Today’s Agenda

- Welcome & Project Overview
- Get to Know Each Other
- Community of Learner Norms
- The Rise of Interest In Early Math
- Lunch (11:30 a.m. – 12:30 p.m.)
- UWM Tasks
- Mathematical Curiosityz
Official Grant Title:

Starting Students Strong in Mathematics: Strengthening Teacher Mathematical Knowledge and Instruction in Grades K–3
Instructional Team

Dr. DeAnn Huinker, UWM
Dr. Gabriella Pinter, UWM
Melissa Hedges, UWM
Michelle Douglas-Meyer, MPS
Nicole Hawkins, UWM

Support & Evaluation Team

MPS: Steve Akin, Kristi Gettelman
UWM: Peggy Kuhnz, Pam Buhr, and Aubrey Ellickson

Meghan Steinmeyer, UWM
Dr. Carl Hanssen, Michigan
Project Goals

Goal 1. Deepen knowledge of mathematical concepts, connections, and progressions for teaching the Wisconsin Standards for Mathematics.

Goal 2. Strengthen use of high-leverage mathematics teaching practices and research on children's learning of mathematics in classroom instruction.

Goal 3. Build a strong mathematical foundation by developing understanding and fluency among young learners along mathematics learning trajectories.
Project Overview

Year 1, Early Number, Operations, & Algebraic Reasoning
Summer Institute: June 20–July 1, 2016; Mon-Fri, 8 am – 4 pm
School Year 2016–2017; Ten Sessions, Thursdays, 4:30–7:30 pm

Year 2, Number and Operations in Base Ten
Summer Institute: June 19–30, 2017; Mon-Fri, 8 am – 4 pm
School Year 2016–2017; Ten Sessions, Thursdays, 4:30–7:30 pm

Year 3, Measurement, Geometry, and Fraction Concepts
Summer Institute Only: June 18–29, 2018; Mon-Fri, 8 am – 4 pm
<table>
<thead>
<tr>
<th>Brown Street Academy</th>
<th>Eighty-First</th>
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<tr>
<td>Engleburg</td>
<td>Grantosa</td>
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<td>Milwaukee Sign Language</td>
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AND NOW A WORD FROM OUR SPONSOR
Grant # WI151201

Starting Students Strong in Mathematics: Strengthening Teacher Mathematical Knowledge and Instruction in Grades K-3

Principal Investigators/Project Directors:

   Dr. DeAnn Huinker, Dr. Gabriella Pinter, and Mr. Steve Akin

Note: We are funded for all three years!!!!
Materials for Working with Students
Growing our Professional Knowledge for Teaching Mathematics

- **Children’s Mathematics**
  - Cognitively Guided Instruction
  - Authors: Thomas P. Carpenter, Elizabeth Fennema, Megan Loef Franke, Linda Levi, Susan Empson

- **Principles to Actions**
  - Ensuring Mathematical Success for All
  - Book

- **Progressions**
  - For the Common Core State Standards in Mathematics

- **Fluency through Flexibility**
  - How to Build Number Sense
  - Numbers 0-20

- **Common Core State Standards for Mathematics**

- **Memberships**
  - Wisconsin Mathematics Council, Inc.
  - National Council of Teachers of Mathematics
  - MPS UWM
UWM Graduate Certificate
Advanced Study of Teaching and Learning: Mathematics

$22,000
Mathematics Focus
Summer 2016
Early Number, Operations, and Algebraic Reasoning
MPS District Priority: Algebra Readiness

“Growing Algebraic Thinking and Understanding through the Grades”

Equality and Equivalence

Composing and Decomposing

Numeric Flexibility

Representational Fluency

Contextualizing and Decontextualizing
This and That

THIS

:)
Summer 2016 Session Dates

Class Sessions
Monday-Friday June 20-24
Monday-Friday June 27-July 1
8:00 am – 4:00 pm
Lunch break, approximately 11:30-12:30

Final Projects and Reflections
Friday Due July 8
Professional Norms for Our Work

Start on Time → End on Time

Silence cell phones. No texting or Wi-Fi.

No sidebar conversations . . .

Name Tags

Attention signal Raise hand!!

Breaks

Food

Restrooms
Fun Facts and Tidbits!

5-4-3-2-1

• You will be provided a topic and will have 1 minute to discuss the topic. When time is up, the outside circle will move 5 people to the left. Introduce yourself to your new partner and get ready for a new topic!

• After 1 minute, the inside circle will move 4 people to the left.
  – Get ready for a new question!

• After 1 minute, the outside circle will move 3 people to the left.

• After 1 minute, the inside circle will move 2 people to the left.

• After 1 minute, the outside circle will move 1 people to the left.
Sharing Out

Listen to the facilitator who will identify which topic you will be discussing with your new partner.

– A Family Highlight...
– A Travel Adventure...
– A Moment of Pride...
– A Sporting Adventure...
– A Pet/Animal Encounter...
– A Brush With Greatness...
Community of Learner Norms

Turn and Talk...What are some norms you need as you engage in professional learning?

• Actively listen
• Attend to the task at hand
• Be supportive of others’ ideas
• Carefully consider your contributions and the contributions of others to discussions
• Come prepared for class
WHAT DOES IT MEAN TO BE SUCCESSFUL IN MATHEMATICS?
Learning Intention and Success Criteria

We are learning to understand the 5 strands of mathematics proficiency as defined by the National Research Council in Adding It Up.

We will be successful when we can articulate a definition of mathematical proficiency make connections to a mathematics task.
In your notebooks respond in writing to the following:

What does it mean to be successful in mathematics?
National Research Council’s Strands of Proficiency Adding It Up, 2001
National Research Council’s Strands of Proficiency
Adding It Up, 2001

**Conceptual Understanding (Understanding)** - comprehension of mathematical concepts, operations, and relations.

**Procedural Fluency (Computing)** - skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.

**Strategic Fluency (Applying)** - ability to formulate, represent, and solve mathematical problems.

**Adaptive Reasoning (Reasoning)** - using logic to explain and justify a solution to a problem, or to extend from something known to something not yet known.

**Productive Disposition (Engaging)** – seeing mathematics as sensible, useful, and worthwhile, and being willing to do the work.
Digging into the 5 Strands

Each group will study one strand.
• Individually, read your assigned strand.

As a group, discuss the reading and come to consensus about key ideas that help to clarify the meaning of the strand.
• Using half of the poster, record the name of the strand and the key ideas you determined.
• One person should be ready to share out.
Caterpillars and Leaves

A third grade class needs 5 leaves each day to feed its 2 caterpillars. How many leaves would the students need each day for 12 caterpillars?

Solve the problem any way you wish! You need to be able to explain how you got your answer and why it works. If time allows, solve it in 2 ways.
Making Connections to the Five Strands

• As a table group, consider the process your group went through when solving the Caterpillar and Leaves problem.

• Use the bottom of the chart paper to identify specific connections between your solution process and the component you studied.

• Be prepared to share out the connections you made with the other groups in your strand study.
Debriefing the Activity

Turn and talk...

How did the Caterpillars and Leaves problem help to deepen our understanding of mathematical proficiency?
Addressing all the strands of proficiency makes knowledge stronger, more durable, more adaptable, more useful, and more relevant.

Just as a symphony cannot be heard by listening to each instrument’s part in succession, mathematical proficiency cannot be attained by learning each of the strands of proficiency in isolation.

--Helping Children Learn Mathematics, p.17
Adding to your thoughts....

Return to your response to this question...

• What does it mean to be successful in mathematics or to be mathematically proficient?

• What insights did you add to your response? Share out around your table.
Learning Intention and Success Criteria

We are learning to understand the 5 strands of mathematics proficiency as defined by the National Research Council in Adding It Up.

We will be successful when we can articulate a definition of mathematical proficiency make connections to a mathematics task.
Please be back and ready to start in 10 minutes.
THE IMPORTANCE OF EARLY MATHEMATICS
Learning Intentions

• We are gaining an understanding of research related to school entry skills and later achievement.

• We will consider the influence this research may have on our perspectives related to mathematics teaching and learning.
Think, Pair, Share

When children begin school at 4 or 5 years of age, what behaviors, skills, experiences might contribute to or influence their long-term success?

• Think on your own for a moment.
• Turn and share your thinking with your partner.
Factors That Influence Later Academic Achievement

Considering all the ideas we have on the chart, take a moment to talk through with your partner which might be especially predictive of later academic achievement.

• Be ready to justify your thinking.
Why Early Math Matters

Read the first page of “Why Early Math Matters.”

What might we identify (or add to our chart) now that we have read a brief summary of the research?
School Readiness and Later Achievement
Duncan et al., 2007

• “Early math skills have the greatest predictive power (of later academic achievement), followed by reading and then attention skills” (p. 1428)

• One noteworthy result is that early math is a more powerful predictor of later reading achievement than early reading is of later math achievement (p. 1443)
The Importance of Early Mathematics Education

- Kindergarten entry 3rd to 8th Grades
- Early reading skills → Later reading achievement
- Early math skills → Later math achievement

Mathematics has strong predictive power.

So what math are we talking about?

The foundation skills of Counting and Cardinality & Number Sense

As they lead to number facts, base ten understanding, computing, & measurement.
What’s Past is Prologue:
Relations Between Early Mathematics Knowledge and High School Achievement

“We find that preschool mathematics ability (at age 54 months) predicts mathematics achievement through age 15, even after accounting for early reading, cognitive skills, and family and child characteristics” (Watts, et. al, 2014, p. 1)

--(Grades 1, 3, and 5 are also included in this study)
Do gains in mathematical knowledge in kindergarten have any impact?

We find that gains in mathematical knowledge from preschool to late in first grade are even more predictive of age 15 mathematics achievement than “entry level” preschool knowledge.

--(Watts, et al., 2014)
Learning Intentions

• We are gaining an understanding of research related to school entry skills and later achievement.

• We will consider the influence this research may have on our perspectives related to mathematics teaching and learning.
Summarize some key points and classroom ideas related to the topics or focus standards in this session.

<table>
<thead>
<tr>
<th>Focus Topics or Standards</th>
<th>Summary of Key Points</th>
<th>Classroom Ideas to Try</th>
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<tbody>
<tr>
<td>Strands of Mathematical Proficiency</td>
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<tr>
<td>The Importance of Early Mathematics</td>
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EARLY MATHEMATICS AND CURIOSITY: A POWERFUL PARTNERSHIP
We now know that there is considerable evidence that early math skills predict later academic success.

Curiosity has been “identified as a driving force in child development and as one of the most important spurs to educational attainment” (Loewenstein, 1994, p. 75).
Learning Intentions

We will

• View our learning for our summer institute through the lens of curiosity

• Explore ways to foster curiosity in young children

• Deepen our understanding of the relationship between mathematics teaching and learning and curiosity
How Curious Is A Four-Year Old?

• How many questions a day does a four-year old ask?

• Take a guess!! Share with your neighbor!

• A general Google search will show that the most popular response is 437 questions a day!

• (How many is that per hour if a the average four-year old sleeps 12 hours a day?)
How curious are young children?

• One study published in Great Britain found that four year-old children ask nearly 300 questions a day.
• That is one question every 2 minutes and 23 seconds! (7:19 a.m. – 7:59 p.m.)
• The girls outpaced boys with 390 question a day!

http://www.telegraph.co.uk/news/uknews/9959026/Mothers-asked-nearly-300-questions-a-day-study-finds.html
Curiosity: An Essential Ingredient for Learning

Curiosity is the single most powerful ingredient in learning. Many studies show when children are curious about something they:

• Learn it far more easily
• Remember it far longer
• Learn at a deeper level

http://www.aboutkidshealth.ca/En/HealthAZ/FamilyandPeerRelations/life-skills/Pages/Curiosity-nurturing-urge-know-more.aspx
Why is mathematics important for early childhood learners?

Research on children’s learning in the first six years of life demonstrates the importance of early experiences in mathematics. An engaging and encouraging climate for children’s early encounters with mathematics develops their confidence in their ability to understand and use mathematics. These positive experiences help children to develop dispositions such as curiosity, imagination, flexibility, inventiveness, and persistence, which contribute to their future success in and out of school.
Why is mathematics important for early childhood learners?

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What is a disposition?

• The usual attitude or mood of a person
• A tendency to act or think in a particular way

--http://www.merriam-webster.com/dictionary/disposition

How might we foster a curious disposition in our young students?
FOSTERING CHILDREN’S CURIOSITY
PRR Protocol
Professional Reading and Reflection

• Tab a page in your notebook and label it PRR #1. Place your name and the date in the upper right hand corner of the page of your notebook.
• Read and begin a response to the prompt.
• Find a partner to share your initial thinking.
• Come back to your table and complete your response.

• Your responses will be read and responded to by project staff.
PRR: Getting Curious About Curiosity

Read and highlight the article. (Excerpts from three articles.)

After you have read, identify two or three sentences or phrases that speak to you regarding fostering curiosity in the lives of young children. Rewrite each phrase in your notebook. Discuss why these phrases stand out to you and what they have you thinking about.
Some phrases you might consider reflecting on:

- “We have lost sight of an important clue in helping our students succeed—that curiosity is an essential ingredient in wanting to learn.”

- “For students to be curious, they must feel worthy of seeking.”

- “The ones who want to learn are easy. The question that stares us in the face every day is how to help all students, especially those for whom curiosity is in short supply.”
What might mathematical curiosity look like?

Find a partner and brainstorm some possible answers to this question.

- A desire to find an answer to a question, a situation, or a problem.
- An interest in what they are learning and why it works.
- A desire to hang in there when tasks are challenging.
- Trying again when a first attempt is unsuccessful.
WHAT GETS IN THE WAY?
Fold your paper into fourths.

Brainstorm with a partner what a culture of curiosity:
- Look like....
- sound like....
- not look like....
- not sound like...

“You don’t just want to lead the horse to water; you actually want them to drink.”
In closing...
(Or is it “The Beginning?”)
Helping children learn to satisfy curiosity through exploration is one of the best skills you’ll ever nurture.

--Karen Stephens, Director
Illinois State University Childcare Center

I have no special talents. I am only passionately curious.

--Albert Einstein
We request the honor of your presence as we explore mathematical curiosity throughout our Summer Institute!

Be ready to explore, discover, and see mathematics in a way you’ve perhaps never thought to consider.
Mathematical Curiosity
Our First Step In!!
Games Debrief Protocol

Work with your table group to complete the Games Debrief Protocol.

We will come together as a full group to gather ideas.
Disclaimer

Strong Start Math Project
University of Wisconsin-Milwaukee, 2015-2018

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