# Fidelity and Beyond: Developing and Using Implementation Evidence in Research and Development Projects

RESEARCH + PRACTICE COLLABORATORY

# Fidelity and Beyond: Developing and Using Implementation Evidence in Research and Development Projects

exploratorium®

# Common Guidelines
## (IES & NSF, 2013)

| Type of Research | Focus of Implementation Research |
|---|---|
| Design and development | Develop measures with evidence of technical quality for assessing the implementation of the intervention in an authentic education delivery setting<br><br>Develop evidence demonstrating the project's success in implementation (feasibility of implementation) |
| Efficacy, impact, and scale-up | Study reports should document implementation of both the intervention and the counterfactual condition in sufficient detail for readers to judge applicability of the study findings.<br><br>Identify the organizational supports, tools, and procedures that were key features of the intervention implementation. If no evidence of a favorable impact is found, the project should examine possible reasons (e.g., weaknesses in implementation, evidence that raises questions about particular aspects of the logic model). |

# Panelists

Bill Penuel (Moderator)

*University of Colorado Boulder*

Sara Heredia

*University of Colorado Boulder*

Jessica Rigby

*University of Washington*

Jennifer Russell

*University of Pittsburgh*

# Why “Beyond Fidelity”?

- Fidelity addresses the question, “Is it possible?”
- If the answer is “no,” then it is difficult to know why, if implementation research focuses only on whether teachers implemented.
  - Needed are methods for identify the learning problems local actors face
  - Needed are theories relevant to different levels of organization in schools.

# Studying Implementation

Policy and implementation research offer multiple lenses for studying implementation:

- Individual-Personal (self-efficacy, knowledge for teaching, stages of concern)
- Interpersonal (social norms, informal collegial interactions)
- Organizational (alignment, competing institutional goals and priorities)

# Informing Design

- Design supports to help teachers address some of the challenges to implementing innovations that can be anticipated based on past evidence (Weinbaum & Supovitz, 2010).
- Adapt professional development on the basis of variation in implementation (Harris, Phillips, & Penuel, 2012).

# Your Questions

# For More Resources

http://researchandpractice.org

http://learndbir.org

Design Based Implementation Research

# SCIENCE TEACHERS' COLLECTIVE SENSEMAKING: A CONCEPTUAL AND ANALYTIC FRAMEWORK FOR UNDERSTANDING IMPLEMENTATION

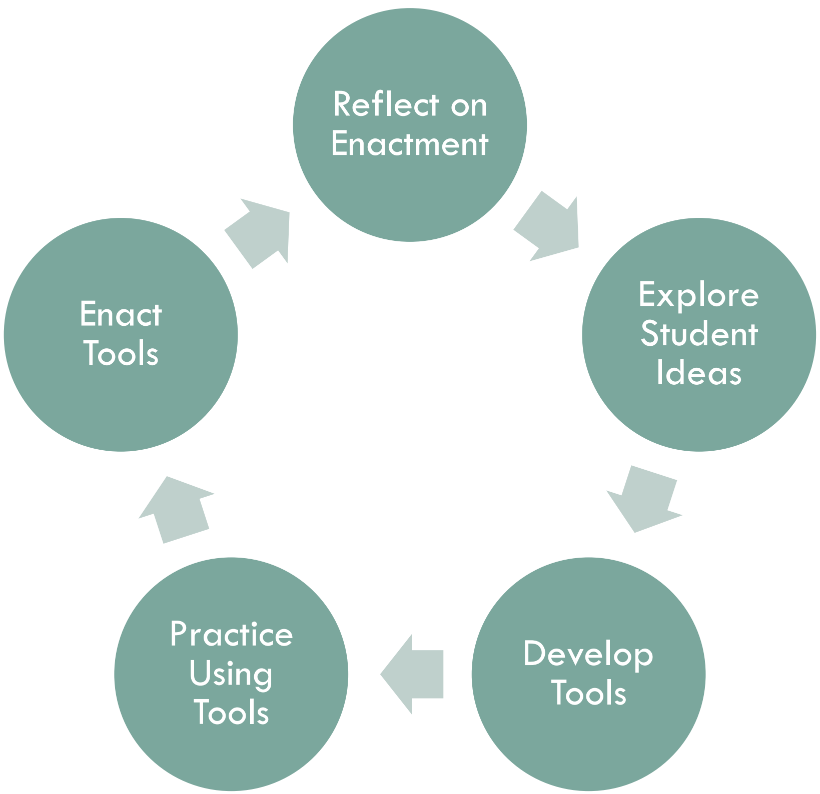
Sara C Heredia

University of Colorado, Boulder

ELEVATE

PI Dr. Erin Furtak
University of Colorado, Boulder





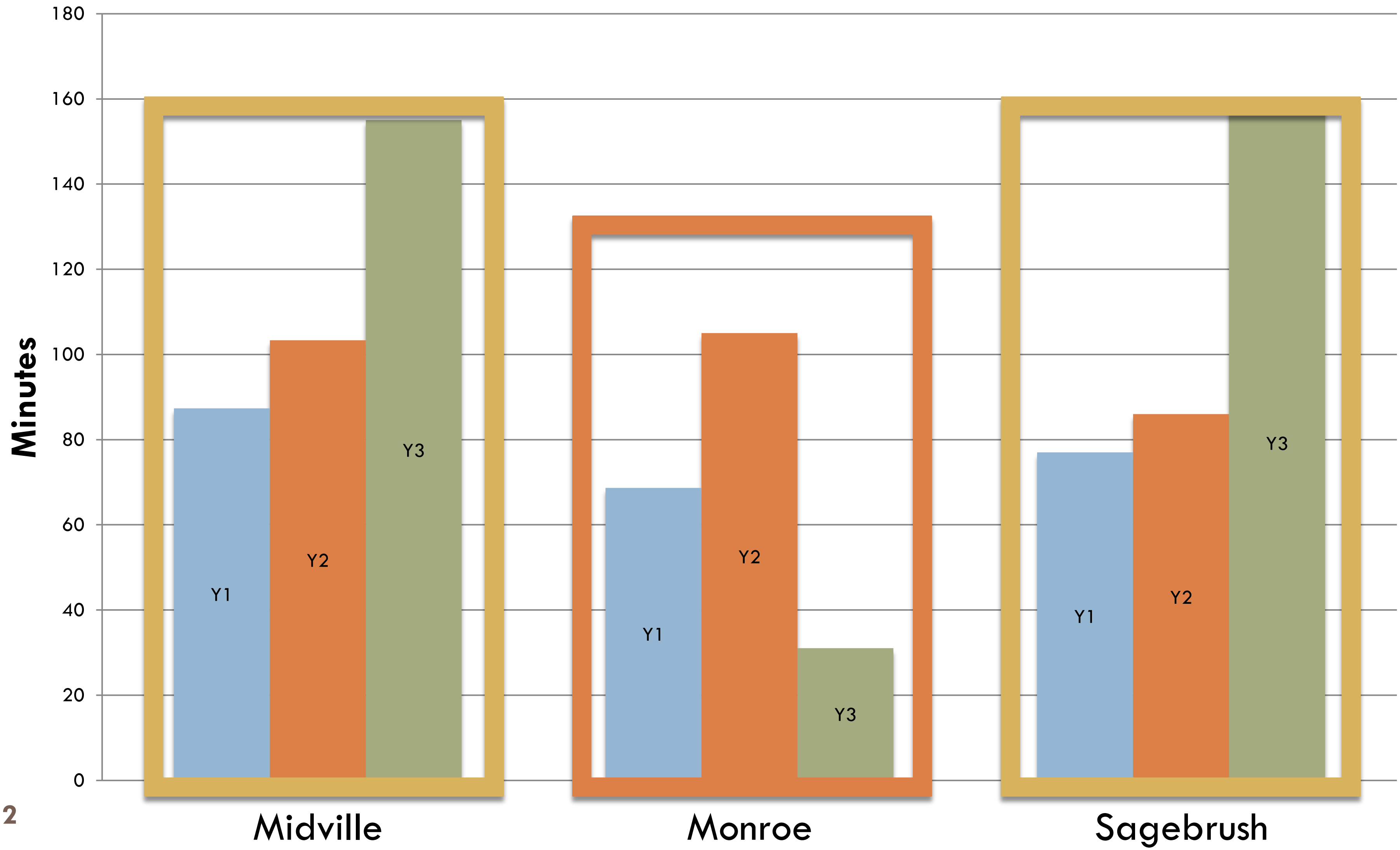

## Sequencing of 'correct' ideas

Increasingly sophisticated ideas

| Random Mutations | Transformationist incorrect | Variation |
|---|---|---|
| Environment causes change with genetic basis | Transformationist ideas | Variation - unclear or vague |
| Unclear or Vague | Unclear usage of 'adapt to environment' | No variation |
| Trait not present | No transformationist ideas | |

Grant No. 0953375

# Average number of minutes each teacher spent using formative assessment tools in the classroom during the evolution unit each year



# Sensemaking



- Reorganization of activity after change to work environment
- Retrospective and prospective communication
- Ambiguity and uncertainty

(Weick, 1995)

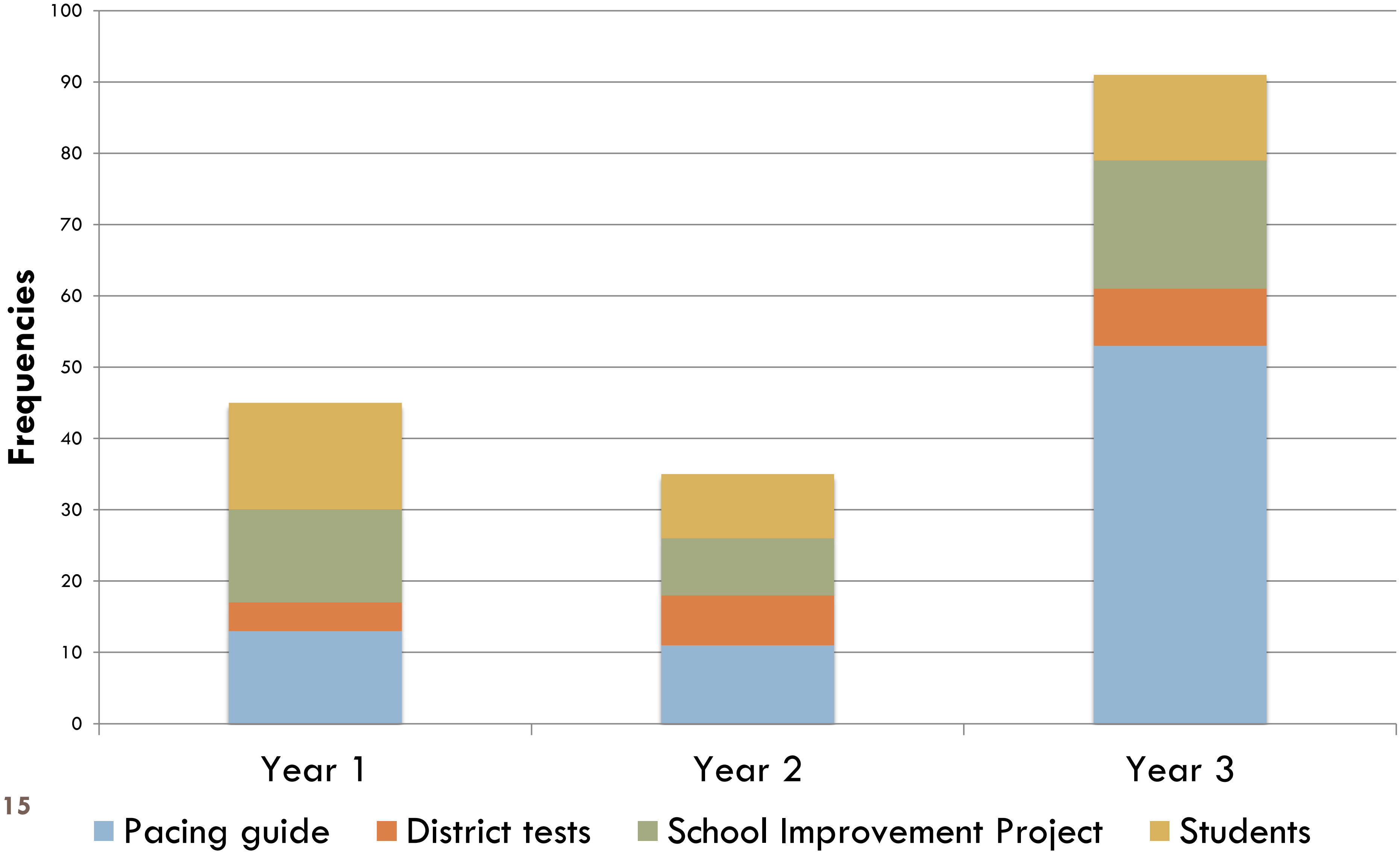
# Teachers' collective sensemaking



- Interpret and act on messages about reform
- Resources for sensemaking include:
  - Perceptions about teaching and learning
  - Experiences with reform
  - Shared understanding of their students and their school/district

(Coburn, 2001; 2004; Spillane et al. 2002)

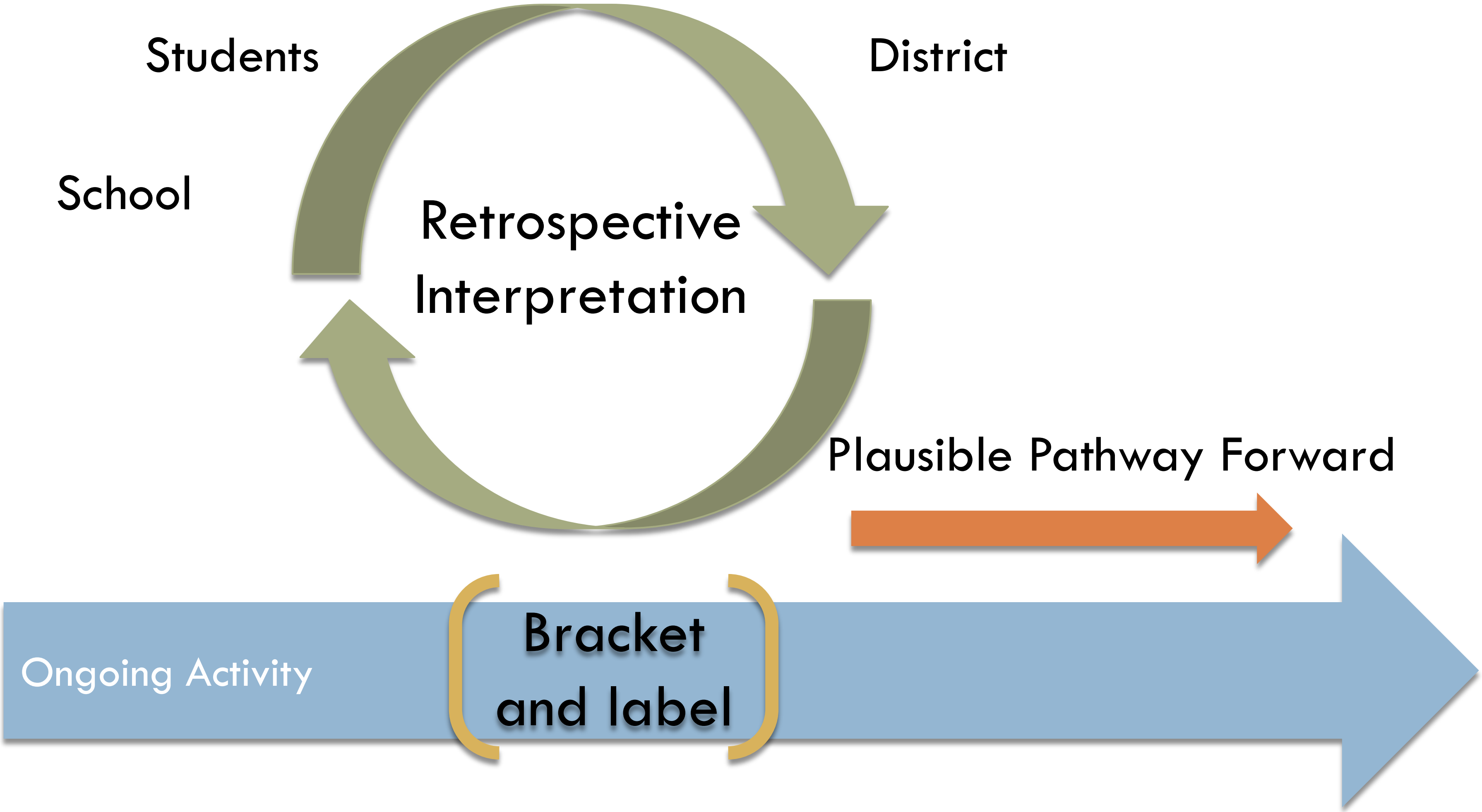
# Count of teachers' references of organizational aspects of their work environment in professional development meetings at Monroe



| Year of PD | Change | Uncertainty or Ambiguity |
| --- | --- | --- |
| 1 | The pacing guide changed from 9 to 6 units of instruction across the school year and moved Evolution to the end of the year. | Teachers were unsure what they needed to teach in the first part of the school year and then were confused about what was left out |
| 2 | Kim left the school and Pamela (physics teacher) took over as lead science teacher. The planning responsibility shifted to Donna | How students would act or do during new types of activities. Donna in particular was concerned her students wouldn't focus and get work done. |
| 3 | The entire administration in Y1 and Y2 were fired and a new administrative staff was hired in their place. | Teachers talked a lot about the expectations for rigor and higher level thinking by the new administration and there was a lot of ambiguity about how that was measured and evaluated. |

# Process of sensemaking






(Weick, Sutcliffe & Obstfeld, 2005)

# Process of sensemaking



And to be honest I feel like although we didn't get to all of these [referring to pieces of learning progression]

PD meeting
October, year 1

Bracket and label

# Process of sensemaking



Retrospective Interpretation

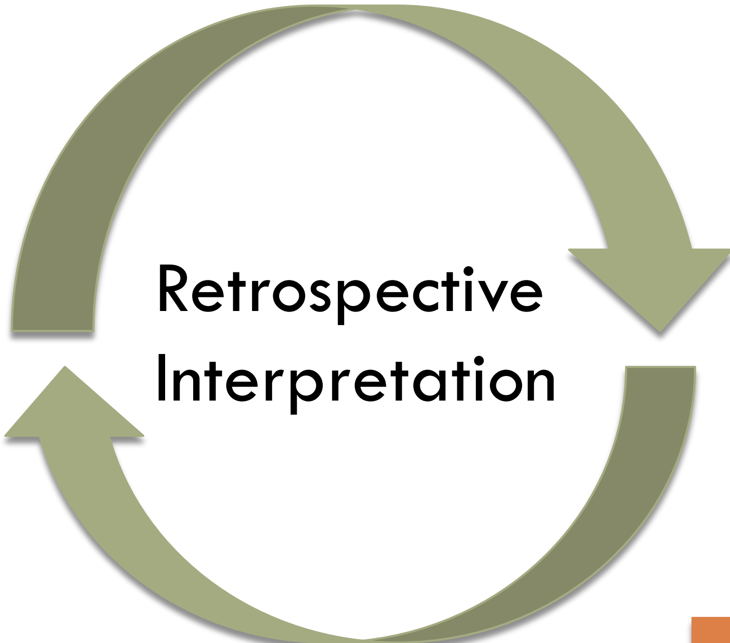
"we had what 2, 3 weeks to teach evolution…we were spending like one day sometimes on these big things so and then having to move on and feeling the crunch and not having enough time to really focus on and I know that's something we've always dealt with. Do we just do surface level on lots of things or do we go deep on a few?"

PD meeting
October, year 1

Bracket and label

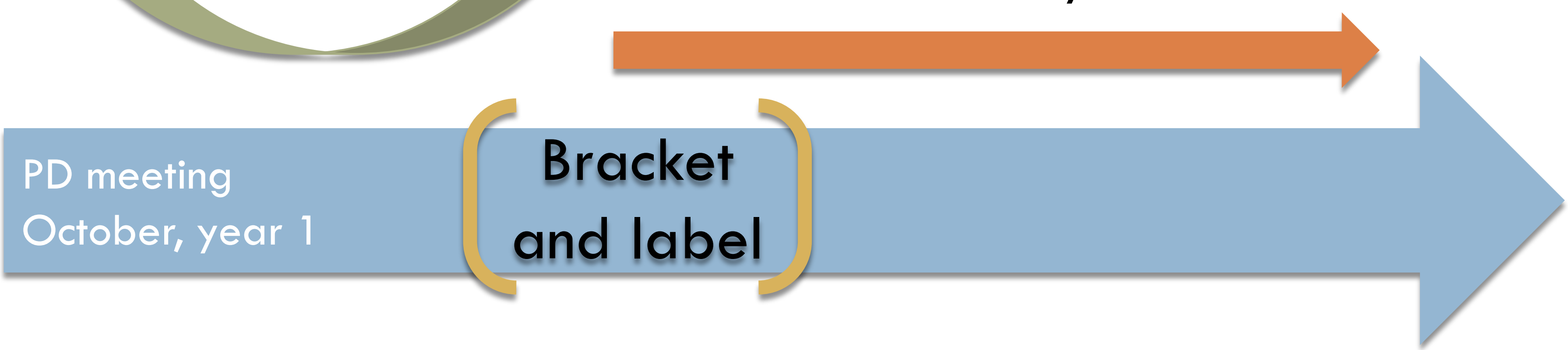
# Process of sensemaking






I think that's going to make a big difference this year because we aren't doing deep surface on a lot we are going to be doing deep on a few.

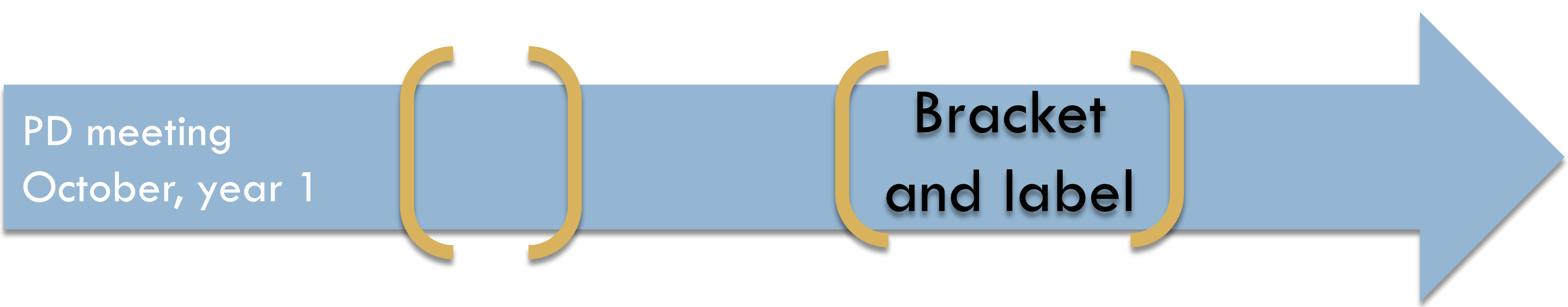
Plausible Pathway Forward



# Process of sensemaking



Well and without having seen the [pacing guide] as far as it goes with natural selection, evolution, it's hard to pick where we should go



## Year 1 planning tool

| | |
|---|---|
| *Step 1: Setting Learning Goals* | |
| Science content | |
| Overarching learning goal | |
| Big idea question | |
| Supporting learning goal | |
| *Step 2: Finding Out What Students Know* | |
| Assessment purpose | |
| Placement in unit | |
| Assessment activity | |
| Data to be collected about student learning | |
| *Step 3: Anticipating Feedback* | |
| Probable student alternative conceptions | |
| Feedback ideas | |

## Learning Progression

| Random Mutations | Transforma-tionist incorrect | Variation |
|---|---|---|
| Environment causes change with genetic basis | Transforma-tionist ideas | Variation - unclear or vague |
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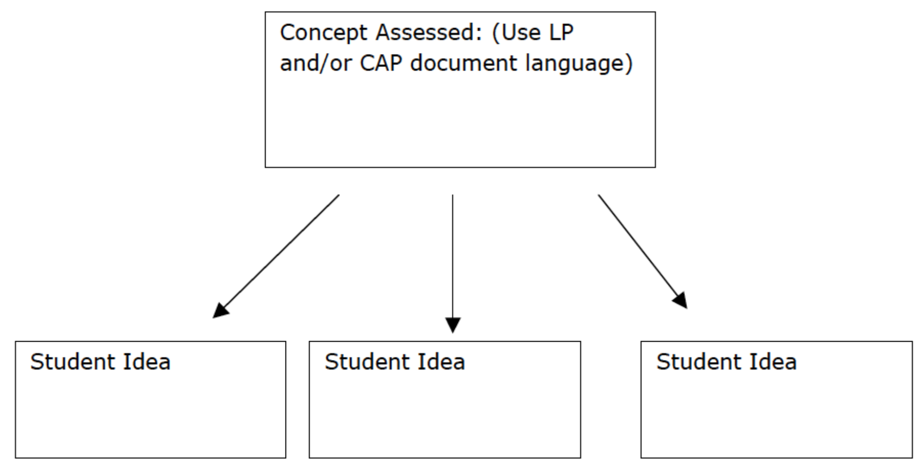
## Year 3 planning tool

Sample Data Analysis Plan

Formative Assessment:____________________



# Implications



- Supports localized design and implementation
- Local sources of ambiguity and uncertainty

# Acknowledgments



- Thank you to Bill Penuel and Erin Furtak for their feedback.
- I also want to thank the teachers at Monroe for their hard work and dedication to our professional development

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VANDERBILT Peabody College

# Teacher Learning Opportunities: changes in the framing of teacher instructional talk in collaborative meetings


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(soon to be University of Washington)

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Florida State University

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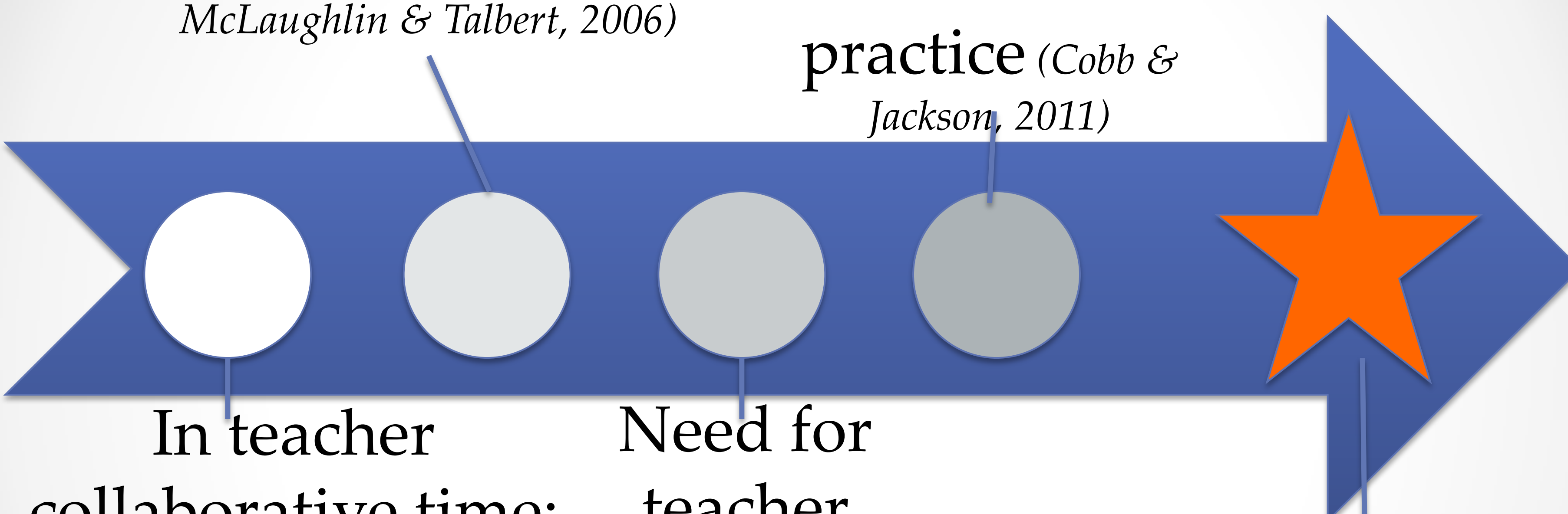
Michigan State University


MIST
MIDDLE SCHOOL MATHEMATICS AND THE INSTITUTIONAL SETTING OF TEACHING

One mechanism: teacher collaborative time *(Louis & Kruse, 1995; McLaughlin & Talbert, 2006)*

Significant reorganization of teacher practice *(Cobb & Jackson, 2011)*



In teacher collaborative time: opportunity to think about, talk about, and plan mathematics and math pedagogy conceptually

Need for teacher learning

*Big Picture Goal:* support district implementation of high quality, inquiry-oriented math instruction

# MIST: *Middle School Mathematics and the Institutional Setting of Teaching*

- What does it take to improve middle school mathematics instruction at the scale of a large urban district in the US?

- Relevant data sources:
  - *Interpersonal*: informal advice networks and audio transcripts

# Study Sample

- Case study (Yin, 2003): Creekside Middle School, 2009-2011
- Primary data sources:
    - Audio recordings of teacher collaborative time (TCT) focused on instruction
    - (Informal Advice Network Surveys)

# Conceptual Frame

Framing Theory *(Cress & Snow, 2000)*

**Diagnostic Framing:**

- How to help students learn math
- How to help students succeed on tests
- Students can not learn

**Prognostic Framing:**

- Adjust Instruction
- Cover topics
- Other

# Nature and Depth of Talk about Mathematics

*(Horn & Little, 2010; Stein & Lane, 1996)*

## *How Teachers Talked about Mathematics*

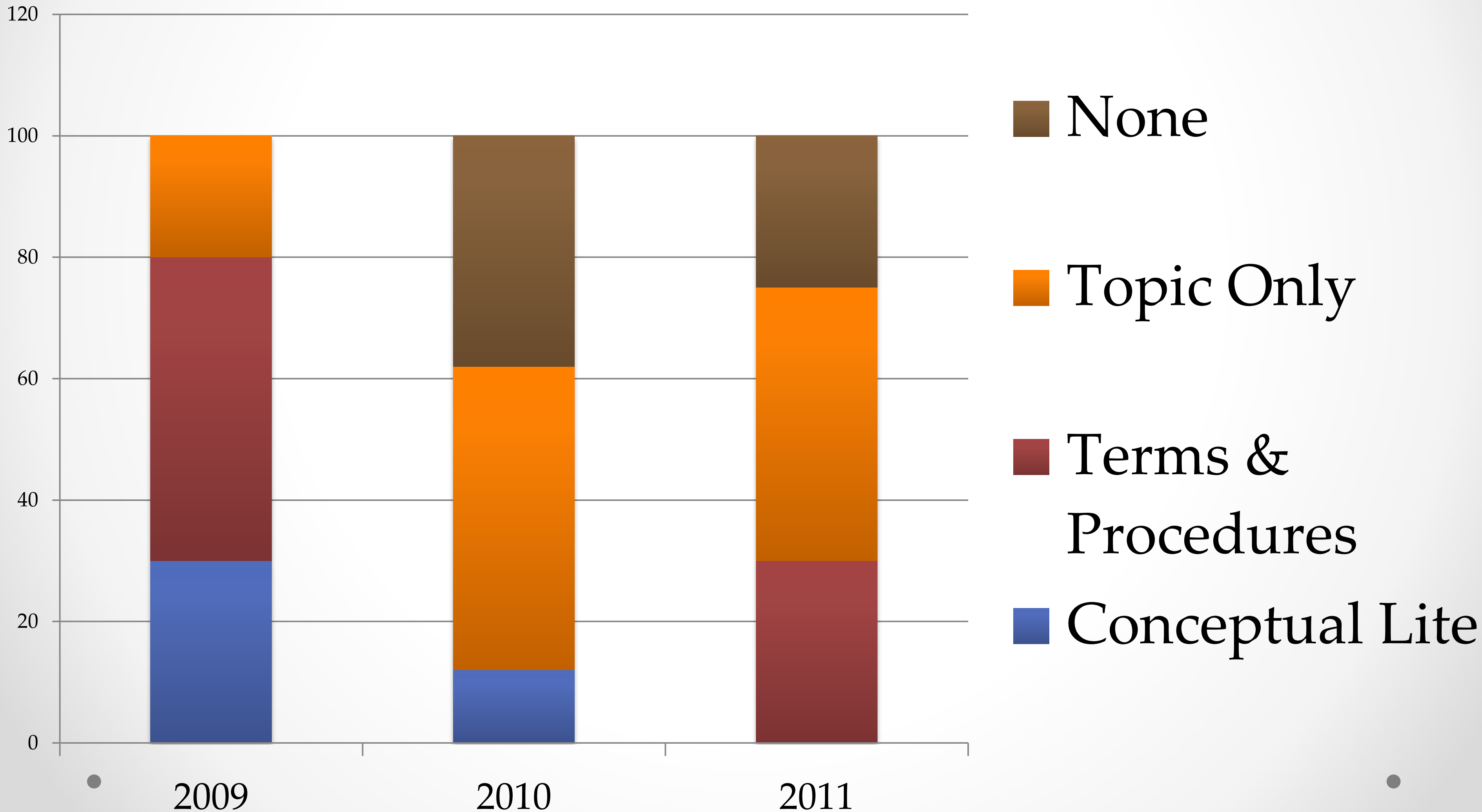
1) Concepts and Explanations
    a. *"Conceptual Lite"*
2) Terms and Procedures
3) Topic Only

# Methods: Analysis

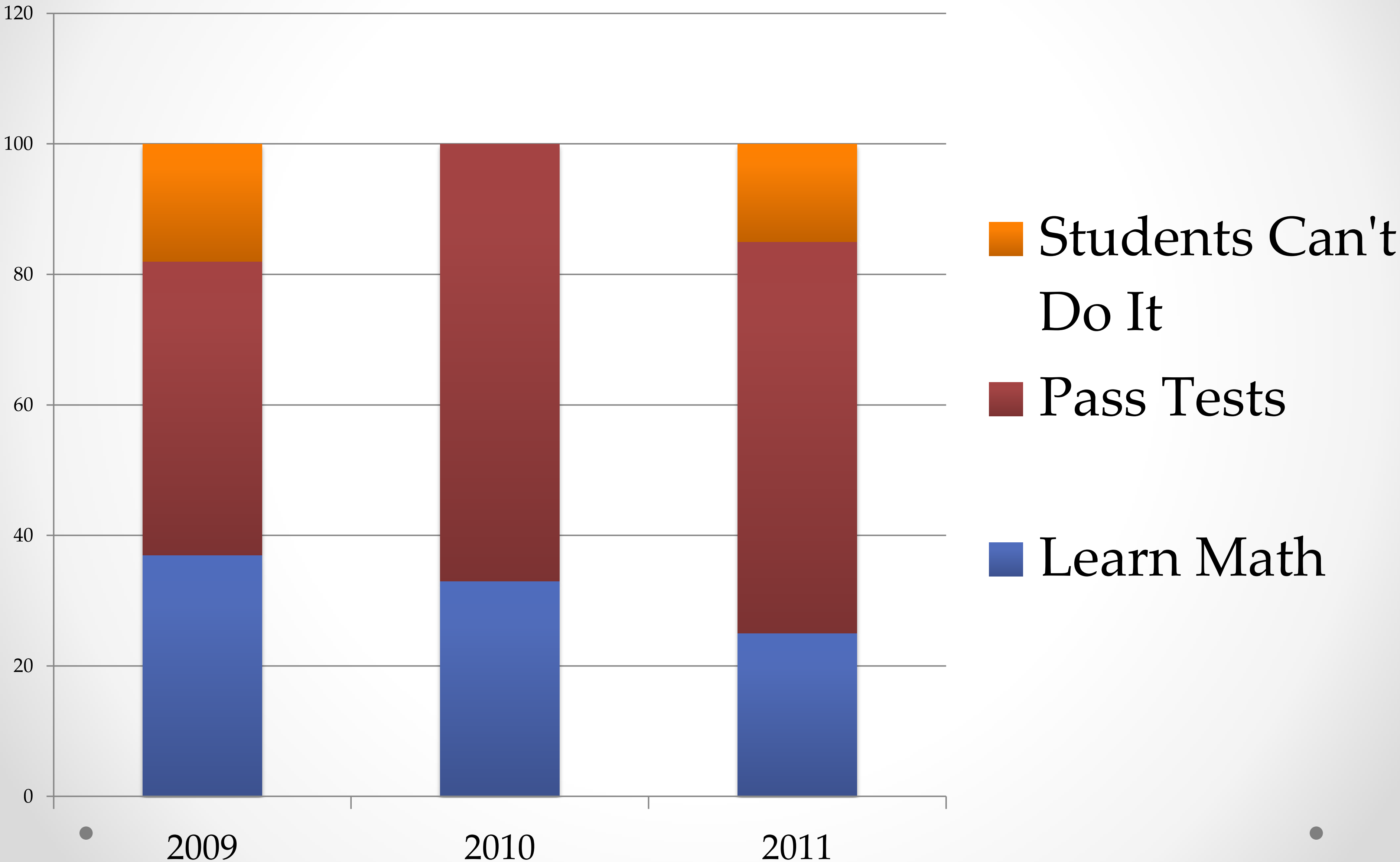
- Qualitative Analysis of Audio Transcripts:
  - *Coded in NVivo with deductive and inductive codes*
  - *Memos, matrices*

- Analysis of District Context
  - *Examined qualitative and quantitative data across all schools in the district over the same time period to contextualize the findings*

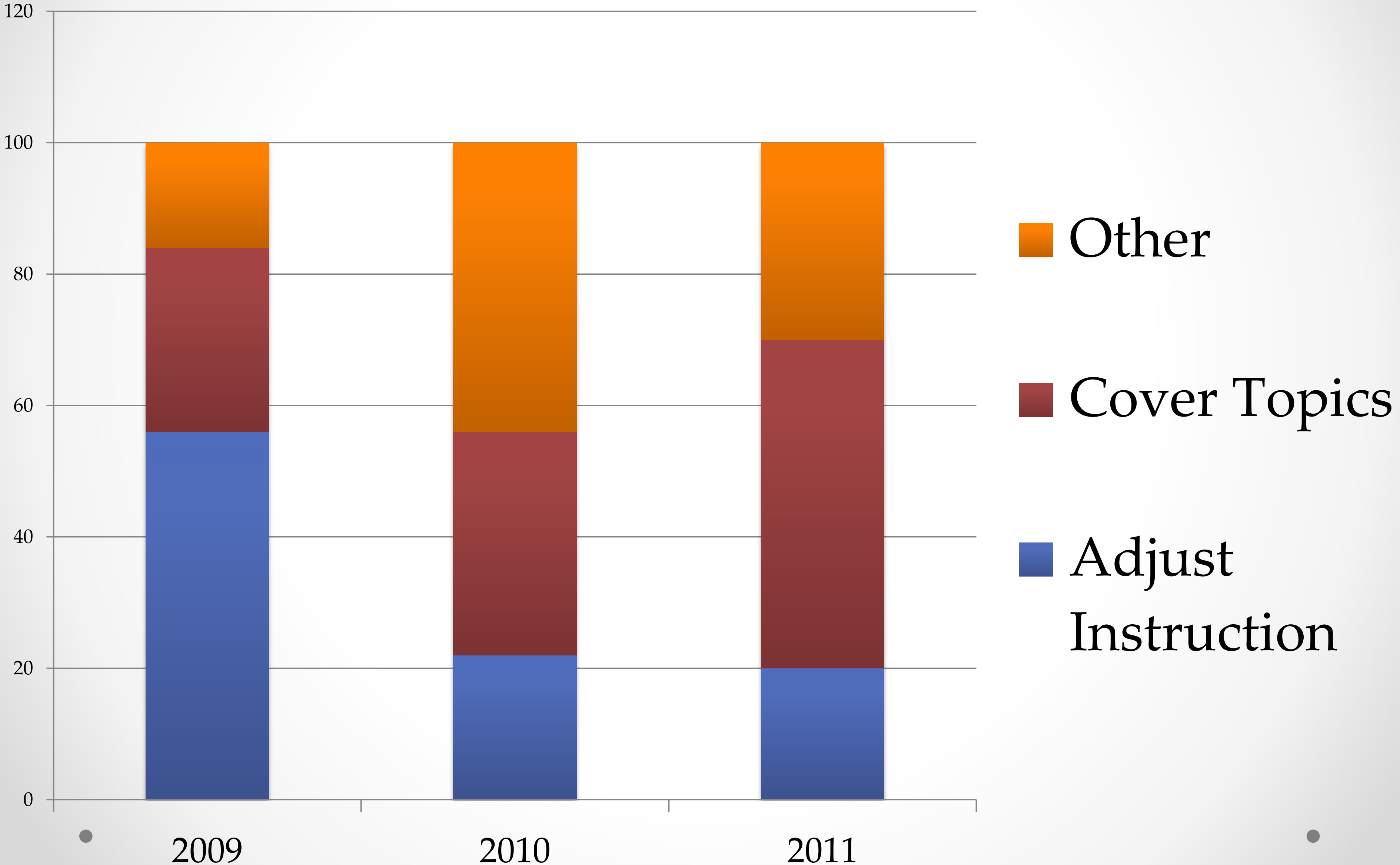
# Finding One:
## Content of Mathematics



# Finding Two: Prognoses



# Finding Three: Diagnoses



# Finding Four: Role of Administrator

Administrative Framing

Administrator Presence

# Implications for Design: *Teachers*

- Kind of math mattered
  - *Conceptual lite is unlikely to help students know how to apply mathematical concepts to standardized tests.*
  - *Given administrator (and district and federal) press on student success on standardized tests, teachers will likely revert to teaching procedures.*
  - *Need to build teacher capacity to concepts & explanations.*

# Implications for Design: *Administrators*

- Administrator press can shift teachers' attention
  - *Provide aligned PD for principals (and APs) as well as teachers, so that they are able to either*
    - *A) give substantive support in implementation (if they have deep content knowledge)*
    - *B) press for ambitious practices (if they don't have deep content knowledge)*

VANDERBILT Peabody College

# Thank you!

Jessica G. Rigby
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MIST
MIDDLE SCHOOL MATHEMATICS AND THE INSTITUTIONAL SETTING OF TEACHING

# Social resources for the implementation of ambitious instructional reform

**Jennifer Lin Russell**
University of Pittsburgh

# Scaling Up Mathematics Study

- NSF-funded longitudinal study of the implementation of **ambitious mathematics curricula** in two urban district: Region Z & Greene

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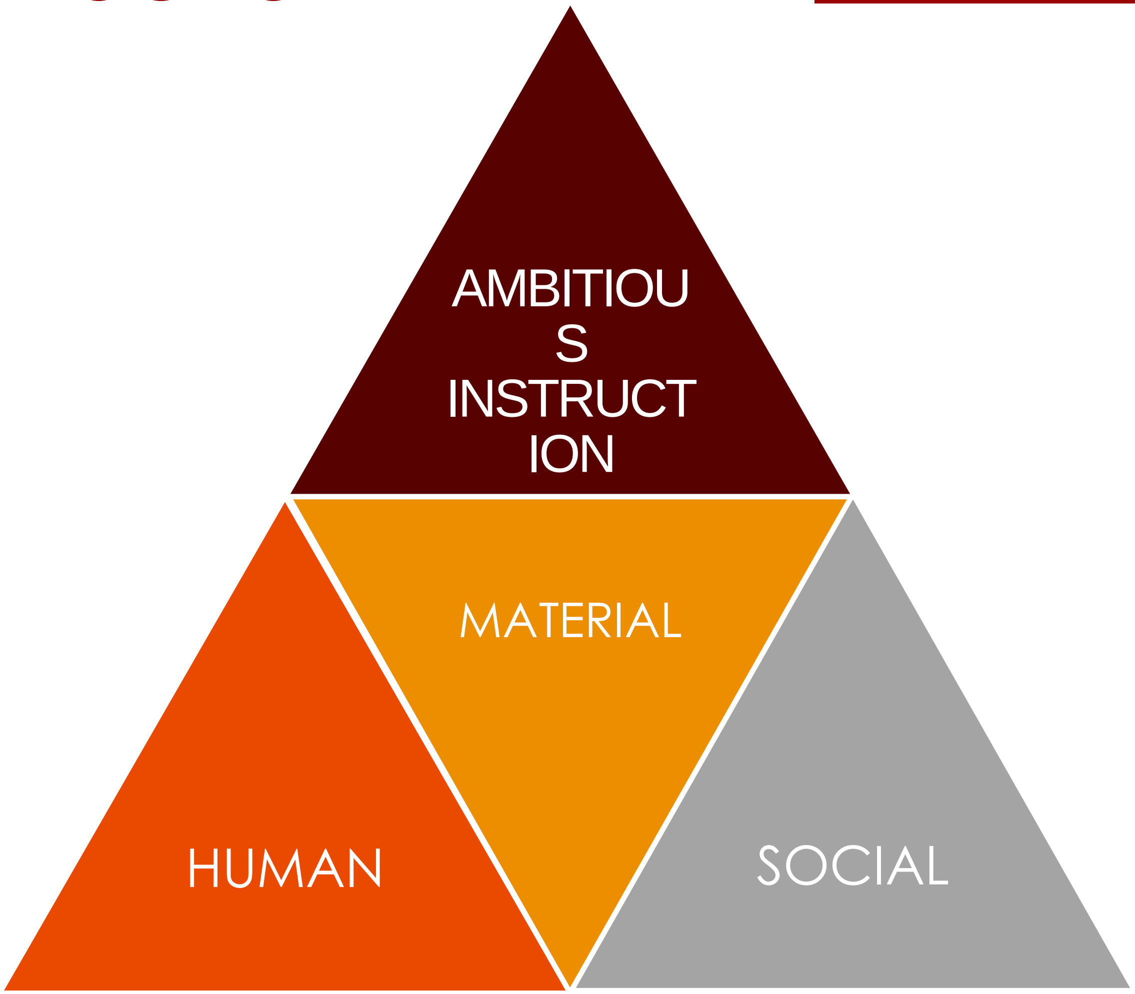
Ambitious mathematics instruction =

- High cognitive demand tasks
- Support for student thinking
- Intellectual authority vested in the discipline

# Scaling Up Mathematics Study

- NSF-funded longitudinal study of the implementation of **ambitious mathematics curricula** in two urban district: Region Z & Greene
- Participating schools
  - 8 elementary schools (4 per district)
  - 48 teachers
- Data (collected at 5 time points over 3 years)
  - Interviews with teachers, coaches, principals, district leaders
  - Observations of classroom instruction, meetings, professional development

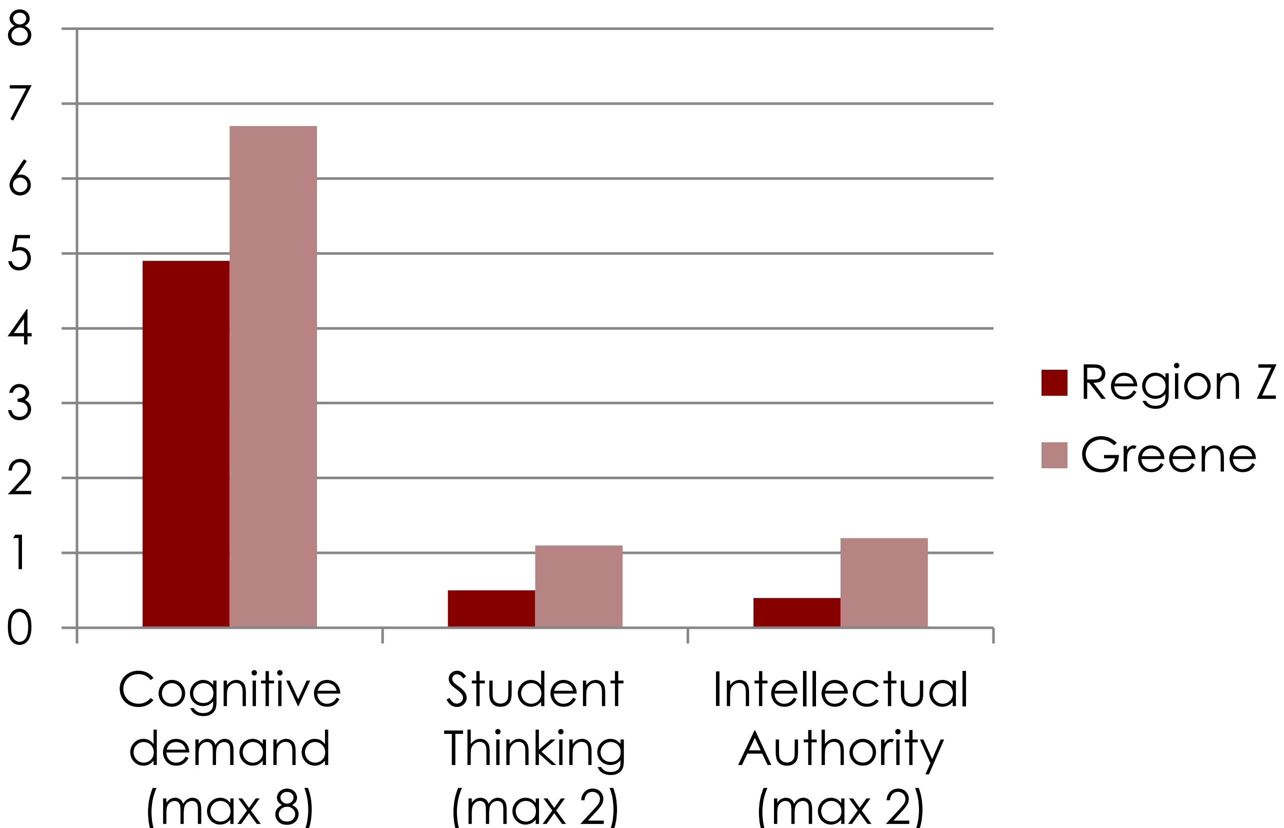
# Foundational capacities for ambitious instruction



# Study districts' capacity for ambitious instruction

| Capacity | Greene & Region Z |
|---|---|
| **Human** | Large urban districts; focus on K-5 teachers; measures of representative sample of teachers' MKT showed no significant difference |
| **Material** | Selection and provision of standards-based mathematics curriculum |
| **Social** | Surface level similarities (e.g. coaching, professional learning communities) – **but significant differences in quality** |

# Implementation quality significantly higher in Greene




Stein & Kaufman, 2010

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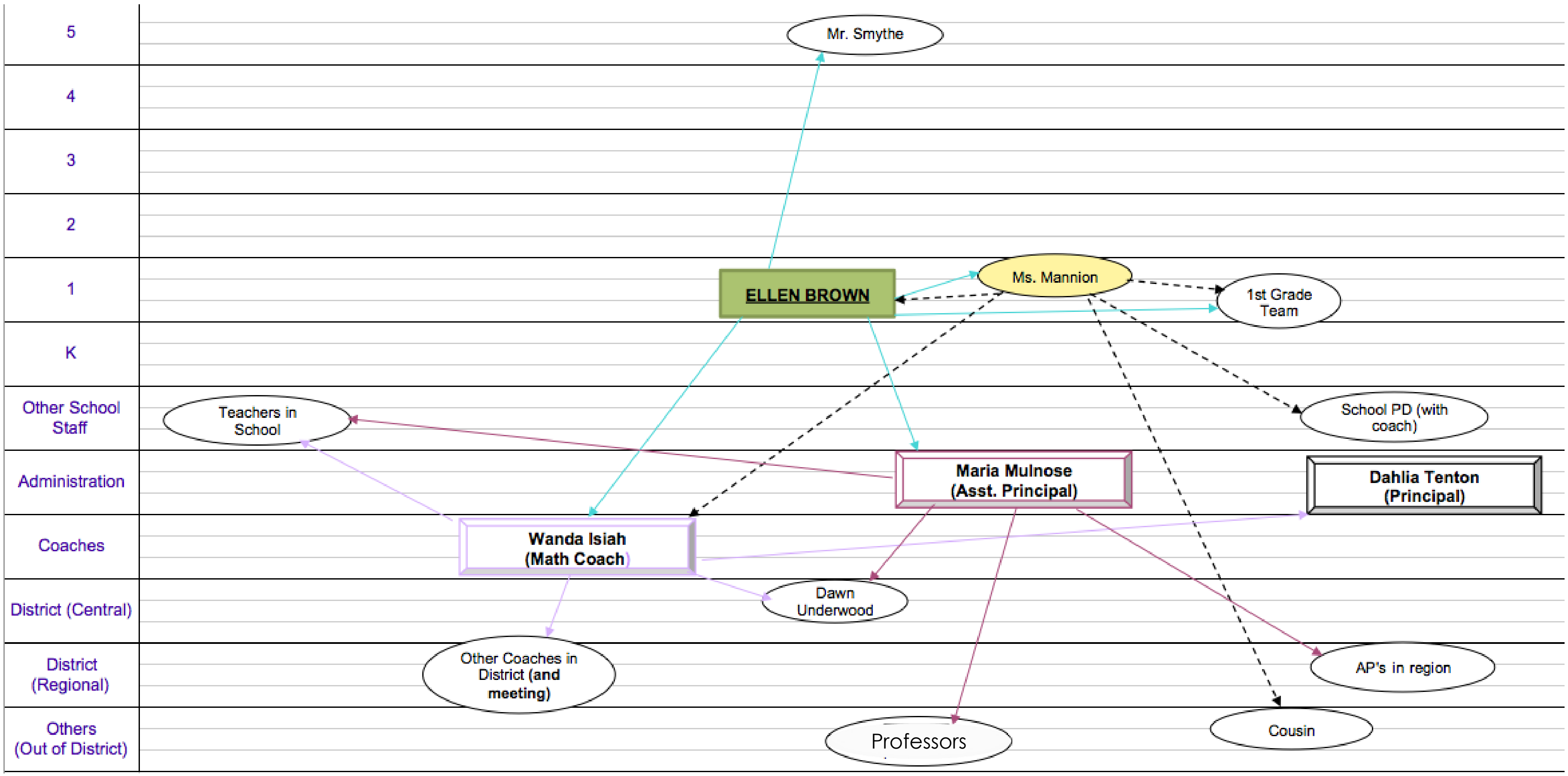
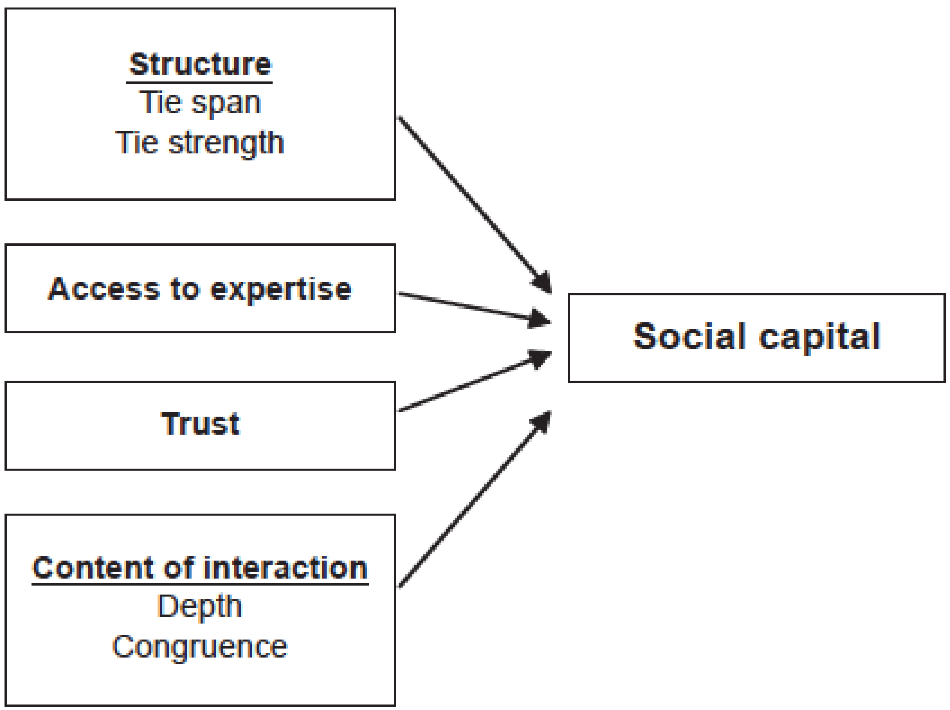
# Social support for instruction: Egocentric math advice networks



# Social networks as a *source* of social capital



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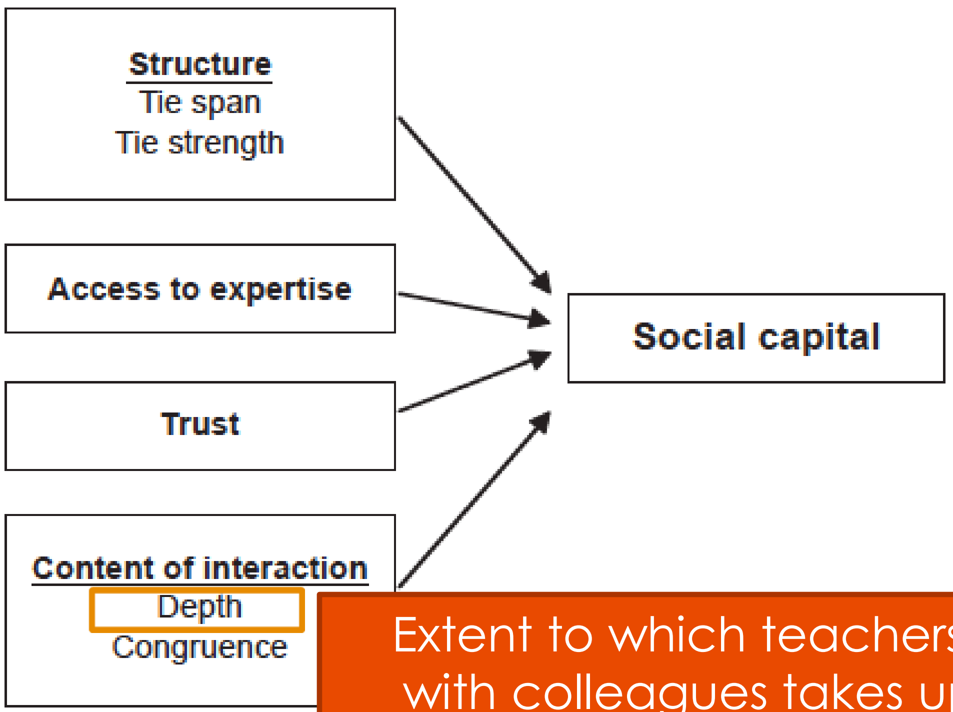


Extent to which teachers' interactions with colleagues takes up substantive issues related to teaching & learning

# Depth of interaction varies by school and district

*Depth of Interaction, by School*

| | % (*n*) | | |
|---|---|---|---|
| District | Low | Moderate | High |
| Region Z | | | |
| School A | 93.8 (45) | 6.2 (3) | 0.0 (0) |
| School B | 82.9 (63) | 17.1 (13) | 0.0 (0) |
| School C | 81.7 (85) | 18.3 (19) | 0.0 (0) |
| School D | 78.2 (68) | 20.7 (18) | 1.1 (1) |
| Greene | | | |
| School E | 59.3 (73) | 32.5 (40) | 8.1 (10) |
| School F | 52.3 (46) | 37.5 (33) | 10.2 (9) |
| School G | 58.0 (65) | 33.9 (38) | 8.0 (9) |
| School H | 39.2 (47) | 54.2 (65) | 6.7 (8) |

*Note*. $n = 315$ interactions in Region Z; $n = 443$ interactions in Greene.

Coburn & Russell, 2008

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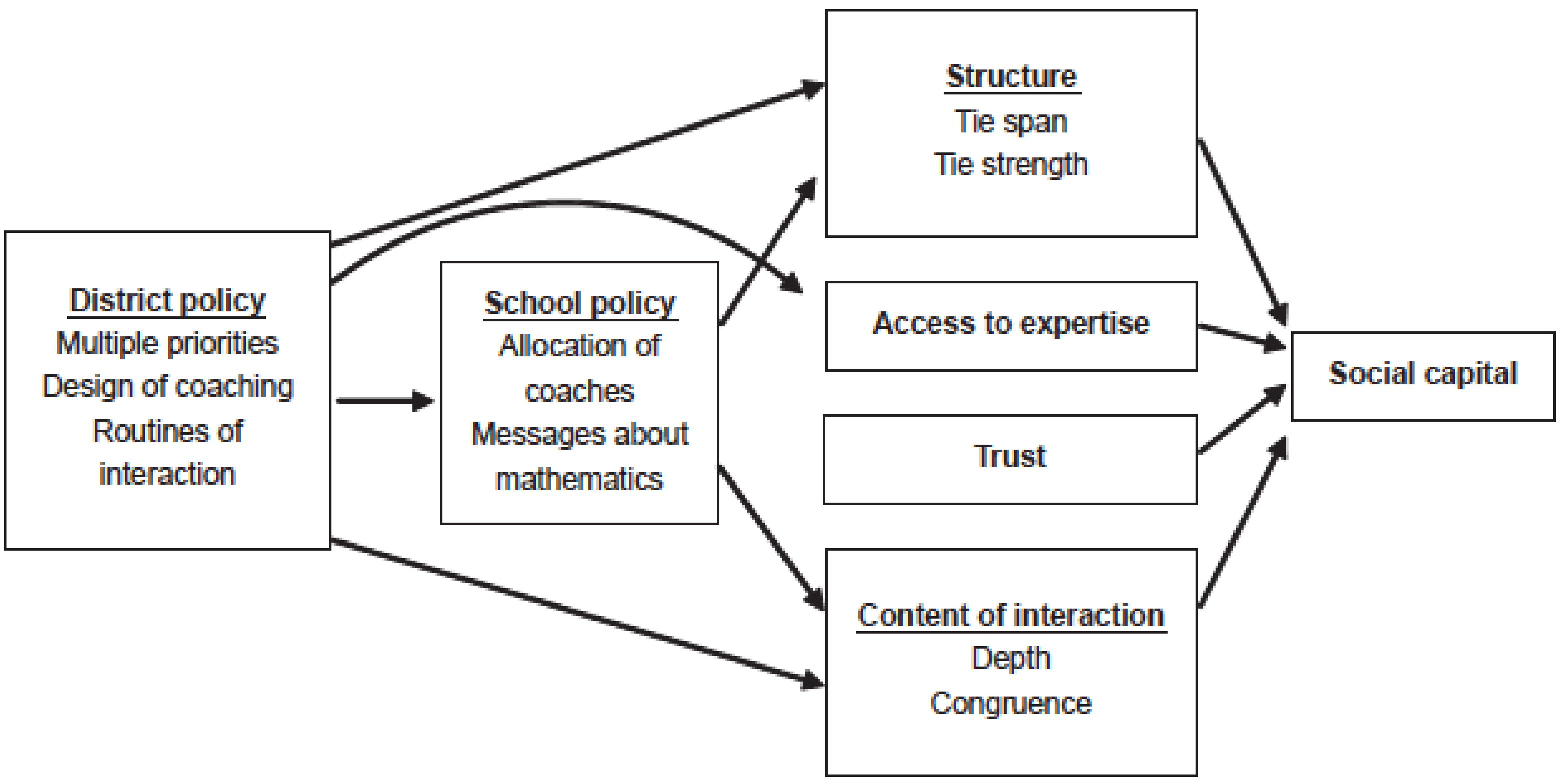
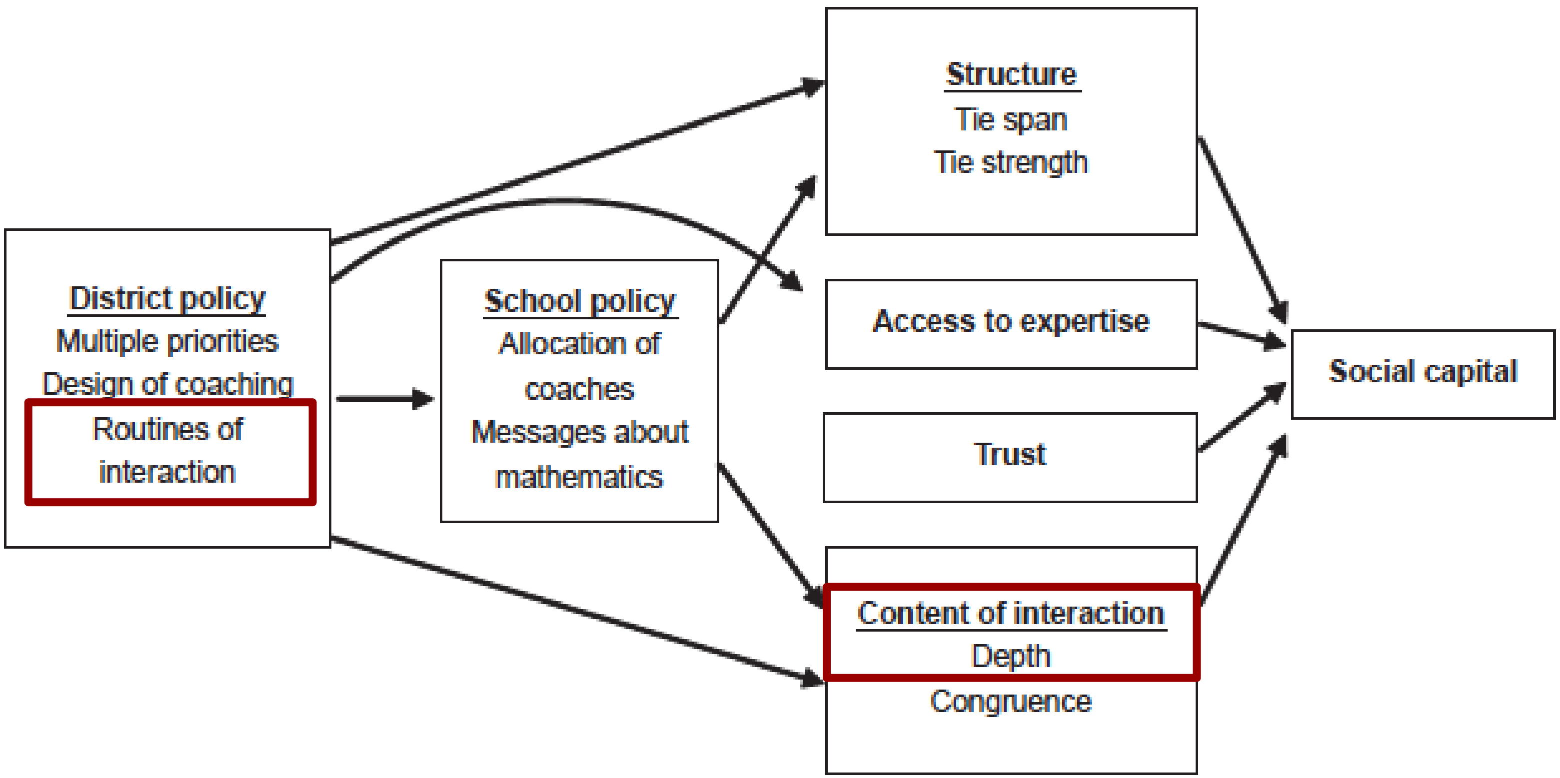
Coburn & Russell, 2008

# System & school leaders influenced social supports




Coburn & Russell, 2008

# District policy influences teachers' social networks




Coburn & Russell, 2008

# Supporting sustainability of ambitious instruction

- In year 3 of the study, Greene largely withdrew supports for implementation of *Investigations*
  - Reduced allocation of coaching resources & math PD
  - Reduced grade level team time focused on math
  - Reduced the amount of time for math instruction in elementary schools from 90 to 60 minutes
- Despite a shift in district reform priorities
  - 7 teachers sustained high quality instruction
  - 5 were not able to sustain high quality enactment

# Supporting sustainability of ambitious instruction

- In year 3 of the study, one of the study districts largely withdrew supports for implementation of *Investigations*
  - Reduced allocation of coaching resources & math PD
  - Reduced grade level team time focused on math
  - Reduced the amount of time for math instruction in elementary schools from 90 to 60 minutes

**SUSTAINABILITY**

- Despite a shift in district reform priorities
  - 7 teachers sustained high quality instruction
  - 5 were not able to sustain high quality enactment

# Study methods

- What aspects of teachers' social networks are consequential for sustained reform-related instruction?
- Longitudinal analysis of teachers' egocentric advice networks in the Greene district (N=12)
- Employed Qualitative Comparative Analysis to detect relationships between complex sets of network variables and instructional outcomes

# Math advice network characteristics associated with sustainability

| | Year 1 | | | Year 2 | | | Year 3 |
|---|---|---|---|---|---|---|---|
| | Depth | Expertise | Strong ties | Depth | Expertise | Strong Ties | High Quality Instruction |

Coburn, Russell, Kaufman & Stein, 2012

# Math advice network characteristics associated with sustainability

| | Year 1 | | | Year 2 | | | Year 3 |
|---|---|---|---|---|---|---|---|
| | Depth | Expertise | Strong ties | Depth | Expertise | Strong Ties | High Quality Instruction |
| 1 | | | | X | X | X | Y |

Coburn, Russell, Kaufman & Stein, 2012

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Coburn, Russell, Kaufman & Stein, 2012

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| 1 | | | | X | X | X | Y |
| 2 | X | X | X | | | | Y |
| 3 | | X | X | X | | | Y |

Coburn, Russell, Kaufman & Stein, 2012

# Math advice network and reform sustainability

| | Year 1 | | | Year 2 | | | Year 3 |
|---|---|---|---|---|---|---|---|
| | **Depth** | **Expertise** | **Strong ties** | **Depth** | **Expertise** | **Strong Ties** | **High Quality Instruction** |
| 1 | | | | X | X | X | Y |
| 2 | X | X | X | | | | Y |
| 3 | | X | X | X | | | Y |

Support from teachers' math advice networks in years 1 and 2 enabled them to achieve the **understanding of the curriculum and its pedagogical approach** that enabled them to continue to enact it flexibly under different conditions

# Implications for STEM reform

- The quality of teachers' social networks is associated with their capacity to sustain reform-oriented mathematics instruction
- District and school level leaders can influence the quality of teachers social networks, in turn supporting reform sustainability
- Engineering social supports should attend to the structure and content of teachers professional interactions

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