

# **The New Professionalism: Empowering Teachers as Researchers, Accomplices, and Agitators**

Mike Steele University of Wisconsin-Milwaukee @mdsteele47

Casey McCormick Our Lady of the Assumption School @cmmteach

National Council of Teachers of Mathematics Annual Meeting & Exposition

Session 444 • 27 April 2018

# Agenda

- Key aspects of professionalism (drawing on Principles to Actions)
- Supporting teachers as:
  - Accomplices
  - Researchers
  - Agitators
- Next steps

# Key points from *Principles to Actions*

- Teaching requires career-long professional growth
- Collaboration and the establishment of shared beliefs and values are important
- Teachers and districts must work to combat professional isolation
- Administrative buy-in is important to long-term success

# Turn and talk...

- What is one aspect of professionalism that is working well in your school or district?
- What is one aspect that you feel would be most important to change?



# Key ideas from the research

Teacher growth areas in effective professional development	Features of high-quality professional development
Mathematical knowledge for teaching	Substantial time investment
Capacity to notice, analyze, & respond to student thinking	Systemic support for teacher learning
Beliefs and dispositions related to continued learning	Participation in active learning
Collegial relationships and learning structures	Focus on the math underlying the curriculum

# Supporting teachers

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

- ...as **accomplices** for one another in enacting high-quality research-based instruction
- ...as **researchers** in their own classroom who learn from the data generated every day
- ...as **agitators** that will take meaningful steps to disturb outdated and unhelpful structures and processes

# Supporting Teachers as Accomplices

Finding your tribe

# Finding collaborators

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

In the dark ages:

- In your building (if they were like-minded and willing)
- Through a graduate program (if there was a good one locally)
- Through NCTM (passive reading or occasional conference attendance)

# Finding collaborators

Structured opportunities

- Graduate programs (in-person and online)
- Professional development projects
- Smaller-scale learning (microcredentialing)

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

# The Milwaukee Master Teacher Partnership

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

- Five-Year Noyce Track 3 project
- 24 high school math and science teachers in Milwaukee Public Schools
- Four action research-based microcredentials “badges” per year
- Anticipating change in:
  - Teacher capacity for action research
  - Instructional practices related to focus of microcredentials
  - Quality of instructional practice overall

# Finding collaborators

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

In-building opportunities

- Finding like-minded teams with which to collaborate
- Vertical teaming
- Being brave and leading change

Online opportunities

- #MTBoS
- My NCTM
- Direct online interactions

# Collaboration examples in #mtbos

Consider the following:

- How does #mtbos help solicit a variety of perspectives?
- How does #mtbos curate and ensure that the feedback/content you receive is of good quality?
- How do you ensure that you get a response?



Casey McTeach  
@cmmteach

So volume of a cone. We poured water from cone to cylinder, pyramid to cube, etc etc. we're good w  $\frac{1}{3}$  x the vol of the other. Kids desperately want to know why it's  $\frac{1}{3}$ , not half (beyond just the experimentation). Anyone got something for me? #mtbos

4:32 PM - 27 Mar 2018

24 Likes



8



24





# Collaboration examples in #mtbos

Consider the following:

- How does #mtbos help solicit a variety of perspectives?
- How does #mtbos curate and ensure that the feedback/content you receive is of good quality?
- How do you ensure that you get a response?



**geonz**  
@geonz

Follow



Great thread about different ways to **\*\*show\*\*** and breathe and touch and feel a formula :)

**Casey McTeach** @cmmteach

So volume of a cone. We poured water from cone to cylinder, pyramid to cube, etc etc. we're good w  $\frac{1}{3}$  x the vol of the other. Kids desperately want to know why it's  $\frac{1}{3}$ , not half (beyond just the experimentation). Anyone got something for me?  
#mtbos

8:42 AM - 28 Mar 2018

1 Like



1



# Collaboration examples in #mtbos

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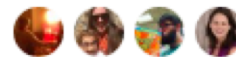


**Casey McTeach**  
@cmmteach

If anyone wants to be a genius for me: 8th (alg1) finished factoring, went to dc for a week, now we have 3.5 days until SB. Starting quads. I don't want to waste time, but I'm also not sure anything great is going to stick this week. Anything you think would be great? [#mtbos](#)

7:54 AM - 25 Mar 2018

4 Likes



11




4



# Collaboration examples in #mtbos

Consider the following:

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- How do you ensure that you get a response?




**Michael Pershan** @mpershan · Mar 25

Replying to @cmmteach

Could you tell me about your sequence for factoring/quadratics? What resources do you use? I'm planning that for after spring break...


4   ↺   ❤️   ✉️   ⌵



**Casey McTeach** @cmmteach · Mar 25

This is one of those places I'm ashamed to say, I follow the structure of my text b/c I don't know a better way! I haven't thought quads out too much b/c I'll mostly do it after break. Usually I run out of time around quads so I'm just trying to cram anything in!


2   ↺   ❤️   |||   ⌵



**Casey McTeach** @cmmteach · Mar 25

@kathyhenderson was sketching out her plan the other day. Maybe she'll share with both of us. Also @GotMathHelp just shared her planning that she really liked. Haven't gotten into it yet, but I'm sure she'd share w you as well!


2   ↺   ❤️ 2   |||   ⌵



**Michael Pershan** @mpershan · Mar 25

My idea this year is to start with equations that are already in factored form, to help kids get confident at solving them, then help kids get confident at graphing them, notice zeroes, etc., then solving/graphing equations in vertex form, then FOILing/factoring and std form.

1   ↺   ❤️ 2   ✉️   ⌵



**Casey McTeach** @cmmteach · Mar 25

One of the things that's weird for me is that by beg of March, half my class has had to learn factoring, quad formula for Aca deca and the Hs challenge test. It's annoying actually. But I guess that's part of why I've always done it first (not q form, just factoring)

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Replying to @cmmteach

Bring in tennis balls tape measures and meter sticks. Need a team. One to bounce the ball, two find where it bounces (zeros), two to find the max ht and location (vertex). "a" value will make equations equal. Can use to formalize after break.



1



2



Casey McTeach @cmmteach · Mar 25

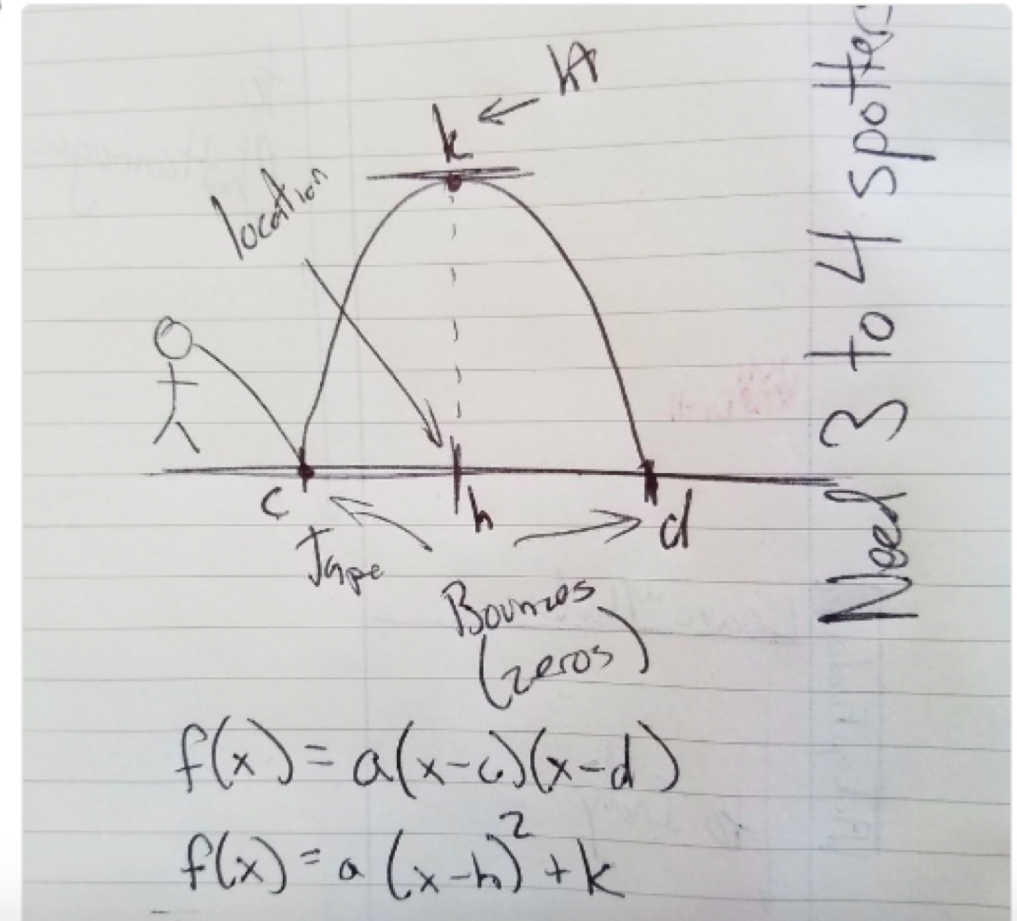
This sounds cool. I don't know if I'd understand it well enough 😊



1



Chris Conrad @conrad\_chris · Mar 25



# Collaboration examples in #mtbos

Consider the following:

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- How do you ensure that you get a response?



**Casey McTeach**  
@cmmteach

I know I gush all the time about you, [#mtbos](#). But you've seriously been on fire lately! Between help with vol of cones/pyramids, quads the other day, desmos projects the other week.... geez man! Not to mention I've had a slew of dinner dates recently. I seriously heart you so big

8:42pm · 27 Mar 2018 · Twitter for iPhone





# Collaboration examples in #mtbos

Consider the following:

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## Set The Hook.

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[Apps In Class](#)
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What are you getting ready to teach? Whatever it might be, the MTBoS has probably blogged about it. To find what you're looking for, just type into the search below! Or, if you're not sure what you want and are looking for some inspiration, hit the random button.



Feeling Mathematically Lucky? Get A Random Post

### Most Popular Search Results

graphing in coordinate plane division of fractions logger inb boolean quadratic formula coterminal pythagorean theorem algebra 2 project solving equations integers imp math washi volume of a pyramid absolute value inequalities

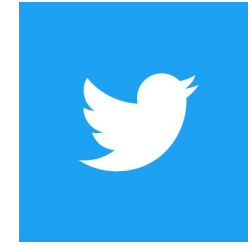
### The MTBoS Search Engine

I've been wanting something like this for a long time, but finally got around to making it. This is a search engine that only combs through Math Teacher blogs. There are some missing. No, there are plenty that are missing. Please let me know and I'll add them as soon as I can. Anyways, simply click on the Google Search bar above this paragraph and away you go.

HUGE hat tip to Robert Kaplinsky for creating [this one](#) that's all about lessons. Also, add yourself to the [MTBoS Directory](#), courtesy of Jed Butler.

<http://www.fishing4tech.com/mtbos.html>

# Call to Action



#mtbos

- **Share the load**  
Don't reinvent the wheel; plan lessons and units collaboratively
- **Leave a trace**  
Share and disseminate planning artifacts and invite feedback and further refinement
- **Be a proud (and thoughtful) peacock**  
Seek out colleagues to share your successes and student work with, and go in depth with that discussion

# Supporting Teachers as Researchers

Analyzing your practice



# Teachers as researchers

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

- Classrooms are incredible laboratories for learning
- Ask structured questions about your practice and collect data on student learning
  - This has to go beyond test scores!
  - Make use of audio and video records of discourse
- Use existing tools to analyze your data
  - Questioning categories in Principles to Actions
  - Short transcripts analyzing teacher and student talk

# MMTP Theoretical underpinnings

- Practice-based teacher development
  - Action research as a means to develop content and pedagogical knowledge
  - Research-practice-research cycle
- Ensuring teacher voice
  - Choices in areas of inquiry (Years 2-5)
- Development of teacher leaders
  - Position teachers as professional developers within district
  - Develop next-generation district curriculum leaders

## Foundations



Action Research I

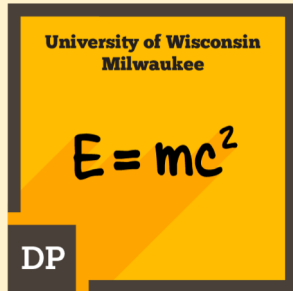


Action Research II

## Content Focused



CCSSM & NGSS



Matter & Energy



Evolution



Modeling Part I

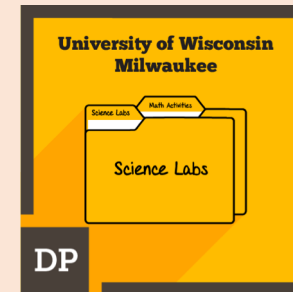


Modeling Part II

## Pedagogy Focused



Student Engagement & Motivation



Cognitively Demanding Tasks

## Leadership



Designing & Supporting Teacher Learning I



Productive Struggle

# The Influence of Feedback and Formative Assessment on Student Engagement and Motivation

Joan M. Masek, Teacher  
Alexander Hamilton High School  
Milwaukee, WI 53220

## BIG ISSUE

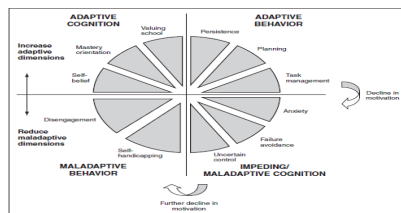
Does student engagement and **motivation** improve when a combination of formative assessment strategies and student discourse methods are introduced?

## LITERATURE REVIEW HIGHLIGHTS

*Formative assessment strategies affect student engagement and motivation.*

- ✓ Improving formative assessment raises standards.
- ✓ Scaffolding promotes autonomy, self-regulation, and ownership.
- ✓ Assessment for learning rather than grades.

Motivation and Engagement Wheel



## RESEARCH QUESTION

- Can a change from traditional methods of assessment impact student engagement and motivation?
- Can the consistent use of varied strategies of formative assessment provide both teachers and students with information about student understanding?
- What are the effects of peer assessment and self assessment strategies on student engagement and motivation in a 9<sup>th</sup> grade algebra class?

## METHOD

- Administer the MSLQ to assess the motivational orientation of my students.
- Introduce Restorative Circles to build classroom culture.
- Talk about community and autonomy.
- Identify formative assessment strategies:
  - Student self assessment form
  - Stop light discs
  - Thumbs up/down
  - Think – pair – share
  - Partners
  - Exit tickets
- Implement assessment strategies and analyze results.

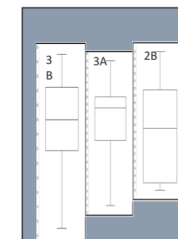


NAME: _____		DATE: _____		BLOCK: _____	
LEARNING INTENTION: _____					
SUCCESS CRITERIA: _____					
STUDENT SELF-ASSESSMENT					
SOLVING PROBLEMS					
1 How do you feel about today's <b>DO NOW</b> problem?					
2 How do you feel about today's ACTIVITY ( )?					
3 How do you feel about today's textbook problems?					
4 How do you feel about today's HANDOUT – practice problems?					
STUDENT MOTIVATION					
4 How <b>motivated</b> did you feel during today's lesson?					
5 How <b>motivated</b> did you feel during today's lesson?					
6 How <b>motivated</b> did you feel during today's lesson?					
OVERALL – RATE TODAY'S LESSON					
7 Why did you rate the lesson this way? What did you like/dislike? If you were sleeping or felt it was awful --- tell me why?					

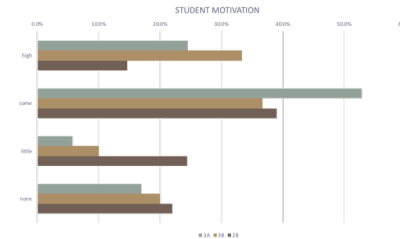
## RESULT SUMMARY

The action research project is ongoing.

MSLQ RESULTS:



STUDENT SELF ASSESSMENT RESULTS:



## NEXT STEPS

- Expand use of content standards in formative assessments
- Continue to collect and analyze data from the self assessment form to explore the connection between motivation and learning of content.
- Increase the use of restorative circles for community building and student learning.
- Introduce another formative assessment strategy --- the use of CABS and written feedback.

## REFERENCES

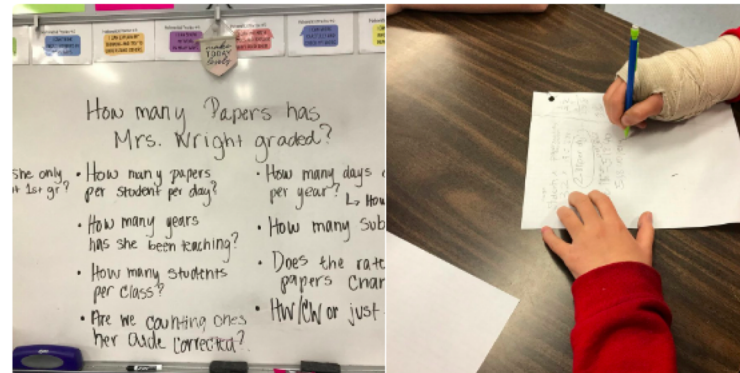
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# How many papers?



Casey McTeach  
@cmmteach

At Mass this am one T was recognized and P said “can you imagine the number of papers she’s corrected?” Went on to call me a math ninja who could figure it out. So what’s a math ninja to do? Naturally, give it to my [@Estimation180](#) wiz kids and get to work...  
[#mtbos](#)

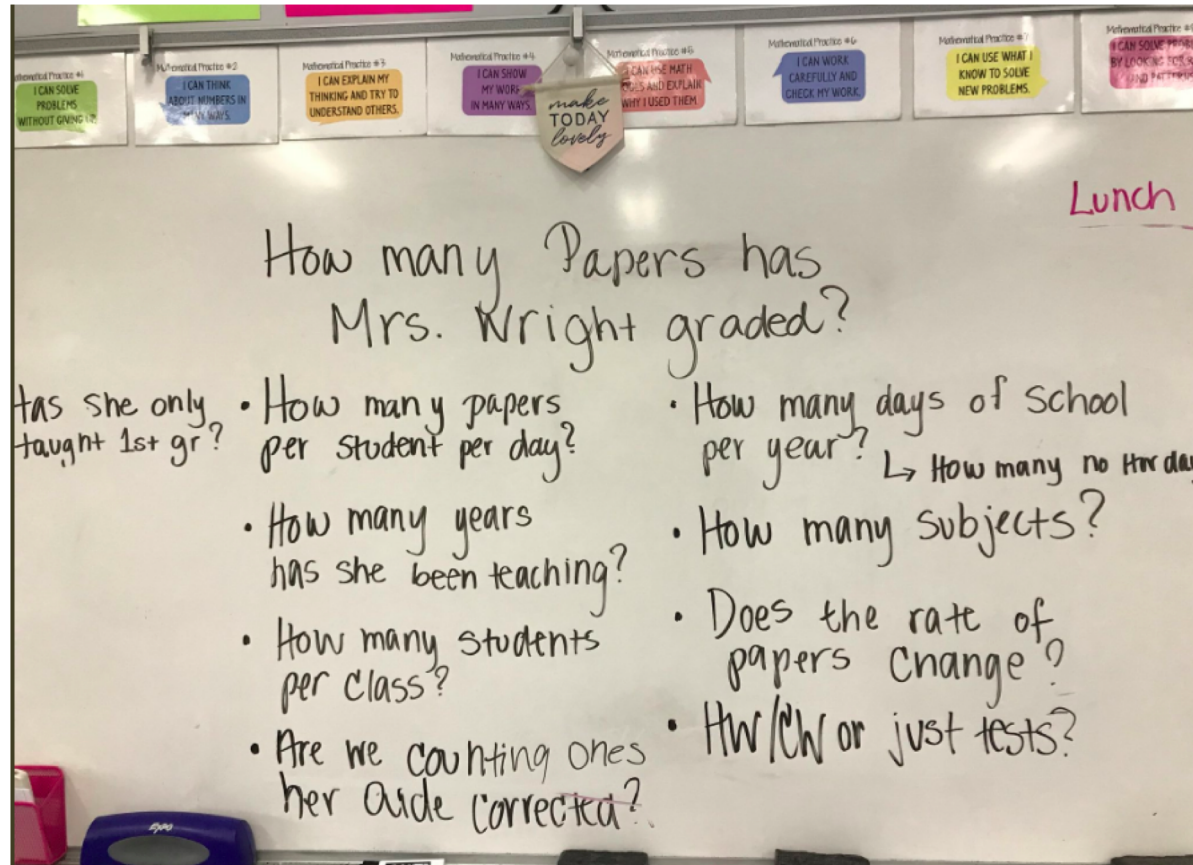


2:34 PM - 2 Mar 2018

2 Likes



# How many papers?





# How many papers?

Whiteboard content showing calculations for the number of papers:

**Left Column (Handwritten Numbers):**

- 1,555,200
- 1,597,320
- 1,868,240
- 914,976
- 3,612,000
- 1,347,840

**Top Row (Mathematical Practices):**

- Mathematical Practice #1: I CAN SOLVE PROBLEMS WITHOUT GIVING UP.
- Mathematical Practice #2: I CAN THINK ABOUT NUMBERS IN MANY WAYS.
- Mathematical Practice #3: I CAN EXPLAIN MY THINKING AND TRY TO UNDERSTAND OTHERS.
- Mathematical Practice #4: I CAN SHOW MY WORK IN MANY WAYS.
- Mathematical Practice #5: I CAN USE MATH TOOLS AND EXPLAIN WHY I USED THEM.
- Mathematical Practice #6: I CAN WORK CAREFULLY AND CHECK MY WORK.
- Mathematical Practice #7: I CAN USE WHAT I KNOW TO SOLVE NEW PROBLEMS.
- Mathematical Practice #8: I CAN SOLVE PROBLEMS BY LOOKING FOR RULES AND PATTERNS.

**Center (Handwritten Calculations):**

days/year  $\times$  years = 5,940

$- 24^{(\times 30)}$  Fridays

$\frac{5916}{\times 30}$  Students

$\frac{177,480}{\times 9}$  papers per s/day

$1,597,320$

**Bottom (Handwritten Calculations):**

32 S  $\times$  papers per day

$32 \times 9 = 288$  pap/day

$288 \times 180$  (days per yr)

51,840

$288 \text{ papers/friday} \times 24 \text{ fri.}$

5760

$51,840 - 5760 = 46,080$  papers/yr

$46,080 \times 30 \text{ yrs} = 1,382,400$

# How many papers?

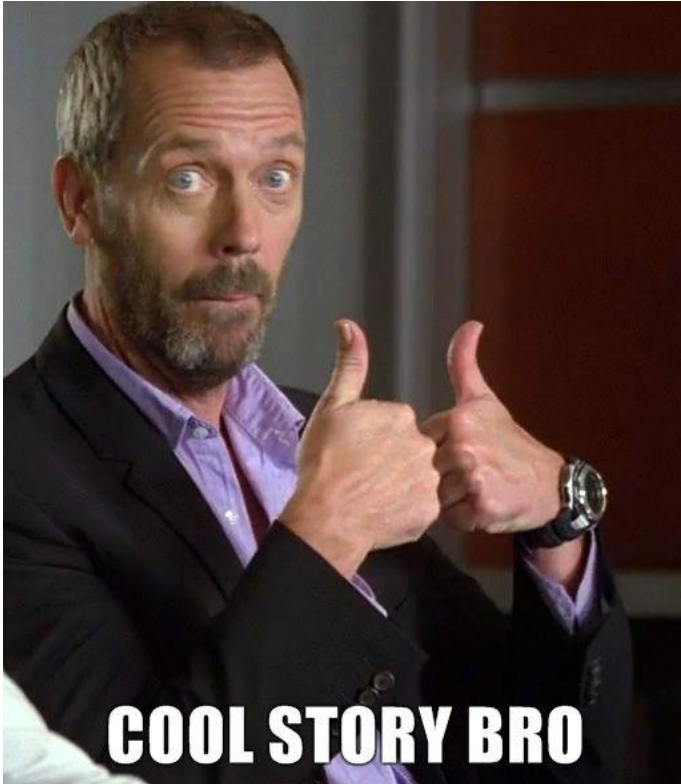
Handwritten calculations on a whiteboard:

$$\begin{array}{l} 9 \text{ papers/day} \times 32 \text{ St.} \\ \text{days per yr} - \text{fridays/yr} \\ 156 \\ 156 \times 288 = 44,928 \\ \text{days} \quad \text{papers/day} \quad \times 30 \text{ yrs} \\ \hline 1,347,840 \\ 285,120 \end{array}$$

Posters on the wall:

- Utilize structure. How can you use this to solve the problem?
- Evaluate results. I know these methods worked because...
- SMARTER than one of us!
- THINKING For you!
- What Problem are you Passionate about solving?
- Mathematics is the study of patterns. mathematicians NOTICE patterns, describe patterns, generalize patterns.





**...but what did that  
have to do with  
research?**

# Call to Action

- **Develop systems to collect data**  
Lesson plans, pictures of student work, video and audio records
- **Annotate and analyze**  
Time spent looking at student thinking will save time in planning down the road
- **Get up here**  
Give a talk at an NCTM conference (state, regional, national)  
**People will care about the work you're doing with kids**

# Supporting Teachers as Agitators

Do not just accept the way things are

# Hard truths

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

- Mathematics teaching and learning is far from equitable for each and every student
- Our systems of management rest on outdated and discriminatory structures rooted in behaviorist and segregationist stances
- Teaching as a profession is being vilified in public spaces
- Nobody is going to fight for us if we do not fight for ourselves

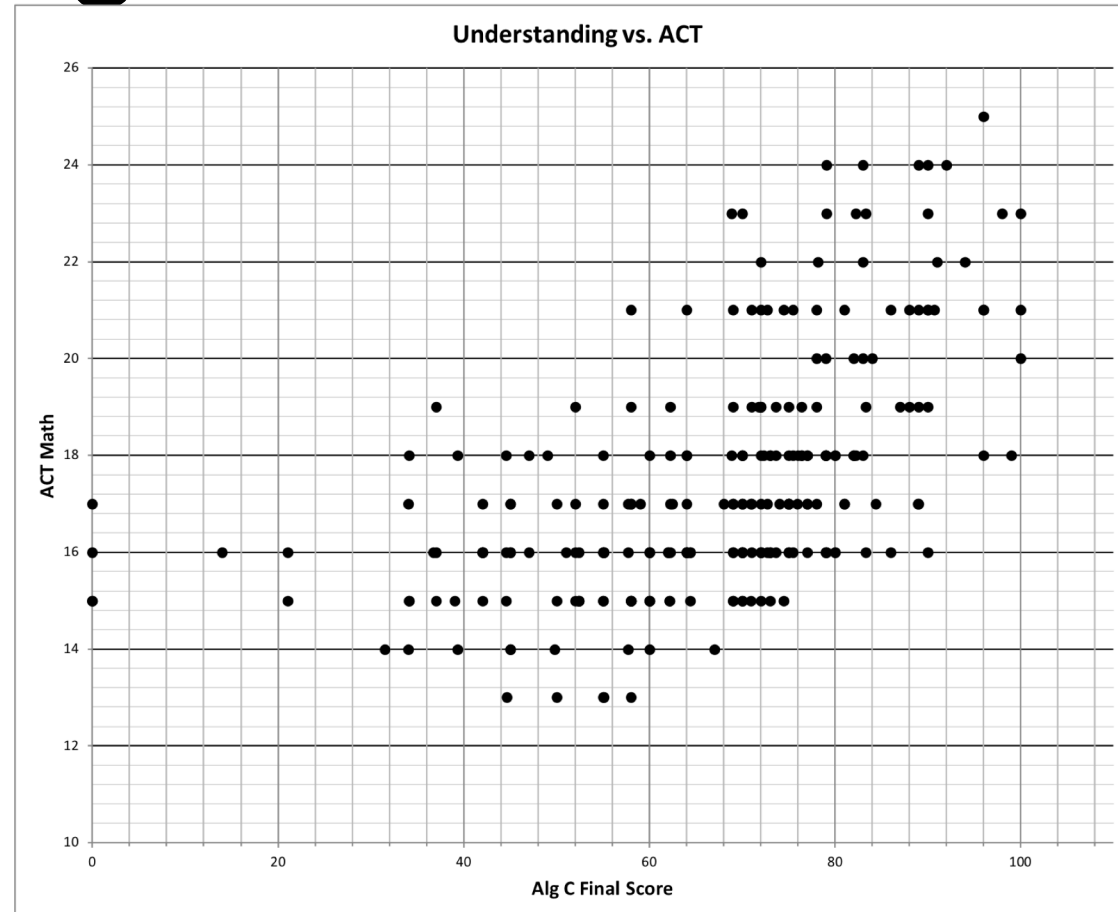
# Collecting Data

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

Simple, straightforward data collection and analysis can be a huge asset

- Holt (MI) High School was concerned about an administrative push to focus on ACT preparation at high school
- The teaching staff believed their current assessment practices were authentically measuring student learning
- They did not believe in the ACT as a tool for measuring conceptual understanding

# Collecting Data



$$r^2=0.3$$

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
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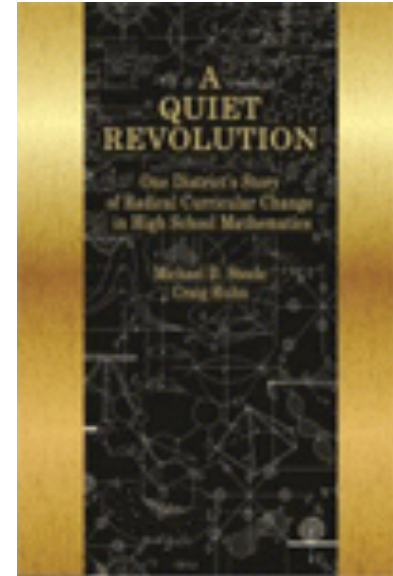


Steele, M.D. & Huhn, C.  
(2018). A Quiet Revolution:  
One District's Story of Radical  
Curricular Change in High  
School Mathematics.  
Information Age Publishing.

# Other steps to take

- Convincing other adults in the building
- Sharing and discussing current research in mathematics education
- Proactively messaging to parents and community members

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Beliefs & dispositions	Active learning
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Steele, M.D. & Huhn, C.  
(2018). A Quiet Revolution:  
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# Casey's Context



# Stage 1: Honoring Work

I wanted to tell you that I am very proud of the work you are doing and your positive, joyous love for your work and students.

# Stage 2: Airing Grievances

It has been frustrating over the years to feel like there's an ever changing plan at the Diocesan level, so we have tried to do what's best for our students at our school site. We also have a wonderful cluster group, although a few of them are very resistant to change.

# Stage 3: Identifying What's Possible

I want to share how much I have learned in following you and many from the #mtbos group.

Despite teaching for so long, I am proud to believe that I can always improve and learn. I really try to meet the needs of all of my students and I have been excited to implement so many things since we crossed paths. (Desmos, would you rather, which one doesn't belong, folded paper click ball ornaments, and fractal Christmas trees, just to name a few.)

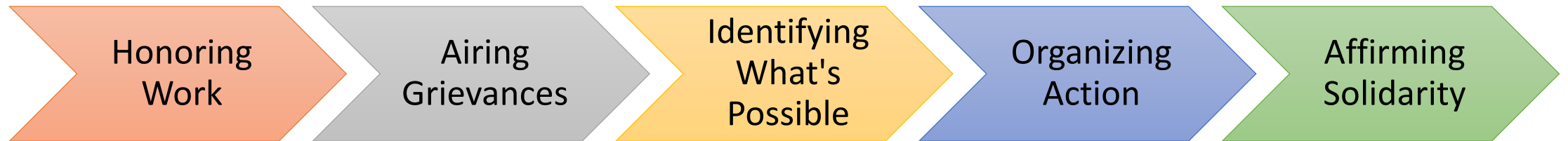
# Stage 4: Organizing Action

I want to support you in your meetings this week. In fact, I had been thinking about contacting XXXXXXXX to suggest that your knowledge and approaches would be awesome PD before I even read your blog post.

# Stage 5: Affirming Solidarity

**I want to encourage you to be true to who you are and know that I am a better teacher because of all of the resources and people that I have come across since the conference where we met.**

# Five Stages of Recruiting Agitators



# Call to Action

MKT	Time
Capacity to notice	Support
Beliefs & dispositions	Active learning
Relationships	Focus on the math

- **Get the facts**  
Analyze data related to assessments, tracking practices, and student achievement across the district
- **Cause a problem**  
Initiate conversations that challenge beliefs and dispositions based on research and open up hard conversations
- **Evangelize**  
Don't wait for parent or community complaints; engage them in dialogue about what you're going to do and why

# Questions and discussion



# We are here to help!

@mdsteele47 • @cmmteach • and the whole #MTBoS