# Exploring the relationship between rigorous curriculum materials and the development of ambitious mathematics instructional practices

Jeffrey Choppin, University of Rochester

Mary Beth Piecham, EDC

Erin Henrick, Vanderbilt University

# Question or challenge:

How do characteristics of inquiry-based curriculum materials support the development of ambitious instructional practices in mathematics?

# Description of Session

- We present findings from three projects investigating the impact of and challenges related to teachers' use of ambitious instructional materials on their knowledge and practice.
- We focus on implementations of curriculum materials, especially with regard to ambitious mathematics and pedagogy.
- We consider how materials are interpreted and enacted, and the means of support that facilitate development of ambitious mathematics and pedagogy.
- Each presenter will present frameworks and findings for 15 minutes, leaving about 40 minutes for audience interaction.

# The Projects

- **The ERGO project –** Jeffrey Choppin
- **The MPI Study** – Mary Beth Piecham
- **The MIST project –** Erin Henrick

# Plan for interaction with participants

**Main question for session**:

How do characteristics of inquiry-based curriculum materials support the development of ambitious instructional practices in mathematics?

**Themes:**

- Coherence
  - of curriculum programs,
  - of use of materials,
  - of use of different materials in schools,
  - in enactments)
- Nature of curriculum materials
  - Features of curriculum materials,
  - Categorizing curriculum and tasks
- Categorizing support and enactments
  - Support from schools and districts,
  - Documenting ambitious practices

# THE MEDIATING ROLE OF THE DESIGNATED CURRICULUM ON THE COHERENCE OF THE ENACTED CCSSM

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Amy Roth McDuffie, Washington State Tri-Cities
Corey Drake, Michigan State University

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# Developing Principles for Mathematics Curriculum Design and Use in the Common Core Era [ERGO]

- $2.2 million NSF-funded study focusing on 98 teachers nationwide and currently in its 4th year

- Develop principles for supporting middle school mathematics teachers' capacity to use curriculum resources to design instruction that addresses the Common Core State Standards for Mathematics (CCSSM).

- Build on existing research regarding teachers' use of curriculum materials and (to a lesser degree) policy/standards implementation

- Address multiple audiences:
  - Curriculum designers
  - Instructional leaders
  - Researchers

PIs

- Jeffrey Choppin, University of Rochester
- Amy Roth McDuffie, Washington State University Tri-Cities
- Jon Davis, Western Michigan University
- Corey Drake, Michigan State University

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# Research Questions

- How do *teachers* perceive the practices and progressions in the CCSSM? Do they see the CCSSM as different from their current vision of mathematics instruction or more of the same?
- How do *districts* support curriculum and instruction aligned with the CCSSM? For example, how do districts' accountability systems and professional development efforts influence teachers' perceptions and practices around curriculum and instruction?
- **How do *curriculum resources* influence teachers' ability to design instruction that is aligned with the CCSSM, particularly in cases where perceptions of the CCSSM are aligned with ambitious pedagogy?**
- How and when do teachers access these resources for particular purposes?

# Study Timeline

| | **Teacher and District Characteristics** | | | **Curriculum Characteristics**<br>**Planning and Enactment** | | | **Impact of CCSSM** |
|---|---|---|---|---|---|---|---|
| | Data Collection Activities | | | | | | |
| | Web Survey | MKT | Back-ground Interviews | Staged Lesson Planning | Lesson Observations and Pre-Post Interviews | Teacher Logs | Exit Interviews |
| Y1 | | | | | | | |
| Y2 | | | | | | | |
| Y3 | | | | | | | |
| Y4 / Y5 | Analyzing data and refining principles for curriculum design and professional development to help teachers better understand resources in curriculum materials | | | | | | |

# CCSSM as the Intended Curriculum

- The CCSSM are intended to provide an opportunity for a coherent national curriculum and to be more rigorous than past state standards.
- However the authors did not describe specific characteristics of curriculum and instruction that should be used to enact the CCSSM.
- Consequently, the wide adoption of the CCSSM provides researchers an opportunity to consider the **impact of the designated curriculum** - especially the textbooks adopted by districts to address the CCSSM - **on the coherence of the enacted CCSSM**.

# CCSSM's Description of Learning

- The CCSSM authors explain that, in order to meet the standards, educators will need to equally pursue three aspects of rigor:
  - conceptual understanding,
  - procedural skills and fluency, and
  - application
- **Conceptual understanding** is viewed as students understanding concepts from a number of perspectives and seeing math as "**more than a set of mnemonics or discrete procedures**"
- They explain that **students who lack understanding "may rely on procedures too heavily**" and may be less likely to engage in adaptive and flexible tool use and reasoning.

# Teachers' interpretations of the CCSSM

- When compared to prior state standards, teachers in our sample reported that the CCSSM required a greater emphasis on:
  - problem-solving,
  - discovery,
  - communication, and
  - conceptually-driven instruction.
- Furthermore, the teachers in our study reported that their materials were aligned with the CCSSM, especially in relation to the content standards, though there were varying opinions about whether the materials aligned with the Standards for Mathematical Practice

# Phases of Curriculum

**The official or intended curriculum (CCSSM)** → **The designated curriculum (district adopted program)** → **The enacted curriculum (planned and enacted lessons)**

**States define curriculum and establish content for standardized testing** → **Schools and districts interpret the intended curriculum** → **Teachers interpret the intended curriculum and choice of designated curriculum as they plan and enact lessons**

# Research Question

**States define curriculum and establish content for standardized testing**

**Schools and districts interpret the intended curriculum**

**Teachers interpret the intended curriculum and choice of designated curriculum as they plan and enact lessons**

If teachers are responding to the CCSSM directly, we would expect to see relatively similar instructional practices and forms of mathematical activity

If teachers are responding to the designated curriculum, we would expect to see instructional practices and forms of mathematical activity vary by curriculum type

Research question: What is the relationship between the designated curriculum program and teachers' instructional practices, in terms of mathematical activity and classroom discourse?

# Description of Study

- Categorized curriculum programs according to two broad types
- Observed 50 lessons in multiple states and curriculum contexts
- Lessons were designed to address the CCSSM and teachers had similar views of CCSSM
- Analyzed the enacted curriculum in terms of:
  - Patterns of mathematical activity
  - Patterns of classroom discourse

# Curriculum Types

| Feature | Delivery Mechanism | Thinking Device |
| --- | --- | --- |
| **Nature, sequencing, and organization of tasks** | Tasks typically involve prescribed methods and have little room for multiple approaches<br><br>Procedures and terminology are explained and modeled first.<br><br>There are sets of problems that provide repeated practice of a well-defined class of problem.<br><br>Applications are typically at the end of each lesson. | Tasks involve choice and opportunity for connections.<br><br>Lessons begin with one big problem (which may have subparts), set in context.<br><br>Practice problems follow student exploration, but are typically not sets of repetitive problems. |

# Curriculum Types

| Feature | Delivery Mechanism | Thinking Device |
|---|---|---|
| **Timing of formal explanations of procedures and terminology** | Formal definitions are presented before students explore the mathematics.<br><br>Problem solving steps and procedures are described or provided through examples before students solve problems. | Problems are situated *before* concepts, procedures, and/or mathematical terms are explained in the text.<br><br>Formalization occurs after student engagement with problems, typically in the whole class summary. |
| **Delegation of autonomy** | Autonomy is released over time | Autonomy is high throughout the lesson |

# Data

- We observed the lessons of 50 teachers during the 2013-2014 School Year.

**21 used 'Thinking Device' programs**

- 16 involved the second (CMP2) or third (CMP3) edition of Connected Mathematics Program
- 4 of the lessons involved College Preparatory Mathematics (CPM)
- One involved Core-Plus Mathematics.

**29 used 'Delivery Mechanism' programs**

- 13 used Glencoe,
- 5 used *digits*,
- 4 used Prentice Hall,
- 3 used Math in Focus
- 4 used other

# Analytic categories

**Nature of Mathematical Activity**

Based on enacted activity, not categorization of task

Follows CCSSM articulation of conceptual activity as involving flexible and adaptive reasoning that goes beyond memorization and computational routine

Consistent with CCSSM language:

- **Non-conceptual activity** is defined in terms of recall, memorization, and procedural or computational routine
- **Conceptual activity** is defined as involving ambiguity, choice, explanation, justification, connections

Allows for specification of conceptual / non-conceptual activity in different mathematical domains

# Analytic categories

**Discourse Mode**

- Focus on extent to which discourse focuses on student thinking and away from teacher exposition
- Connects to CCSSM focus on communication and student sense-making

# Nature of Mathematical Activity

| | | |
|---|---|---|
| Non-conceptual | Recall, memorization, or basic application of definition or rule | Activity focused on memorization, recall, application of basic facts, definitions, or simple algorithms. |
| | Procedural or computational routine | Activity focused on describing and accurately carrying out computations or well-established procedures, with little to no discussion of the strategic implications or explanations of the concepts underlying the computations. |

# Nature of Mathematical Activity

| | | |
|---|---|---|
| **Conceptual** | Procedure plus (justification or explanation) | Activity in which students were developing or applying procedures, but the activity included explanations in which connections were made to underlying concepts or students provided reasoning for the use of the strategy. |
| | Interpreting or generating represent-ations | Activity that involved creating or interpreting information a table, graph, equation, or other representation. This category involved mathematical activity that required students to make choices regarding the creation of a representation, to translate information across types of representations, or to extract and describe a pattern evident in a representation. |
| | Developing definitions or formulas | Activity that involved creating a definition or formula. This is different from when the teacher simply provided a definition, which was categorized as recall or memorization. Though primarily related to geometry, Munter, Stein, and Smith (2015) emphasize the need for teachers and students to co-construct definitions across all content strands when appropriate. |

# Discourse Mode

| | Pre student work on problem | During or post student work on problem |
|---|---|---|
| **Teacher-focused:** Evaluative discourse in which the teacher is the primary intellectual contributor | Teacher explains topic and models problems before students work on them | Teacher asks series of known-answer short-response questions to determine accuracy of procedure or response |
| **Student-focused**: Non-evaluative discourse focused on eliciting and probing student reasoning | Teachers probes student understanding of mathematical topic, problem requirements, or problem context | Teacher elicits student explanations, probes for clarity and reasoning, and asks other students to rephrase or extend strategies or asks for different strategies |

# Methods

- Transcribed whole class and audible group work
- Coded segments in intervals of roughly two to four minutes (combination of duration and topically related set – e.g., a line of questioning around a topic or problem)
- Coded each lesson segment with one code each from Mathematical Activity and Discourse Mode categories (codes within categories were treated as exclusive)
- Divided number of segments for each code by the total number of segments, multiplied by 10 and rounded, to get a score of 0 to 10 for each code for each lesson.

# Methods

- We then collapsed all of the categories for conceptually-oriented activities and non-conceptually oriented activities in order to provide an overall lesson rating of *conceptual*, *non-conceptual*, or *mixed*.
- We considered a lesson as *conceptual* if at least twice as many segments were rated as conceptual than non-conceptual and vice-versa for non-conceptual, with all lessons with a ratio of less than two-to-one in any direction rated as *mixed*.
- Similarly, we generated a lesson rating as *teacher-focused*, *student-focused*, or *mixed discourse*, with guidelines similar to the conceptual lesson ratings.

# Results: Mathematical Activity Types

| | Non-conceptual | Mixed | Conceptual |
|---|---|---|---|
| Thinking Device Curriculum | 3 (2)* | 6 | 12 |
| Delivery Mechanism Curriculum | 22 (17)* | 4 | 3 |

*Rated as having no conceptually-focused lesson segments

# Results: Discourse Modes

| | Teacher focused | Mixed focus | Student Focused |
|---|---|---|---|
| Thinking Device Curriculum | 11 (5)* | 3 | 7 |
| Delivery Mechanism Curriculum | 28 (22)* | 1 | 0 |

*Rated as having no student-focused lesson segments

# Student focused vs Teacher focused lesson segments

Teachers using ‘thinking device’ materials

Teacher focused discourse **almost equal to** student focused discourse

Teachers using ‘delivery mechanism’ materials

Teacher focused discourse **fourteen times more than** student focused discourse

# Interaction between mathematical activity and discourse mode

| Thinking Device | Non-conceptual | Mixed | Conceptual |
|---|---|---|---|
| Teacher focused | 3 | 6 | 2 |
| Mixed | 0 | 0 | 3 |
| Student focused | 0 | 0 | 7 |

| Delivery mechanism | Non-conceptual | Mixed | Conceptual |
|---|---|---|---|
| Teacher focused | 22 | 4 | 2 |
| Mixed | 0 | 0 | 1 |
| Student focused | 0 | 0 | 0 |

# Variation within Thinking Device Curriculum Programs

| **CMP3 – Exper.** | Non-conceptual | Mixed | Conceptual |
|---|---|---|---|
| Teacher focused | 0 | 2 | 0 |
| Mixed | 0 | 0 | 1 |
| Student focused | 0 | 0 | 4 |

| **CMP3 - New** | Non-conceptual | Mixed | Conceptual |
|---|---|---|---|
| Teacher focused | 3 | 3 | 0 |
| Mixed | 0 | 0 | 1 |
| Student focused | 0 | 0 | 2 |

| **CPM** | Non-conceptual | Mixed | Conceptual |
|---|---|---|---|
| Teacher focused | 0 | 1 | 1 |
| Mixed | 0 | 0 | 1 |
| Student focused | 0 | 0 | 1 |

# Mediating effect of designated curriculum

**Curriculum as delivery mechanism** → **Less conceptual types of mathematical activity; predominantly teacher-focused discourse**

**Curriculum as thinking device** → **More conceptual types of mathematical activity; more student-focused discourse**

These associations occurred even though:

- Multiple curriculum programs, schools, and states were present in each of the curriculum types.
- Underlying perceptions of the CCSSM were consistent

# What are teachers responding to?

**States define curriculum and establish content for standardized testing**

**Schools and districts interpret the intended curriculum**

**Teachers interpret the intended curriculum and choice of designated curriculum as they plan and enact lessons**

The systematic differences between instructional practices according to curriculum type suggests that teachers' conceptions of the CCSSM do little to influence their instruction

The systematic differences between instructional practices according to curriculum type suggests that the designated curriculum influences teachers' instructional practices

New question: What are schools and districts responding to in their choice of curriculum programs, especially if the ostensible goal is to align instruction with the CCSSM?

# Variation within Enactments of Thinking Device Materials

- Having ‘thinking device’ materials did not guarantee conceptual or student-focused instruction
- Teachers who were **more experienced** with thinking device programs engaged in more student-focused and conceptual instruction than teachers newer to the programs
- Teachers **using CPM** were less student focused than experienced CMP3 teachers

# Variation within Enactments of Delivery Mechanism Materials

- There was much less variation within the ‘delivery mechanism’ programs regardless of experience or program
- Instruction involving ‘delivery mechanism’ programs was almost exclusively teacher-focused and non-conceptual

# Repeating history – with a caveat

- The results from the ‘delivery mechanism’ teachers are consistent with results from lessons observed soon after the release of the NCTM Standards documents
- In the early 90s, most teachers struggled to incorporate the NCTM recommendations in their lessons beyond surface features, even when they reported understanding and supporting the recommendations

An important caveat:

- These lessons were conducted without the benefit of curriculum programs designed to comprehensively integrate the recommendations.

# Implications – Curriculum Adoption

- Enactments of the official curriculum – the CCSSM – are heavily mediated by decisions and curricular choices at the local level.
- This suggests challenges for policy makers who hope to change classroom instruction without providing a stronger articulation of the kinds of curriculum materials that are necessary to enact their recommendations.
- It also raises questions regarding the kinds of training and feedback necessary to help teachers adapt ‘delivery mechanism’ materials to enact student-focused and conceptually-oriented instruction (if at all possible).

# Parting questions

- What are schools responding to in their choice of curriculum programs, especially if the ostensible goal is to align instruction with the CCSSM?
- What messages do schools or districts send when they adopt curriculum programs?
- What does their choice of curriculum program say about the depth with which or the evidence with which decisions about curriculum programs are based?

# Mathematical Practices Implementation Study

Examining the impact of a CCSSM-aligned curriculum on secondary teachers' instructional practice

EDC Learning transforms lives.

UNIVERSITY of WISCONSIN
UWMILWAUKEE

Supported by the National Science Foundation under Grant No. DRL-1019945

DR K-12 PI Meeting, Washington, DC
June 3, 2016

# Curriculum context

- CME Project is a coherent four-year NSF-funded curriculum published by Pearson
- Traditional course sequence
- Student-centered, problem-based
- Organized around **Mathematical Habits of Mind (MHoM)**

“the ways of thinking used by mathematicians in their mathematical work” “(Cuoco, Goldenberg, & Mark, 1996, 2010)

# Educative features

<u>Mathematical Approaches</u>

- General mathematical habits of mind
  - E.g,. Finding and explaining patterns, Generalizing from examples
- Algebraic habits of mind
  - E.g., Seeking regularity in repeated calculations, Changing variables in order to hide complexity, Seeking and specifying structural similarities
- Orchestrated problem sets

<u>Pedagogical Devices</u>

- *Getting Started* lessons
  - "Experience before formality": students experience grappling with mathematics before ideas are formalized
- *Minds in Action* student dialogues
  - Characters wrestle with ways to approach problems and represent their ideas in precise language
- Low ceiling, high threshold

# Hypotheses

- The *CME Project* curriculum and professional development is educative for teachers on two levels:
  - in supporting their instruction, and
  - in providing opportunities to learn mathematical practices and content.
- The changes that teachers experience depends on several key factors:
  - their MKT,
  - teachers' use of the curriculum,
  - teachers' views about mathematics teaching, students, and the curriculum, and
  - teachers' professional context.

# Research questions

1. How may implementation be related to high school teachers' mathematical knowledge for teaching?
2. How may implementation be related to high school teachers' instructional practices?
3. What patterns are there in teachers' use of *CME Project?*
4. In what ways do teachers' beliefs and school contexts influence implementation and instructional practice?

# Study context

- Teacher sample:
  - 42 high school Algebra 1 teachers
  - First and second years of implementation
  - Range of teaching experience
  - 62% held Master's degrees
- School sample:
  - 18 high schools in 10 districts across 5 states
  - School locations: 11 urban, 6 suburban, 1 rural
  - Average 58% students eligible for free/reduced-price lunch
- Moderate level of curriculum-focused PD was provided

# Constructs and Measures

| | |
| --- | --- |
| MKT | Content Knowledge for Teaching Algebra (MET Study) (T1-T3)<br>Knowledge of Algebra for Teaching (T2-T3)<br>MHoM Knowledge Assessment (T1-T2-T3) |
| Textbook Implementation | Table of Contents chapter surveys (8 times/year)<br>Textbook Use Diaries (10 days/year) |
| Instructional Practice | Instructional Quality Assessment (IQA) Mathematics - Academic Rigor rubrics – lesson observation and student work collections (fall & spring/year) |
| School and District Supports | Administrator interviews (each year)<br>Teacher surveys (each year) |

# Table of Contents Survey Excerpt

## Table of Contents Chapter 8

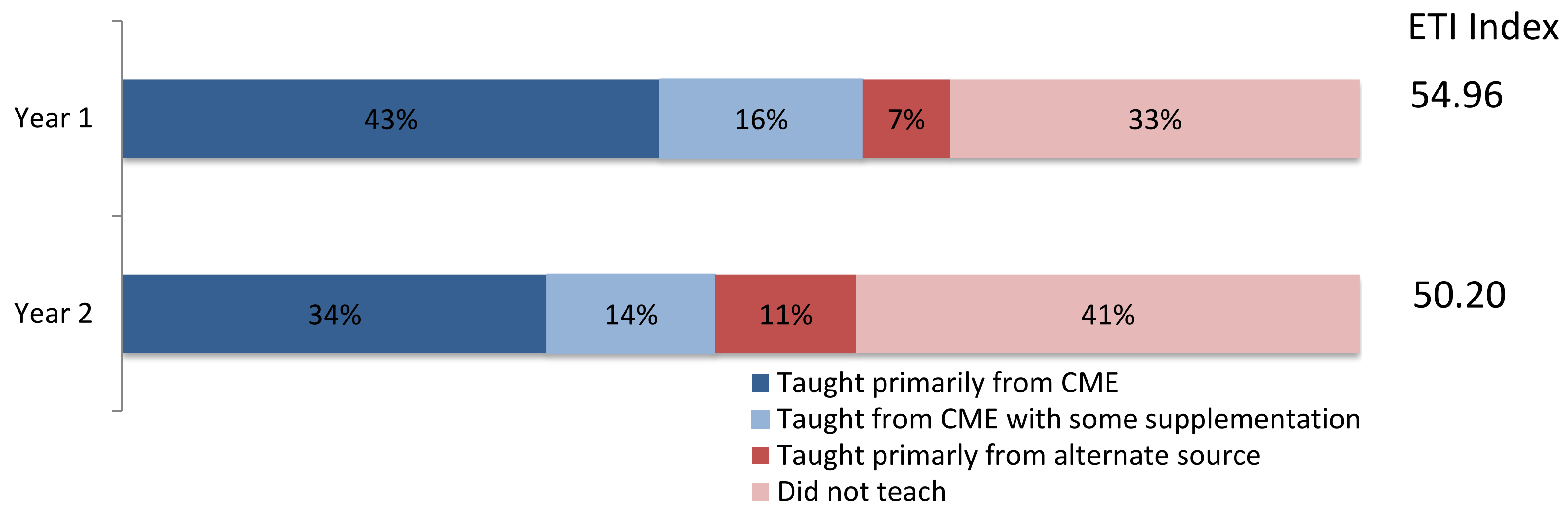
**4. Investigation 8A - The Quadratic Formula. Please indicate the option that best describes your use of the CME Algebra I textbook for each lesson in Investigation 8A.**

| | Taught primarily from CME textbook | Taught from CME textbook with some supplementation | Taught primarily from alternative(s) to CME | Did not teach |
|---|---|---|---|---|
| **8.1** Getting Started | ○ | ○ | ○ | ○ |
| **8.2** Making it Formal -- Deriving the Quadratic Formula | ○ | ○ | ○ | ○ |
| **8.3** Going the Other Way -- Building a Quadratic Equation From Its Roots | ○ | ○ | ○ | ○ |
| **8.4** Factoring Nonmonic Quadratics | ○ | ○ | ○ | ○ |
| **Mathematical Reflections** | ○ | ○ | ○ | ○ |

**5. If you used materials other than the CME textbook to teach any of the lessons in Investigation 8A, please describe the materials you used and your reasons for using them.**

# Textbook Implementation Findings

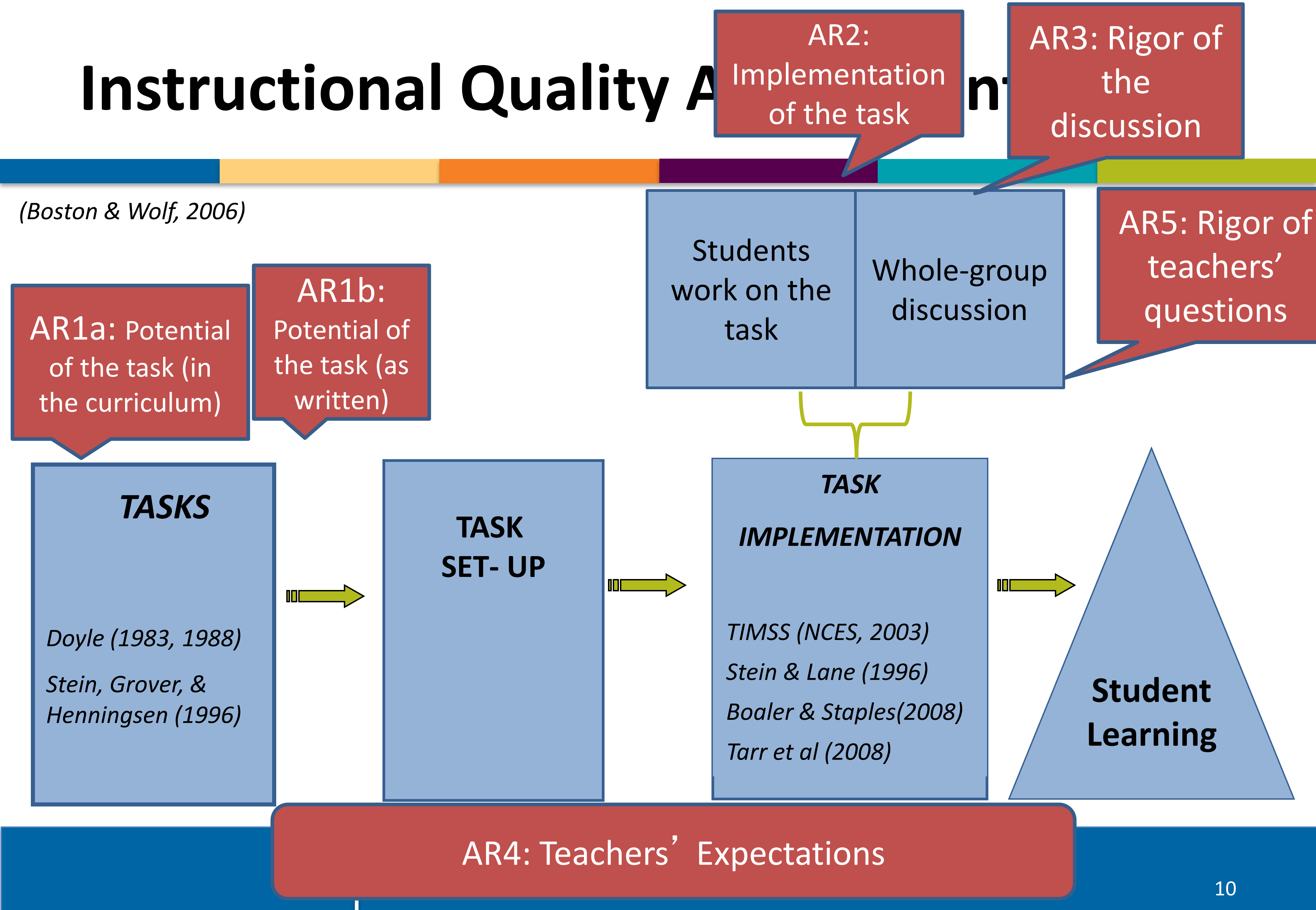
*ETI Index: Extent to Which Textbook Content is Taught Directly from the Textbook*




- Higher incidences of skipping and supplementing CME in Year 2, suggesting teachers were more intentional in use decisions.
- Chapter-level ETI indices show levels of supplementation were higher in later chapters in Year 1 and more uniform across all chapters by Year 2.

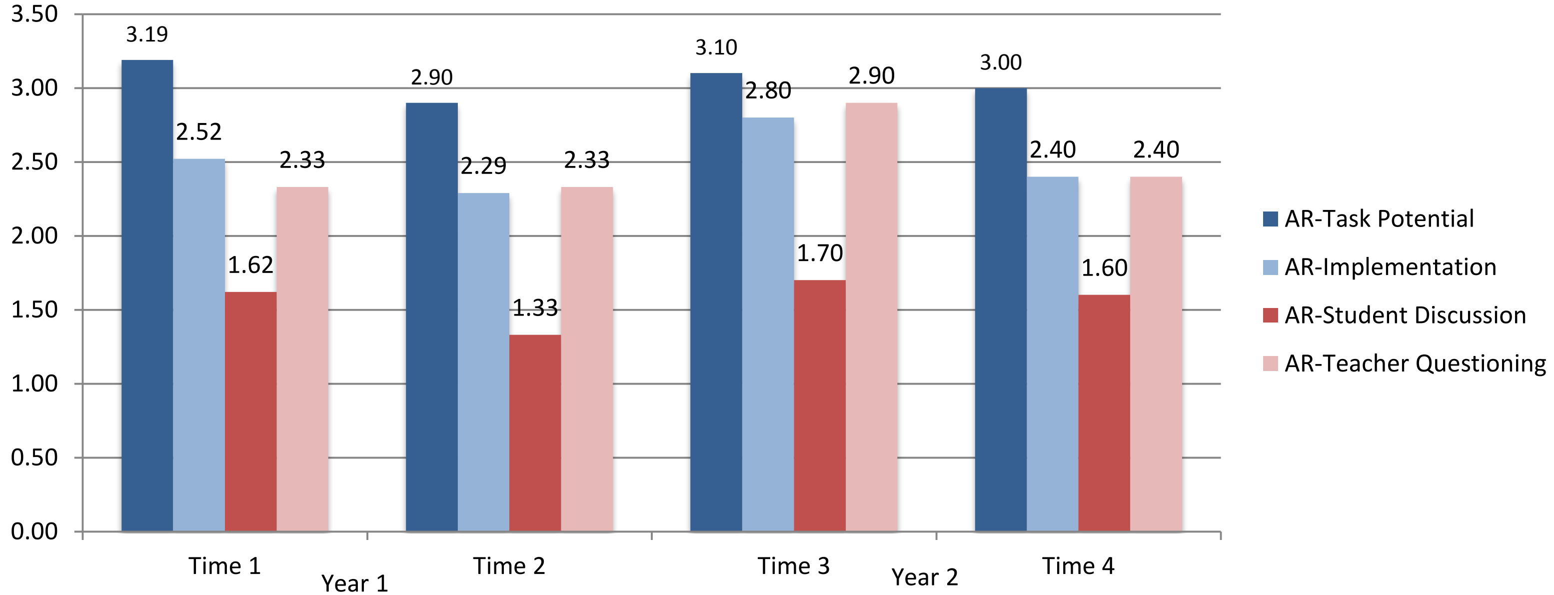
# Instructional Quality A n

(Boston & Wolf, 2006)



# IQA Lesson Observations Analysis

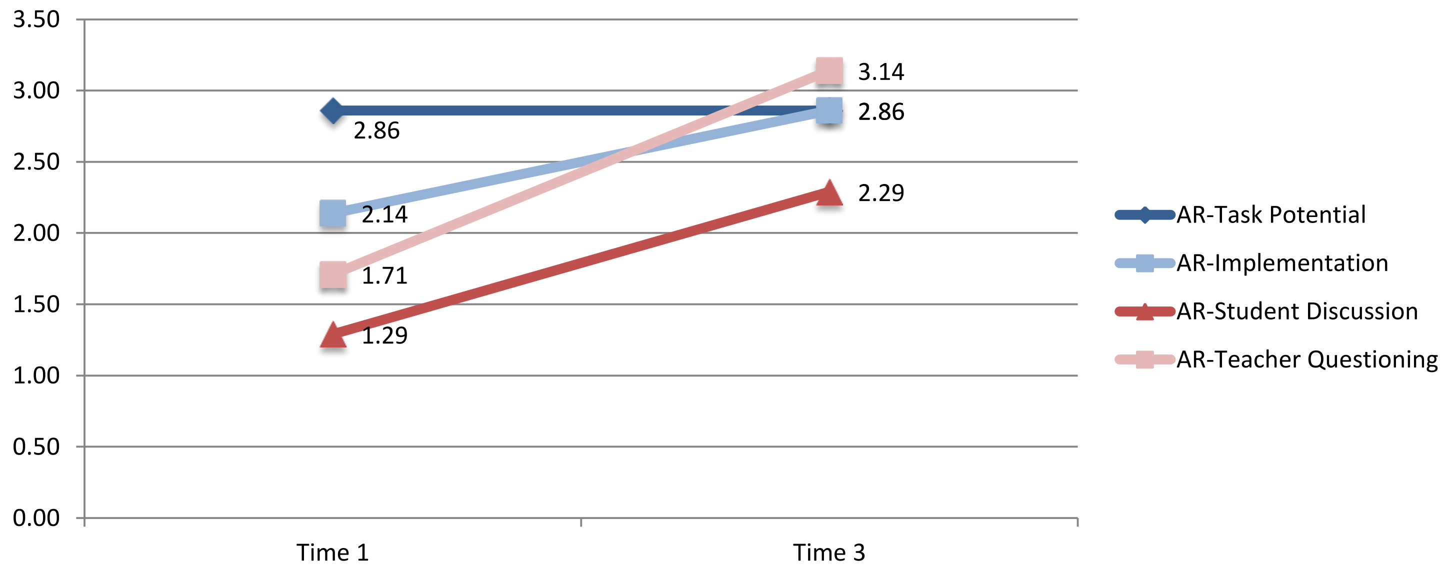
*Mean of IQA Lesson Observations based on highest rated task per teacher at each timepoint (n=21 in Year 1; n=10 in Year 2)*




More teachers were able to sustain high rigor implementation and ask rigorous questions in the fall of their second year of use (Time 3).

# IQA Lesson Observations Analysis

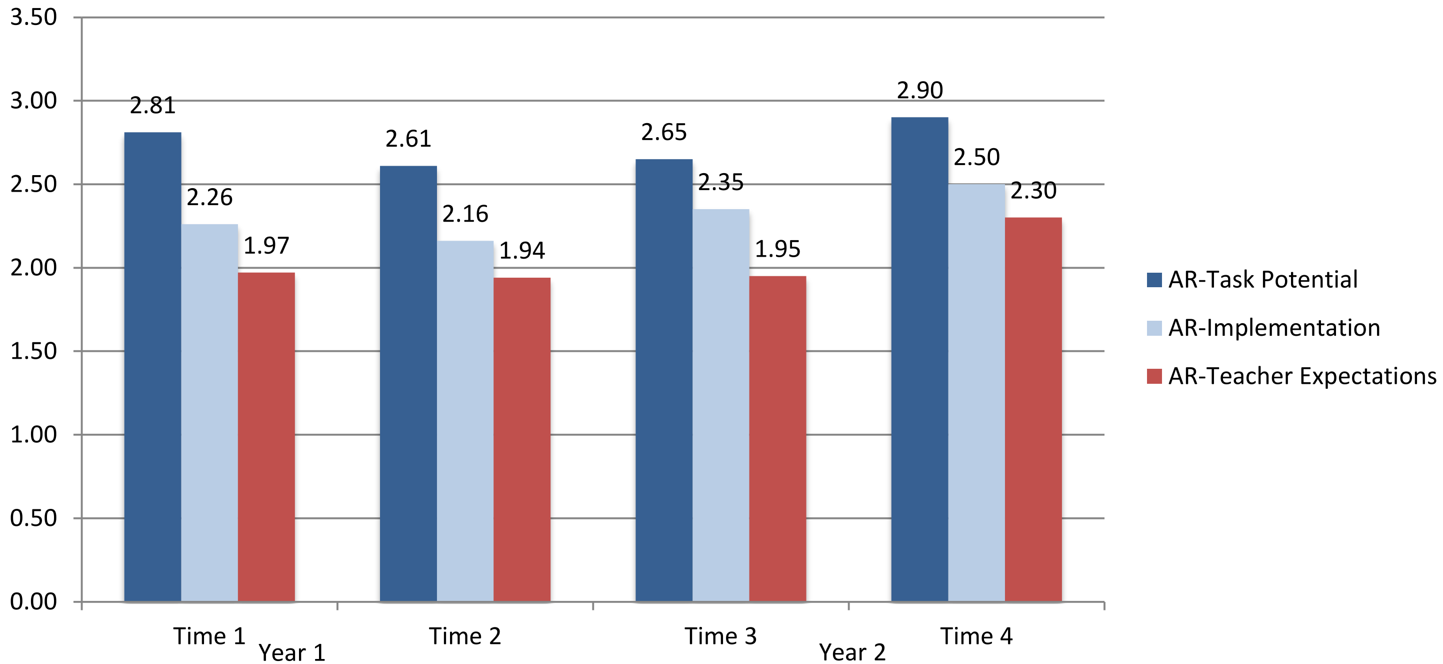
*Mean of IQA Lesson Observations based on highest rated task per teacher at each timepoint (teachers with complete data, n=7)*




Results of a paired sample t-test show significant improvement in Student Discussion and Teacher Questioning, with Implementation approaching significance by Fall of Year 2 (Time 3).

# IQA Student Work Collection Analysis

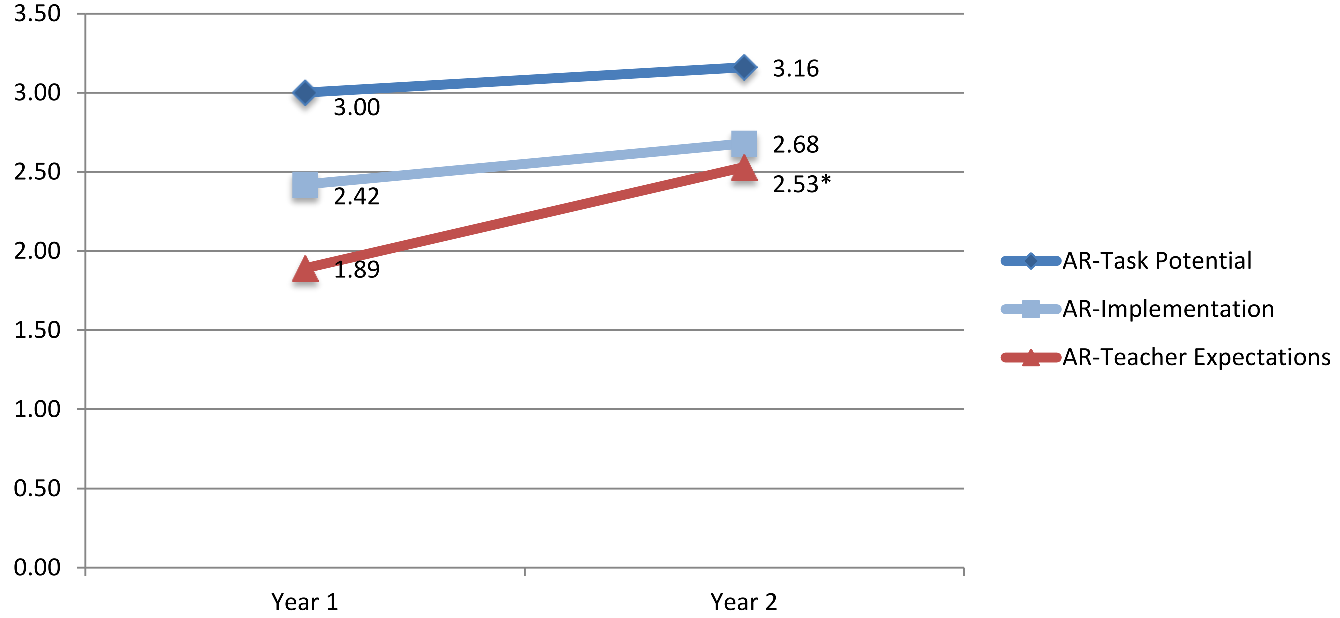
*Mean of IQA Student Work Ratings based on highest rated task per teacher at each timepoint (n=31 in Year 1; n=20 in Year 2)*




Across the sample, 38% of the highest rated assignments were from CME; other sources included "ramp up" materials and teacher-created worksheets.

# IQA Student Work Collection Analysis

*Mean of IQA Student Work Ratings based on highest rated task per teacher per year (teachers with complete data, n=19)*




Results of a paired samples t-test indicates that Teacher Expectations ratings were statistically significantly greater in their second year of use.

# Patterns in IQA Lesson Observation

*Maintenance of Cognitive Demand Across Fall & Spring timepoints in Year 1 & Year 2*

| | No. teachers | | |
|---|---|---|---|
| | Year 1 | Year 2 | Years 1- 2 |
| Pattern Group | (n=21) | (n=10) | (n=7)* |
| Maintenance | 4 | 3 | 2 |
| Maintenance Improved | 1 | 1 | 2 |
| Maintenance Declined | 5 | 4 | 0 |
| No Evidence of Maintenance | 11 | 2 | 2 |

# A Closer Look at Teacher Cases (n=7)

## Maintenance or Improved Maintenance

## Maintenance Declined or Not Present

Teachers described learning new approaches to content and developing new perspectives about mathematics and their students, providing examples of students' conceptual understanding and/or making mathematical connections.

- Enactment of GPTs and MHoM were discussed at a higher frequency
- Textbook implementation increased in 2$^{nd}$ year, especially of critical lessons

- More challenges were described during implementation, e.g., pacing, alignment with state test, engaging students
- Lower textbook use in the 2$^{nd}$ year, high levels of supplementation

# Remaining Questions

1. What are the different pathways to instructional improvement?
2. Given the wide variation in textbook coverage and use of CME, is it reasonable to expect high fidelity to curriculum?
3. How can more effective curriculum use be supported at scale?
4. Is there a "critical period" for educative curriculum to take root in teachers' practice?

# Supporting teachers' use of ambitious instructional materials

Erin Henrick and the MIST Team

Vanderbilt University

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# MIST

## Design-research Research Practice Partnership

### PI and Co-PIs

- Paul Cobb, Erin Henrick, Ilana Horn, Vanderbilt University
- Kara Jackson, University of Washington
- Thomas Smith, University of California- Riverside

**2007-2011**
4 large urban districts
360,000 students
**2011-2015**
2 large urban districts
180,000 students

### Project Goals

- Add value to partner districts improvement efforts
- Generate knowledge regarding what it takes to improve middle-grades mathematics teaching and learning at the scale of large, urban districts.

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# Shared goals and vision

<u>Goals for Student Learning</u>

- Develop both conceptual understanding of key mathematical ideas and procedural fluency in a range of mathematical domains
- 

<u>Vision of High Quality Mathematics Instruction</u>

- Cognitively demanding tasks
- Students engaging in disciplinary practices such as explaining their reasoning and justifying solutions strategies

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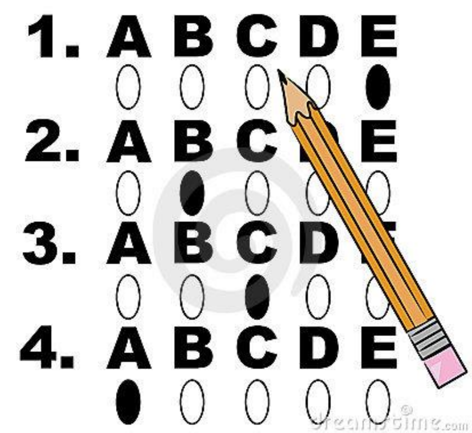
# District Improvement Strategies

- Reform-oriented Curriculum
- Teacher Collaborative Time
- Professional Development
- Mathematics Coaches
- Instructional Leadership

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# Participants and Data

<u>Approximately 200 participants a year</u>

- Teachers
- Coaches
- School Leaders
- District Leaders

<u>Measures</u>

- Instructional Quality
- Mathematical Content Knowledge
- Vision of High Quality Mathematics Instruction
- Type and Quality of School and District Supports

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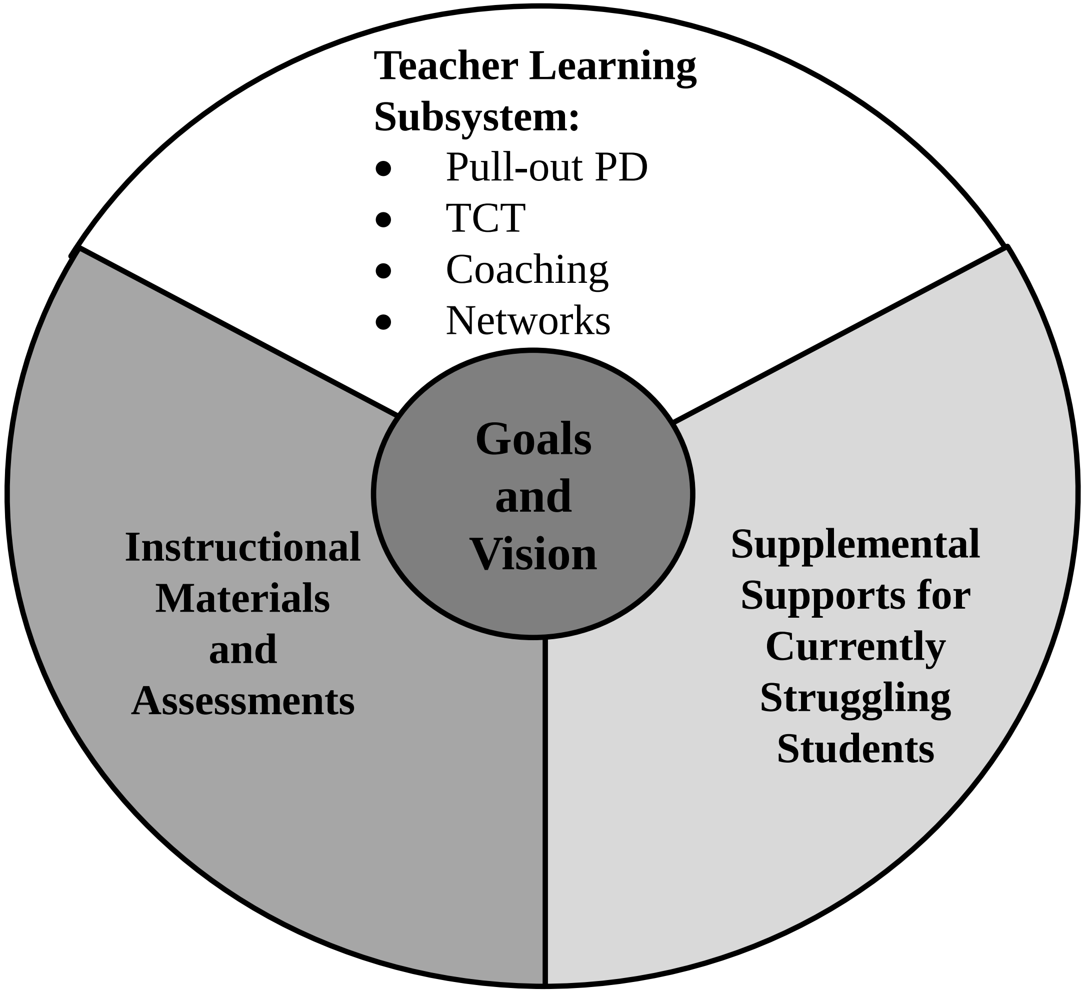
# Theory of action for instructional improvement in mathematics

- Coherent instructional system
- School leaders’ practices as instructional leaders in mathematics
- District leaders’ practices in supporting the development of school-level capacity for instructional improvement

# Elements of a Coherent Instructional System

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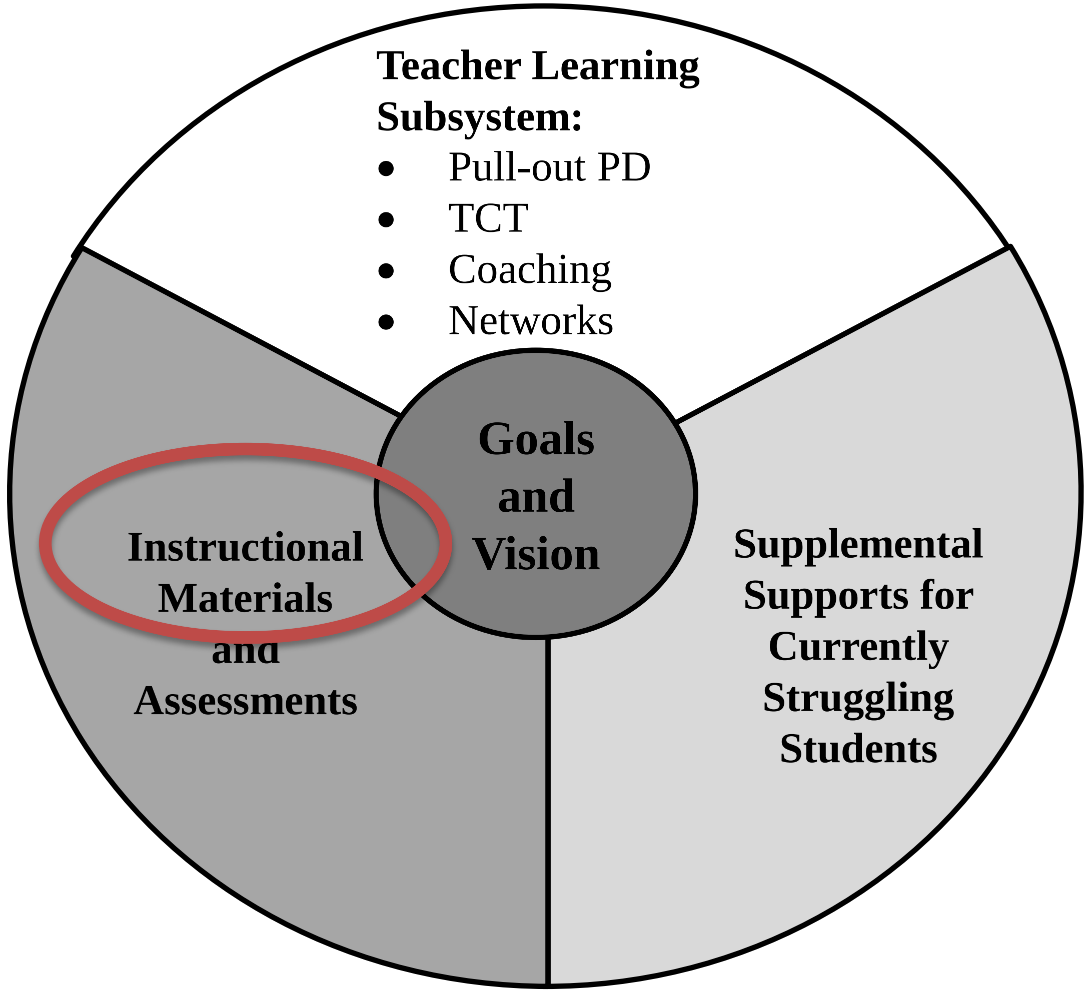
# Elements of a Coherent Instructional System

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# What impacts use of instructional materials?

Teacher Beliefs

Textbook Adoption Process

Standards and Assessments

School Leader Expectations

**Instructional Materials**

Instructional Coach Expectations

Teacher Collaboration

Experience with Inquiry Oriented Instruction

Kids' Previous Learning Experiences

Lesson Planning

Professional Development

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MIDDLE SCHOOL MATHEMATICS AND THE INSTITUTIONAL SETTING OF TEACHING

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Survey Scale

## To what extent is the primary mathematics curriculum at your school consistent your personal beliefs about effective teaching methods?

| Y1-4 | Dist A | Dist B | Dist C | Dist D |
|---|---|---|---|---|
| % teachers answering to a "great" or "moderate" extent | 92% | 57% | 79% | 77% |
| Number of teachers | 112 | 120 | 115 | 126 |

# What impacts use of instructional materials?

Teacher Beliefs

Textbook Adoption Process

Standards and Assessments

School Leadership

**Instructional Materials**

Instructional Coaching

Teacher Collaboration

Professional Development

Experience with Inquiry Oriented Instruction

Kids' Previous Learning Experiences

Lesson Planning

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# Pull-out PD

## Challenges

- Expertise of facilitator
- Range of teacher needs
- Often voluntary
- Other district initiatives

## Potentially Productive Practices

- "Just-in-time" PD focused on planning for and addressing key student misconceptions for upcoming units

# Teacher Collaborative Time

**Challenges**

- Expertise of group
- Expertise of facilitator
- Expectations for time use
- Lesson planning routines are limiting

**Potentially Productive Practices**

- Facilitated by expert coach
- Large blocks of time set aside for unit planning
- Lesson planning involves thinking about 1) the math 2) what that means for instruction and 3) students thinking

# Instructional Coaching

## Challenges

- Expertise of coach
- Expectations of district and school leaders
- Support of school leader

## Potentially Productive Practices

- Facilitate teacher collaborative meetings
- Coaching cycle (plan, observe/co-teach, debrief)
- Focus on supporting teachers to maintain the rigor of the task

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# Case: Teachers are reducing the rigor of the task when they introduce it

- Teachers are proceduralizing high level tasks
  - Showing the students a strategy to use instead of providing an open-ended problem and facilitating group work/problem-solving
    - This is a problem because all of the students are solving the task using the same strategy
    - Discussion at the end of the class is not productive

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# Example of Coherent Teacher Learning System Strategy

District PD focuses on the importance of maintaining the cognitive demand of the task when introducing the task

During teacher collaborative time, teachers plan a lesson together and discuss how to maintain the rigor when introducing the task

When instructional coaches observe classroom instruction, they focus on how the teacher introduces the task to maintain the rigor

The coach helps the school leader determine the state of his math department related to introducing the task, and together they plan what supports are needed for individuals and the group

Based on feedback from the coaches and school leaders, the district PD facilitators design PD to support continued improvement

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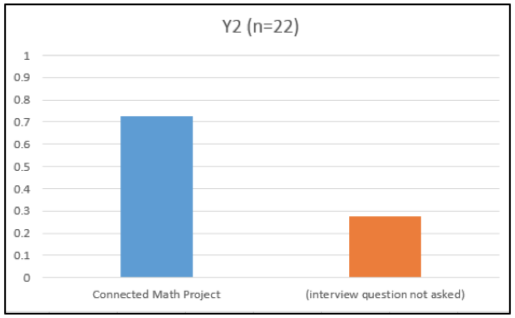
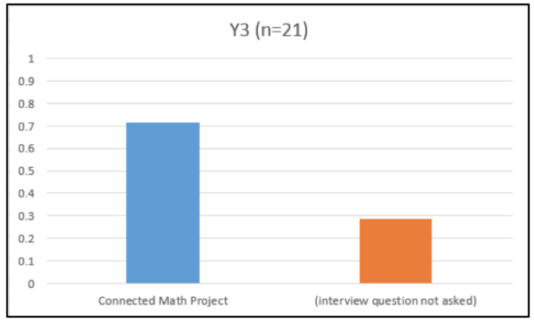
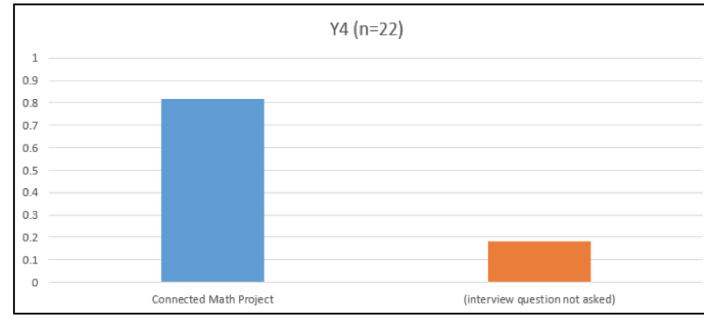
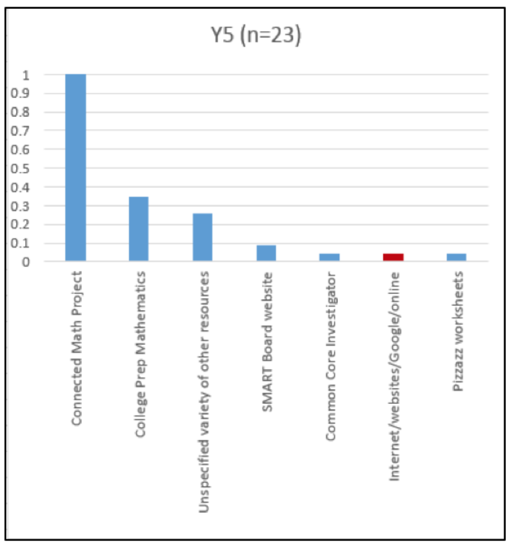
# FREQUENCIES SIX YEARS, FIVE SCHOOLS, ONE DISTRICT

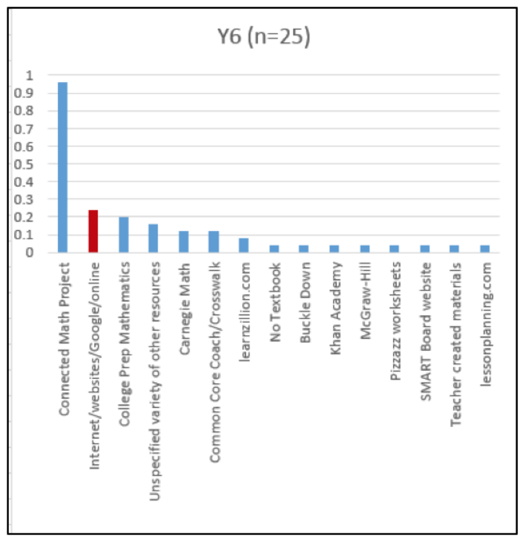
TEACHERS REPORTING USING THESE RESOURCES

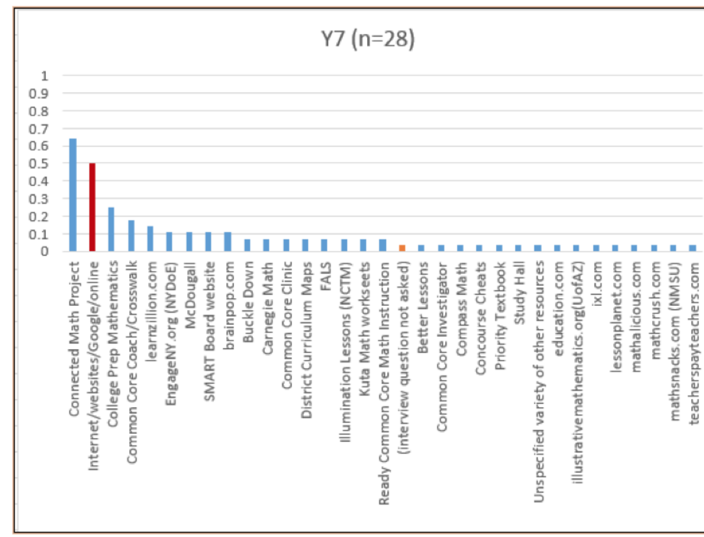


# TEACHERS THEMES

## POST CCSSM IMPLEMENTION

**Third Year** of Common Core Adoption, study year 7

- I think that's part of the adjustment that we as teachers have to make is that there, you know, it doesn't say, "Go to page 15 for Standard 6.NS.1," you know? It is - **we have to find what aligns better. So the freedom's good. I like the freedom.** But at the same time, it's kinda like it went from, "This is what you do," to, "Oh you can do anything." (laughs) [Diana]

- It's just it is **very difficult to find the resources** to, you know, like the workbooks that go along with [CCSSM]. What I liked about CMP is that, you know, they could do a little exploring on their own, and kinda make it more in depth, but, you know, sometimes I, **I feel like I've become a worksheet queen.** [Julia]

- I like that I'm not bound down to a book that's not aligned to the Common Core. **I dislike that I don't have a book that is aligned to the Common Core**, and that I have to pull from all kind of different things. I mean **it's time consuming.** [Tyler]

Papers, redacted feedback reports, interview protocols, surveys

Downloadable at:

http://vanderbi.lt/mist

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