Better Math Teaching Network

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Overview

• Why we formed a NIC
• How we prepared to launch
• How we launched
• What our work looks like in action
• What we’ve been learning
• Short video
Why we formed a NIC
We identified a problem

“Big deal, an A in math. That would be a D in any other country.”
No seriously, we have a problem

We’re below the middle of the international pack on the PISA (2015), a test that matters
We then decided to study it

• Inspired by **student-centered pedagogy**, but not interested in re-igniting the “math wars”

• Finding 1: Student-centered teaching is **nuanced**, with multiple entry points for teachers

• Finding 2: **Positive association** between student-centered instruction and students’ problem-solving skills (PISA)

*High School Math Teaching Study (2014)*
And we didn’t want our report to collect dust

How can we support teachers in improving their instruction by using more student-centered approaches?
And we didn’t want “any old” PD program

• Limited evidence on math professional development programs that work
  • Including some of our own studies

• One potentially promising direction is PD that is strongly rooted in teachers’ daily work
Networked Improvement Communities

- Professional development grounded in teachers’ work
  - Focus on instructional routines as standard work processes
- Foster collaboration and learning across schools and contexts
- Encourages incremental change with reflection
- More deliberate attention to data than teachers typically do when reflecting
- Opportunity to link research and practice
How we prepared to launch
We started small and purposefully

• Hub members participated in Learning Lab (2015-16)
  • 3 researchers and 1 practitioner
  • Alternating periods of planning and action
• Worked with initiation team to plan (spring 2015)
  • 4 math instructional leaders
  • 3 high school math teachers
• Expanded into a pilot network (fall 2015-16)
  • 3 math instructional leaders
  • 10 high school math teachers
The work

Initiation Team Meeting
Refined theory of improvement

PDSA Cycle #1
Hub supported

Full NIC Meeting #2
Cross group sharing
Planning next cycle

Advisory Board Meeting

PDSA Cycle 4

Full NIC Meeting #3
Cross group sharing
Planning next cycle

Full NIC Meeting #4
Cross group sharing
Feedback from year

2015

May-Jun

July-Aug

Sep-Oct

Nov-Dec

Jan-Feb

Mar-Apr

May-Jun

2016
What we learned

• Teachers
  • Liked the network focus on student-centered instructional routines to more deeply engage students
  • Needed time to reflect on instruction and identify an aspect to change
  • Benefited from the support of an improvement science coach to plan, design, and collect data for PDSA testing
• Refining the aim and driver diagram are ongoing processes
What we learned (continued)

• The network is best supported by a combination of small- and whole-group meetings
  • Small PDSA testing groups (3-4 teachers) focused on a similar change idea and facilitated by a hub “coach”
  • Periodic whole-group meetings to share and learn from each other

• Instructional leaders should be organized into a separate group focused on spreading the work
Launching the BMTN
Our aim statement

2,019 in 2019:
By 2019, the number of students who connect, justify, and solve with depth in algebra will increase by 2,019.
Deep student engagement

- **Connect.** Make connections among mathematical algorithms, concepts, and application to real-world contexts, where appropriate
- **Justify.** Communicate and justify mathematical thinking as well as critique the reasoning of others
- **Solve.** Make sense of and solve challenging math problems that extend beyond rote application of algorithm
Deep Student Engagement in Algebra

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Mathematics Instruction
Mathematical instruction provides ongoing opportunities for all students to connect, justify, and solve in algebra through the choice of task/activity and by shifting the academic responsibility to the students. (Instruction is student-centered.)

Classroom Environment
Positive, caring learning environment for all students

Student Attitudes
Students see school and learning as important and valuable

Student Readiness
Students enter algebra with the requisite knowledge, skills, and dispositions to succeed

Instructional Routines to Introduce New Material

Instructional Routines to Practice/Reinforce Previously Introduced Material

Primary Drivers
(WHAT?)

Secondary Drivers
(WHERE?)

Change Ideas
(HOW?)

AIM Statement

Mathematics Instruction

Classroom Environment

Student Attitudes

Student Readiness

Instructional Routines to Introduce New Material

Instructional Routines to Practice/Reinforce Previously Introduced Material

Better Math Teaching Network
Network members

- Recruitment
  - High school algebra teachers
  - Reflective, interested in student-centered instruction, desire to improve

- Growing over time
  - Year 1 (2016-17) - 23 teachers, 5 instructional leaders
  - Year 2 (2017-18) – 41 teachers, 10 instructional leaders
  - Year 3 (2018-19) – 55 teachers, 15 instructional leaders

- Facilitated by a hub
  - Researchers, practitioner, research assistants
Our work in action
Our basic structure

Virtual meetings every six weeks with small groups of teachers testing similar instructional routines

July | Oct | Dec | Mar | May

End of year celebration teachers present refined routines

Five in-person meetings per year, anchored by a weeklong summer institute
What did those routines look like?

• Introducing new material using *open-ended problems* to encourage students to make connections (*Connect*)

• Providing and, ultimately, removing scaffolds for students to use *claim-evidence-reasoning* in justifications (*Justify*)

• Integrating more *non-rote problems* when new material is introduced (*Solve*)
What about the PDSA process?

• Teachers developed measures for **three key questions**
  • Will I implement the routine **as planned**?
  • Will my students **engage**?
  • Will my students engage **with depth**?

• They use different types of **data sources**
  • Teacher journal, student surveys, student work – e.g., exit ticket, observation, audio recordings of students
Examples

3. STUDY

Questions: Questions you have about what will happen. What do you want to learn? (From Plan – Step 1)

Predictions: Make a prediction for each question. Not optional. (From Plan – Step 1)

What were the results? Comment on your predictions in the rows below. Were the correct? Record any data summaries as well.

Will my students connect with depth? 40% will score a “2” or higher on the connection rubric

40% scored a “2” and 10% scored a “3” for a total of 50% scoring a “2” or more

Score | Evidence
--- | ---
0 | No reflection attempted
1/Beginning | • Has no connection to the concepts or the meaning underlying the procedure being used.  
• Cited an incorrect connection.  
• Explanations focus solely on describing the procedure that was used.
2/Emerging | • Explains the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas.  
• Student engages with conceptual ideas that underlie the procedures to develop understanding.
3/Connecting | • Student is able to independently explore and understand the nature of mathematical concepts, process, or relationships.  
• Student make connections among multiple representations to help develop meaning.  
• Explains that broad general procedures have close connections to underlying conceptual ideas.  
• Connections are logical and meaningful.
Assessing our progress toward the aim

• Student **survey questions** that align with our aim (and teachers’ instructional improvement efforts)
  • Ask how often students have opportunities to engage in activities to connect, justify, solve
• Administer the survey each Fall and Spring
What we’ve been learning
Things we learned right away

• Both new and experienced teachers told us and our external evaluator that it helped break down professional isolation

• Teachers liked the focus on instructional routines that they used weekly, sometimes daily

Teaching as an isolated profession is not new
(Lortie, 1975)
Value of network learning

Opportunities to collaborate with educators from other schools and districts
98%
Extremely Beneficial

Opportunities to better understand/improve my teaching
93%
Extremely Beneficial

Participation in network meetings & events
90%
Extremely Beneficial

I value the opportunity to be part of the BMTN
91%
Strongly Agree
As we got going, it also became clear

- Teachers found the **PDSA structure useful** for testing and refining instructional routines, including the narrowed focus on Connect, Justify, and Solve
- Teachers learned it was possible to deepen student engagement by making **incremental improvements** to their instruction
Challenges

- How to spread change ideas
- How to support growing network
- Measures, measures, measures
  - How to measure deep engagement
  - How to make practical measures
Connect

Percentage of students reporting making connections between math and real world on a daily basis, Fall to Spring

- Fall 2016: 30%
- Spring 2017: 51%

p<.05
Percentage of students reporting **arguing or defending their approach** to solving math problems a daily basis, Fall to Spring

- **Fall 2016**: 35%
- **Spring 2017**: 59%

p < .05
Solve

Percentage of students reporting solving **multi-step problems** that take 20+ minutes to solve on a daily basis, Fall to Spring

- Fall 2016: 16%
- Spring 2017: 48%

$p<.05$
Our work is beginning to spread

• Refined **instructional routines** are being shared inside and outside the network
• BMTN leaders and teachers are **presenting their work** at regional and national conferences (>10 delivered, more planned)
• **Publications** are in the works
Thanks!

www.bettermathteachingnetwork.org

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