cohort is supporting 46 teachers within 8 districts. Common to many grants, the original numbers fell immediately when district finally commit to the project's pre-post testing needs, summer academy structure (2 weeks), yearlong PLC development and meeting structures, etc.
- Our grant serves 8 districts within northwestern Wisconsin that are working on Vertical team issues including special education staff, K-10. These districts identified the need for a PLC approach to the teaming issues within their individual districts

# TEAM Project Goals

- **Goal 1:** Strengthen the mathematics content knowledge of regular and special education teachers, grades 1-9.
- **Goal 2:** Enhance mathematics pedagogical content and assessment practice to provide support for ALL students
- **Goal 3:** Establish a relationship between and among participants and partners to sustain teachers' on-going professional collaboration, leading to instructional change and teachers' growth.
- **Goal 4:** Improve student achievement in mathematics, grades 1-9.

# How are we creating community, student thinking and formative assessment?

- Discuss with your team and respond to student #5's thinking.
  - Think about:
    - What does this student seem to understand mathematically?
    - What questions would you like to ask this student?

## **Student 5**

What's  $42 \div 7$ ? Well, 40 divided by 10 is 4, and 3 times 4 is 12, and 12 and 2 is 14, and 14 divided by 7 is 2, and 2 plus 4 is 6, so it's 6.

# What Math and pedagogical math content support our project?

- Jennifer Harrison, Ph.D., UW-Eau Claire Math Dept.



# Applicable Goals

- **Goal 1:** Strengthen the mathematics content knowledge of regular and special education teachers, grades 1-9.
- **Goal 2:** Enhance mathematics pedagogical content and assessment practice to provide support for ALL students

# Mathematics Content Focus

- Year 1 – Number & Operations
- Year 2 – Geometry & Measurement
- Year 3 – Probability & Statistics

# Year 1 – Number & Operations

- Focus on engagement with content through engaging activities and investigations of student thinking
- Resources
  - Sowder textbook
    - Sowder, J. (2009). *Reconceptualizing Mathematics*
  - Cognition-Based Assessment
    - Battista, M. T. (2012). *Cognition-Based Assessment & Teaching of Fractions*
    - Battista, M. T. (2012). *Cognition-Based Assessment & Teaching of Multiplication & Division*
    - Battista, M. T. (2012). *Cognition-Based Assessment & Teaching of Addition & Subtraction*

# Year 1 - Number and Operation

Consider the work of nine second-graders as displayed on the following slide, all of whom were asked to solve  $364 - 79$  in written form without calculators or base-ten blocks.

- a) Which students clearly understand what they are doing, which ones might understand, and which do not understand?
- b) Describe the steps the students followed to complete their work.

1.

$$\begin{array}{r}
 364 \\
 - 79 \\
 \hline
 -5 \\
 -10 \\
 \hline
 300 \\
 \hline
 285
 \end{array}$$

2.

$$\begin{array}{r}
 \overset{2}{\cancel{3}}\overset{1}{\cancel{6}}4 \\
 - 79 \\
 \hline
 235
 \end{array}$$

3.

$$\begin{array}{r}
 \overset{2}{\cancel{3}}\overset{15}{6}4 \\
 - 79 \\
 \hline
 285
 \end{array}$$

4.

$$\begin{array}{r}
 \overset{1}{\cancel{3}}\overset{6}{6}4 \\
 - \overset{8}{7}9 \\
 \hline
 285
 \end{array}$$

5.

$$\begin{array}{r}
 \overset{1}{\cancel{3}}\overset{6}{6}4 \\
 - 79 \\
 \hline
 395
 \end{array}$$

6.

FIRST I TAKE THE 70 FROM 360  
 AND THATS 290 THEN I PUT THE 4  
 BACK AND ITS 294 THEN I TAKE 9  
 AWAY 4 FIRST TO 290 THEN 5  
 SO ITS 285.

7.

WELL I KNOW its the same as  $365 - 80$   
 AND THATS the same as  $385 - 100$   
 SO 285

8.

$$\begin{array}{r}
 364 \\
 - 79 \\
 \hline
 \cancel{300} \\
 \cancel{290} \\
 285
 \end{array}$$

9.

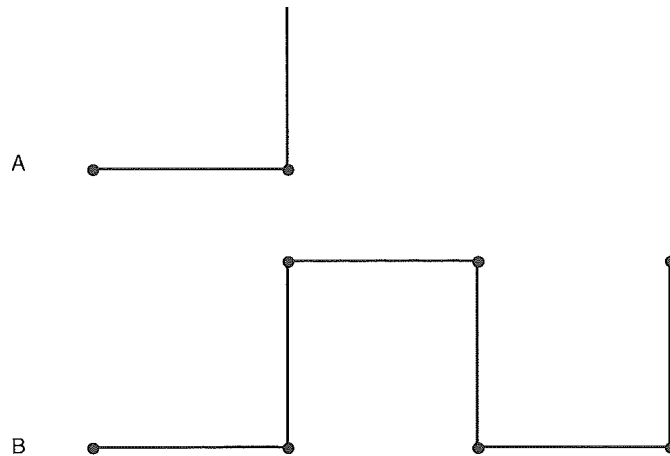
$$\begin{array}{r}
 364 \\
 - 79 \\
 \hline
 300 \\
 - 10 \\
 \hline
 290 \\
 - 5 \\
 \hline
 285
 \end{array}$$

# Year 2 – Geometry & Measurement

- Attempts to try to make content more accessible and useful for participants
- Repeated focus on engaging activities and investigations of student thinking
- Resources
  - Problem of the Month – [insidemathematics.org](http://insidemathematics.org)
  - Cognition-Based Assessment
    - Battista, M. T. (2012). *Cognition-Based Assessment & Teaching of Geometric Shapes*
    - Battista, M. T. (2012). *Cognition-Based Assessment & Teaching of Geometric Measurement*
  - Beckmann textbook
    - Beckmann, S. (2014). *Mathematics for Elementary Teachers with Activities*

# Student thinking example

- Which wire is longer, or are they the same length? All segments between dots are the same length. Describe how you found your answer.



**answer:**

# Student thinking example

- Student explains how to straighten the wires piece-by-piece as shown. Because his "straightened" top wire extends farther than his straightened bottom wire, he concludes that the top wire is longer.

...th will equal the top path.”

...: Student counts 1 through 20 as he traces Wire A and 1–14 as Wire B. Says that A is longer.

...1: Student counts 7 dots on each wire and says the wires are the same length. ...: Student counts the number of squares that occur along the wire.





# Year 3 – Probability & Statistics

- Focus on engagement with content through engaging activities and investigations of student thinking
- Resources
  - Guidelines for Assessment and Instruction in Statistics Education (GAISE)
  - STEW (Statistics Education Web):  
<http://www.amstat.org/ASA/Education/STEW/home.aspx>

# Probability Misconceptions?

- Ethan and Gabriella each receive a box containing two white marbles and two black marbles. Ethan extracts a marble from his box and finds out that it is a white one. Without replacing the first marble, he extracts a second marble. Which is more likely?
  - A. Ethan extracts a white marble.
  - B. Ethan extracts a black marble.
  - C. Both have the same chance.

# Probability Misconceptions

- Ethan and Gabriella each receive a box containing two white marbles and two black marbles. Gabriella extracts a marble from her box and puts it aside without looking at it. She then extracts a second marble and sees that it is white. Which is more likely?
  - A. The first marble Gabriella extracted was white.
  - B. The first marble Gabriella extracted was black.
  - C. The first marble is equally likely to be white or black.

# Successes & Challenges

- Difficulties finding ways to make content accessible to all participants ...
  - Willingness to be flexible and make changes based on participant feedback
- Participants demonstrated much more growth in content & pedagogical content knowledge in Year 2

# What do our PLCs' do?

- Terri Magnuson, Clayton Mathematics Teacher/Project LEA Leadership team

# How has our project supported classroom practice?

- Support from the cohort teachers across our project.

Amery, Clayton, Shell Lake and Siren

\*\*Teams share their experiences with success in their PLC and vertical team structures, student achievement and instructional quality and ongoing needs.

# What evaluations support our project?

John Gugerty, MS, External Evaluator, University of Wisconsin-Madison  
Wisconsin Center for Education Research (WCER)

- \*Why evaluate?
- \*What did we do?
- \*What did we find?

# What is evaluation?

Evaluation is the systematic collection and analysis of data to measure:

- the extent to which an event, process, project, or program was implemented,
- the conditions of its implementation, and
- its impact.



# Why evaluate?

1. What gets measured gets done.
2. If you don't measure *results*, you can't tell success from failure.
3. If you can't document success, you can't reward it.
4. *If you can't reward success, you may be rewarding failure.*
5. If you can't document success, you can't learn from it.
6. If you can't recognize failure, you can't correct it.
7. Evaluation enables you to:
  - a) Determine whether or not you are using your money and other resources effectively.
  - b) Determine whether or not parts of program work better than others, and revise as needed.
  - c) Find out if fewer activities get the same results.
  - d) Find out how participants compare with non-participants.
  - e) Win public support if you demonstrate success.

# \*Types of evaluation

\***Formative:** Is the effort being implemented—

- as designed
- with the planned level of intensity
- for the intended duration
- following the intended schedule
- following the intended approaches
- involving appropriate participants

\***Summative:** What difference did this effort make for—

- Participating teachers
- The local educational organization
- Students

- \* When the **COOK** tastes the soup, it is *formative evaluation*.
- \* When the **GUESTS** taste the soup, it is *summative evaluation*.

# \*What did we look at?

- \*Participants' reactions
- \*Participants' learning
- \*Local administrators' /schools' support for change
- \*Participants' use of new knowledge/skills
- \*Outcomes

# \* Participant reactions: End-of-the-Day Exit Slips

TEAM Project End-of-the-Day Exit Slip      Date \_\_\_\_\_

\* What was your greatest “ah-ha” for the day?

\* I found the following to be extremely helpful:

\* I have questions regarding:

\* Comments:

\* Name (optional):

**\* Participant Reactions, administrative support, & use of new knowledge/skills  
[Overall workshop evaluation for 07/10–14 & 07/17-20/2017]**

**Please respond to each of the following 17 statements or questions. Consider both week one and week two.**

- |    |  |           |          |          |           |
|----|--|-----------|----------|----------|-----------|
| 1  | This workshop achieved the stated goals and objectives.  | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 2  | The instructional methods allowed participants to be actively engaged.   | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 3  | Presenters responded effectively to participants' comments and questions.  | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 4  | Workshop content was relevant to my professional development   | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 5  | The workshop content was research-based.   | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 6  | Workshop materials were helpful and easy to use.   | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 7  | This workshop provided information and techniques that will be useful in my practice.  | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 8  | Strategies presented will have a positive impact on student learning.  | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 9  | I will implement and/or share what I learned during this workshop.   | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 10 | I am satisfied with the overall quality of the workshop.   | <b>SA</b> | <b>A</b> | <b>D</b> | <b>SD</b> |
| 11 | For me, the most effective part of this workshop was: _____  |           |          |          |           |
| 12 | If I could change one thing, it would be: _____  |           |          |          |           |
| 13 | <i>During the coming school year I will use what I learned during this workshop in the following ways: _____</i>   |           |          |          |           |
| 14 | <i>My next steps to implement the approaches that I described in #13 above will be to: _____</i>   |           |          |          |           |
| 15 | <i>Additional comments about this workshop: _____</i>  |           |          |          |           |
| 16 | IN ORDER TO CONTINUE KEY ELEMENTS OF THIS PROJECT after its conclusion August 31, 2017, I will: _____  |           |          |          |           |
| 17 | <i>Please rate the level of administrative and organizational support you currently receive in your efforts to change the way your school and district teach mathematics courses</i> |           |          |          |           |
|    | HIGH LEVEL of support to initiate and sustain changes  | Comments  | _____    |          |           |
|    | SUFFICIENT support to initiate and sustain changes   | Comments  | _____    |          |           |
|    | INSUFFICIENT support to initiate and sustain changes   | Comments  | _____    |          |           |

\* **Administrative support and use of new knowledge/skills:**  
*Middle-school Mathematics and the Institutional Setting of Teaching (MIST).*

- \* Each year, participants completed the Vanderbilt Middle-school Mathematics and the Institutional Setting of Teaching (MIST) Teacher Survey.
  - The MIST Teacher Survey focuses on the teacher's teaching responsibilities, teacher collaboration/PLC work, teacher's views on high-quality instruction in mathematics, and organizational support.
    - Estimated time to complete: 45 minutes
    - Content: 70 multi-part questions
  - MIST data helps inform the participants' SMART Goal identification and implementation, as well as specific professional development/support strategies.

For details on MIST, go to

[http://peabody.vanderbilt.edu/departments/tl/teaching\\_and\\_learning\\_research/mist/mist\\_instruments.php](http://peabody.vanderbilt.edu/departments/tl/teaching_and_learning_research/mist/mist_instruments.php)

# \*Participant learning

- \*The federal MSP Program **requires** projects to report on:
  - Changes in teacher content knowledge based on pre-and post-testing; and
  - Proficiency levels on state-level assessments of students of teachers who received professional development.



## \* Participant learning: Diagnostic Teacher Assessments in Mathematics & Science (DTAMS) assessment

- \* 2015-16 project year: The DTAMS *Geometry & Measurement* instrument was administered to both TEAM participants and comparison group members.

DTAMS is a nationally validated instrument that measures both content and pedagogical knowledge

- factual knowledge
- conceptual understanding
- reasoning and problem solving
- pedagogical content knowledge.
- Each assessment is composed of 20 items—10 multiple-choice and 10 open-response. Six versions of each assessment are available in paper-and-pencil format.
- For details, go to <http://louisville.edu/education/centers/crmstd/diag-math-assess-middle>

- \* TEAM participants' performance on the DTAMS Geometry assessment:  
Twenty-nine of thirty-six participants who completed both pre- and post-tests attained statistically significant gains

## \* **Student Outcomes: Statewide Test Results**

- \* The statewide student assessment for the 2014-15 school year, the *Badger Exam*, was replaced for the 2015-16 school year by the *Forward Exam*, which in turn will be replaced by an *entirely different statewide exam* scheduled for deployment in the spring of 2017. **None of these exams are comparable with one another.**

# \* Student Outcomes: Locally Developed Measures

## \* Each school district' participating team develops SMART goals:

- Specific
- Measurable
- Attainable
- Realistic
- Time-bound

## \* One Approach: Problem of the Month (POM)

- *Goal:* All students have the experience of attacking and solving non-routine problems and developing their mathematical reasoning skills.
- Problem is divided into five levels (Level A through Level E) to allow access and scaffolding for the students into different aspects of the problem and to stretch students to go deeper into mathematical complexity.
- *Example 1:* “Design and implement Problem of the Month (POM) structure in grades K-8 four times during the 2016-2017 school year to focus on problem solving and perseverance to increase student perception of themselves as mathematicians.”
- *Example 2:* “To improve problem solving skills, we will use a Problem of the Month (POM), and incorporate the eight mathematical practices.”



# Sustainability.....

- Where do we go from here?

- Issues identified by teams for Sustainability

1. How can we support those individuals within and new to our local teams going forward?
2. What action is needed to ensure “high quality” opportunities for all students?
3. What challenges do we face with state assessments and our local standards?
4. How do we access needed resources to continue this work?

**These issues will be discussed and planned for both regionally and locally throughout our Summer Institutes to include each grant team and administrators.**

Questions, thoughts, sharing.....