Using Data for Improvement to Support Implementation At-Scale: Adaptive Integration in the TN Mathematics Coaching Project

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Link to full paper

Please see our full paper at:

http://www.scalingupcenter.org/data/files/gallery/ContentGallery/Russell_et_al_Final.pdf

TN Mathematics Coaching Project

- Test and refine a model for mathematics instructional coaching
  - Resource for schools and districts throughout the state
  - Support the transition to rigorous, college and career ready mathematics standards
- Robust collaboration among three strategic partners
  - Policymakers from the TN Department of Education
  - Researchers from the Learning Research and Development Center, University of Pittsburgh
  - Professional development practitioners from the Institute for Learning

Problem space

Challenges associated with instructional improvement at scale:	
Problems of education policy	Develop policy that can affect instruction in diverse settings by utilizing instruments available to a state department of education
Problems of practice	Implementing a standard coaching model in diverse local contexts
Problems of research practice	Build an evidence base to refine the efficacy of the coaching model, while learning about how to get increasing numbers of practitioners to implement it

Embracing adaptive integration

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Adaptive Integration

Using improvement research methods to integrate standard coaching processes into new contexts

Challenge & promise of coaching to support high quality mathematics teaching

- Emerging evidence base that coaching can support mathematics instructional improvement (Campbell & Malkus, 2011; Foster & Noyce, 2004; Polly, 2012)
- Coaching varies greatly in the way it is implemented (Coburn & Russell, 2008; Murray, Ma & Mazur, 2009)
- Lack of consensus on effective coaching practices
- Coaching work lies at a critical intersection in the process of policy implementation
  - Boundary spanners between district and school contexts
  - Coaching is shaped by the demands of multiple levels of the educational system

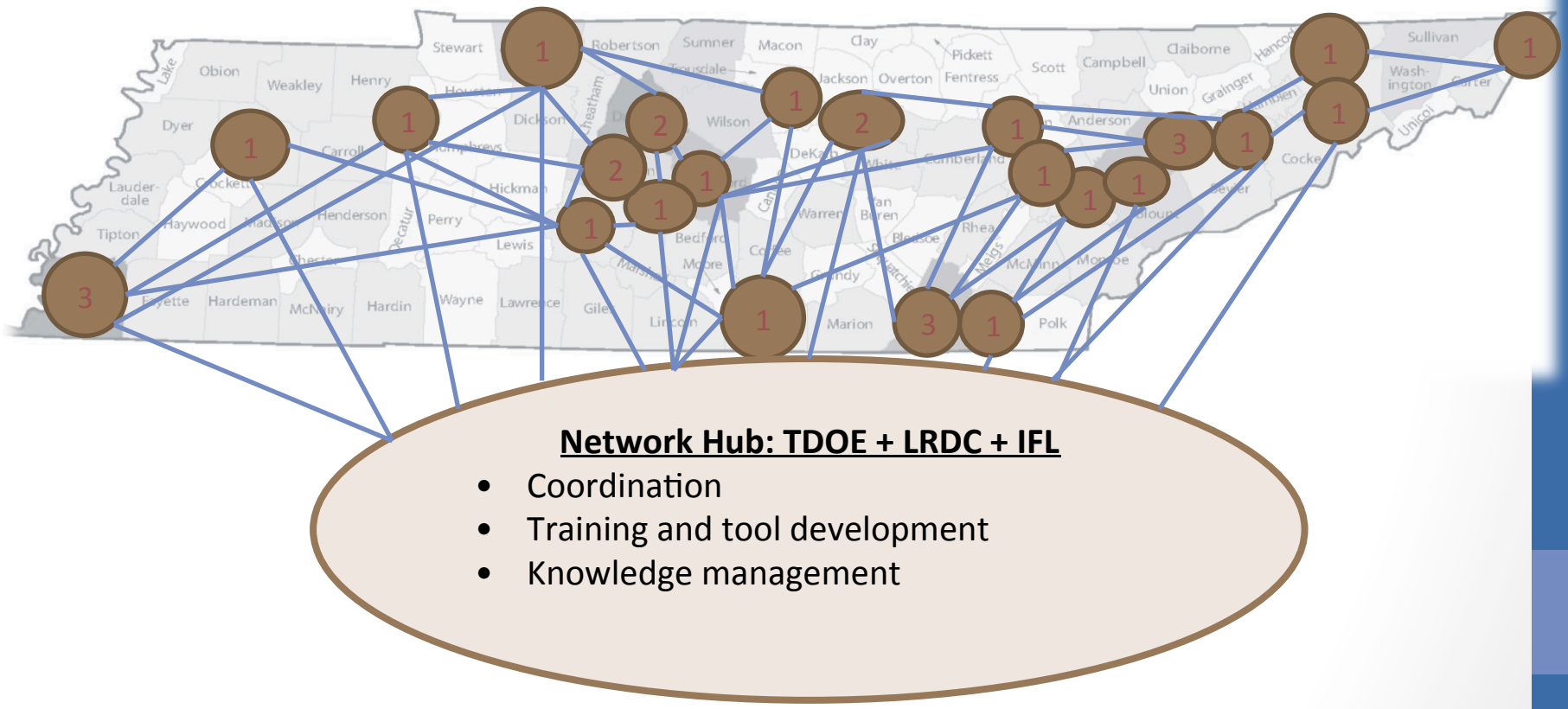
Networked Improvement Communities and Adaptive Integration

- Networked improvement communities (Bryk, Gomez, Grunow & LeMahieu, 2015):
  - focused on a well-specified common aim;
  - guided by deep understanding of the problem, the system that produces it, and a shared working theory to improve it;
  - disciplined by the methods of **improvement research** to develop, test, and refine intervention; and
  - organized to accelerate interventions into the field and to effectively integrate them into varied educational contexts.
- Adaptive integration, "involves using improvement research methods to integrate a standard work process into new contexts, which is critical for learning how to scale improvements. As an innovation or change that has worked in one context moves into others, improvement methods are used to learn what it takes to make it work under diverse conditions" (Bryk et al., 2015)

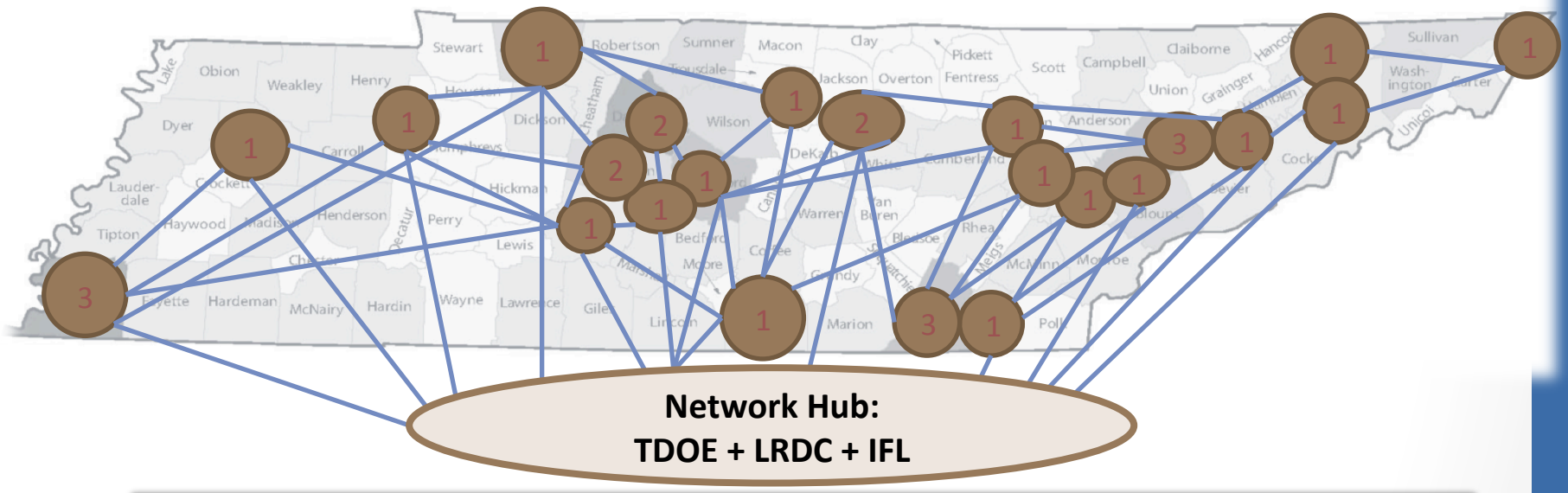
Goal of this paper

- Describe an approach to testing, implementing and scaling a promising innovation for instructional improvement: the TN Mathematics Instructional Coaching Model
- Highlight what and how we are learning about the **adaptive integration** of the coaching model into diverse local contexts

TN Math Instructional Coaching Network



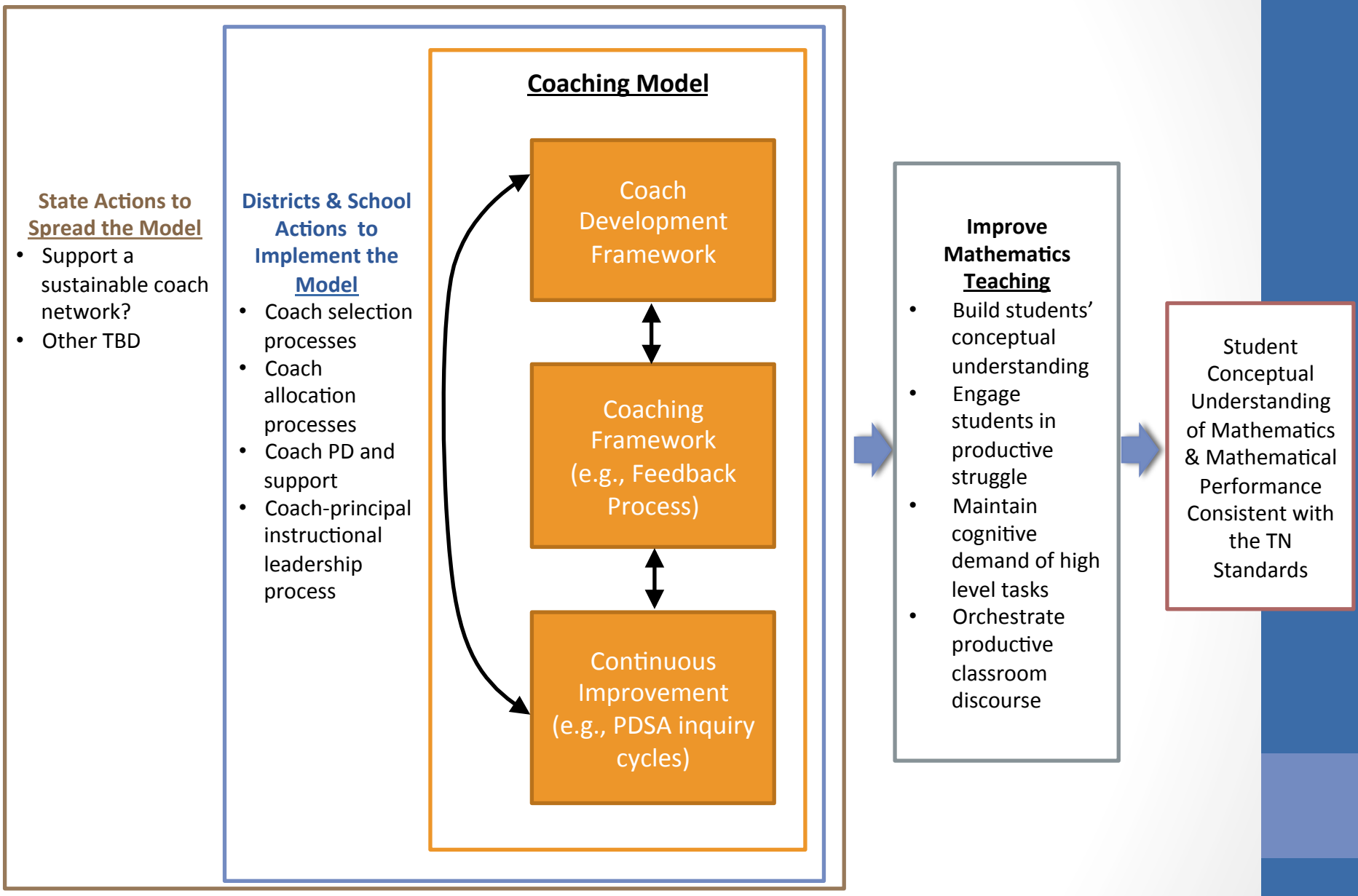
TN Math Instructional Coaching Network



COACHES partner in the continuous improvement of the coaching model:

- Gather and share data about their practice
- Engage in reflective practice
- Generating ways to improve or augment the coaching model for use in their specific local context.

TN Mathematics Coaching Model



Coach-Teacher Discussion Process

① Goal and then Task Selection

Coach & teacher set or clarify the **mathematical learning goals**

→ Coach & teacher communicate to select a high level task for the cycle

→ Coach & teacher independently work out solutions for task prior to planning conference

② Pre-Observation Planning Conference

Coach & teacher schedule pre-observation planning conference within 24-48 hours before lesson

→ **Coach & teacher mark specific pedagogical goals in service of the the mathematical goal** for the lesson and both commit to working toward the goals

↔ Coach & teacher engage in a **deep & specific discussion of the instructional triangle** (mathematics content, student thinking & pedagogy)

③ Classroom Observation

Coach observes the teacher teaching the task

↔ Coach & teacher **gather evidence related to the mathematical & pedagogical goals**

④ Post-Observation Conference

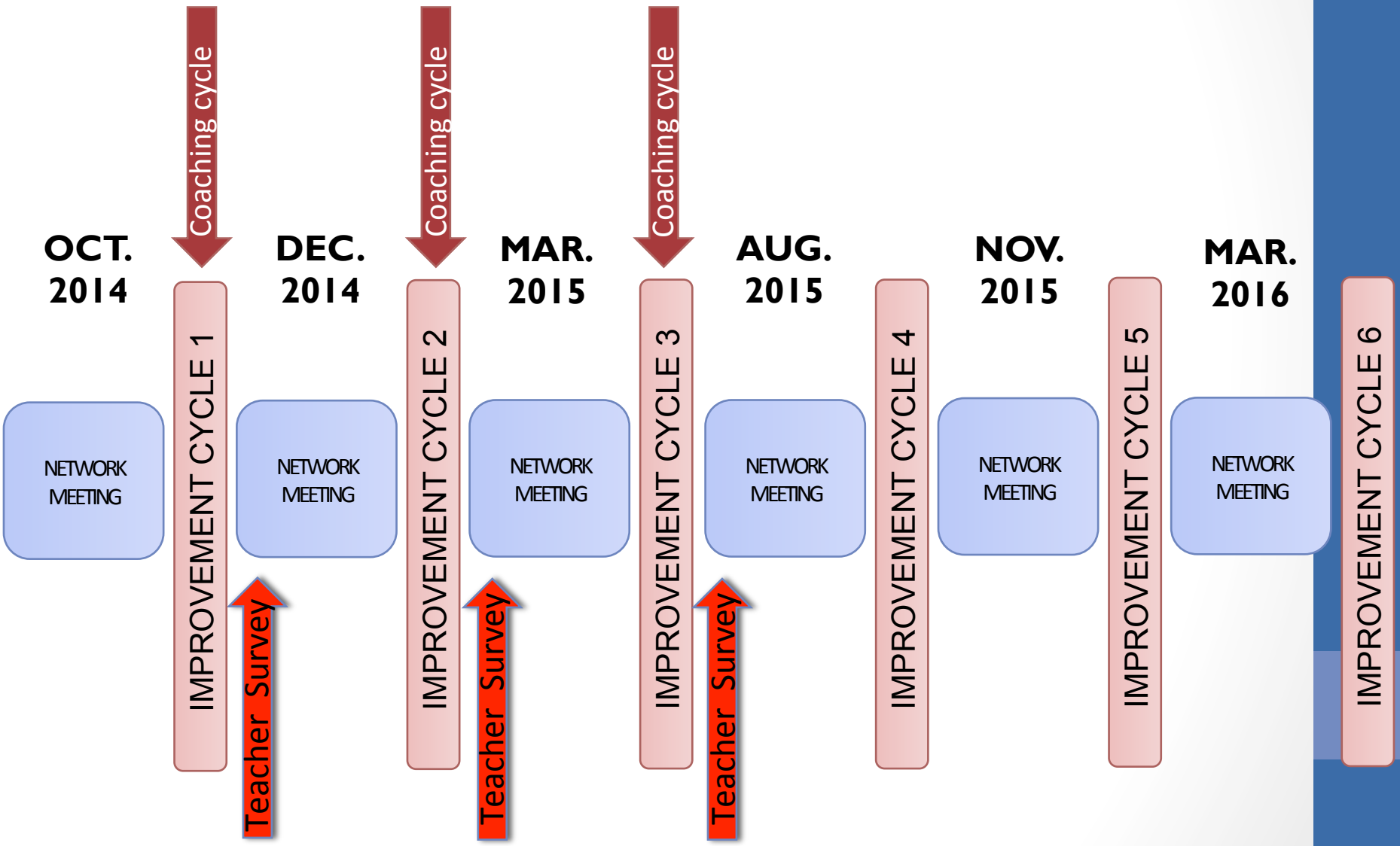
Coach & teacher schedule post-observation conference within 48 hours of observation

→ **Coach & teacher analyze evidence** to highlight the goals that were and were not accomplished

→ Coach provides **evidence-based feedback that is contextualized within a larger framework of effective teaching**

→ Coach & teacher co-**construct pedagogical goals for next cycle** and commit to working toward goals

Data & Improvement Cycles



Data & analysis of teaching

SURVEY

- Pre-survey administered in Fall 2014 before coaching (N=64 teachers)
  - Self report of beliefs and practice (e.g., attention to conceptual understanding)
- Post-survey administered in Spring 2015 after 1 year coaching (N=49 teachers)

VIDEOTAPES

- Videos of mathematics teaching at 3 different time points over 2014-15 school year (N=64 teachers)
- Coded by experts for the maintenance of the cognitive demand of tasks (Stein & Kaufman, 2010)

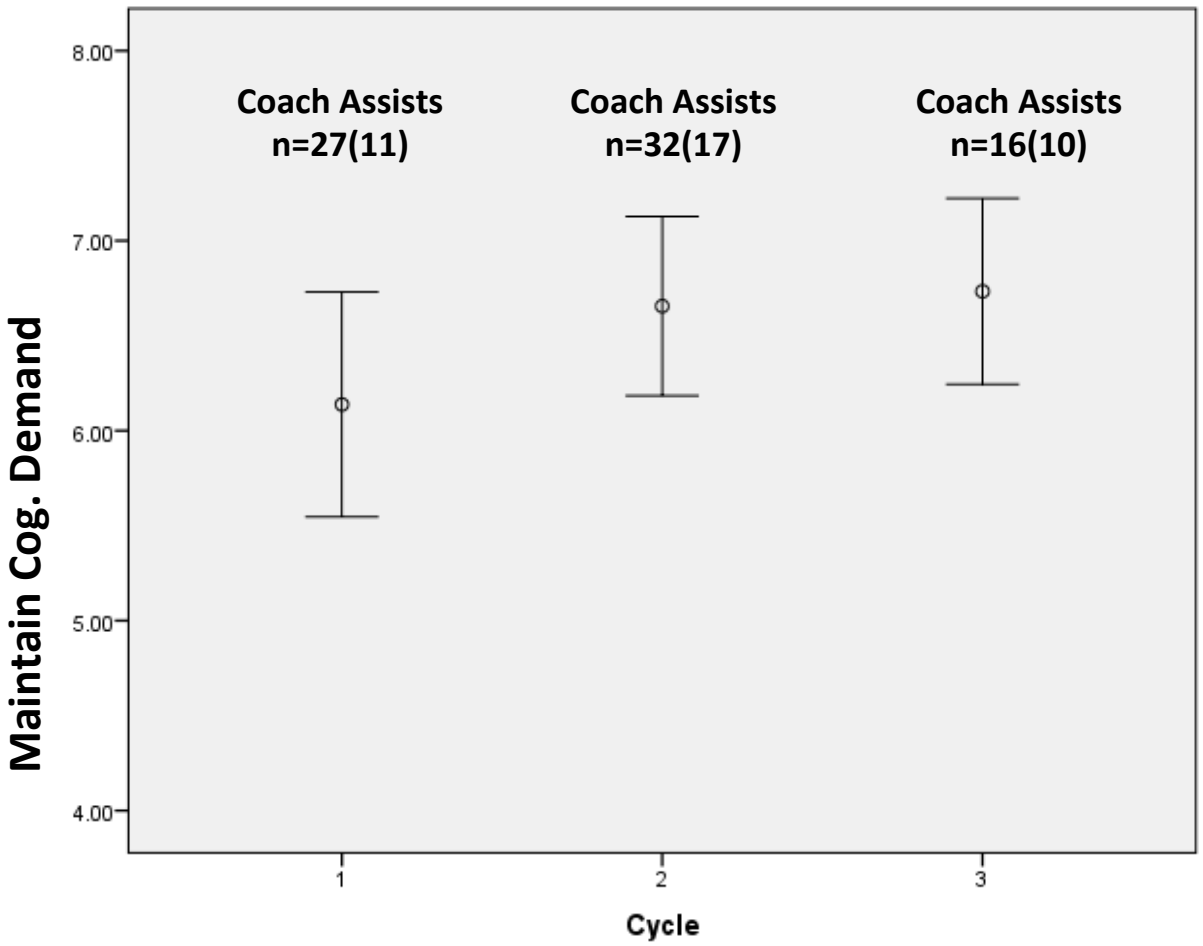
Data & analysis of coaching

Key Coaching Practices	In-Depth Measures	Scale Measures
Goal Setting (Mathematics & Pedagogical)	Coding types of goals set (performance, learning & pedagogical) Coding the degree to which coaches co-construct the goals	Post-cycle survey items completed by partner teachers (combination of open and closed-ended items about goal setting)
Evidence-based Feedback	Coding instances of coach feedback in post-observation conferences – qualitative investigation of the characteristics of feedback that engender teacher engagement	Post-cycle survey completed by partner teachers
Deep & Specific Conversations	3-part coding scheme applied to pre-conference transcripts. Indicators of deep and specific talk about: • Student mathematical thinking • Mathematical goals for the lesson • Pedagogy	Post-cycle survey completed by partner teachers

TRENDS IN TEACHING AND COACHING PRACTICE IN YEAR 1

EVIDENCE THAT WE ARE ON THE RIGHT TRACK

Changes in expert scored video observations



Signs of Improvement:

- Mean Improvement
- Decrease in SD
- Fewer Coach Assists in Cycle 3

Paired samples t-test for **CD** (cyc3-cyc1): **ES = .24**
t=1.77~, df=57, p<.1

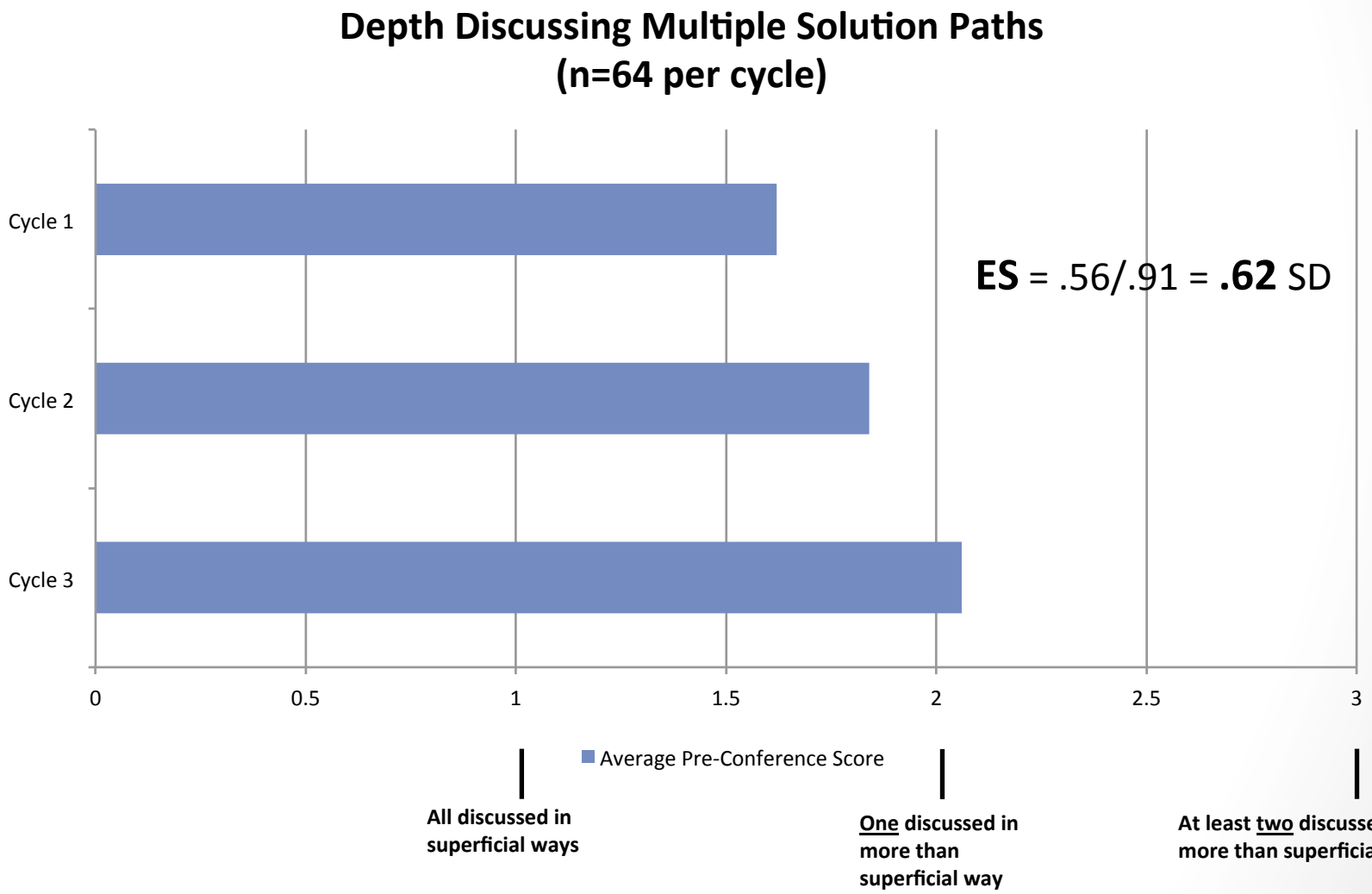
Improvement for Whom?

1. Limited opportunity for Stable High-Enactors
2. Struggling Enactors
   - How many?
3. Improving Teachers

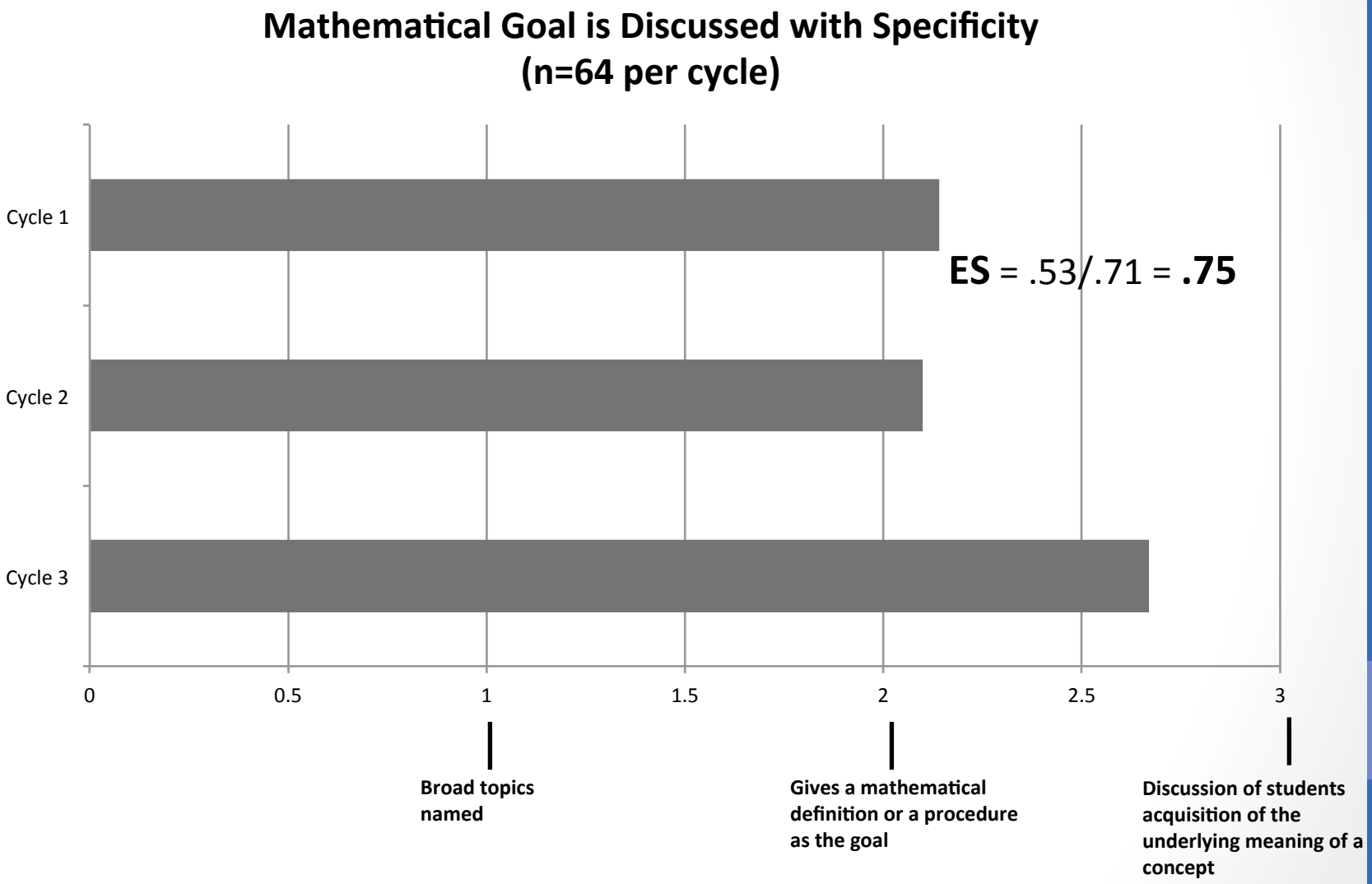
Changes in self reported beliefs and practices

Item Description KEY: **<.01; *<.05	Cycle 1 Mean	Cycle 2 Mean
INCREASE in Frequency [3=sometimes; 4=often]		
Student work forms the basis for classroom discussion *	3.42	3.83
Students listen to and critique others' reasoning **	3.38	3.83
Students generate explanations that focus on underlying justifications *	3.21	3.53
DECREASE in Beliefs [2=disagree; 3=neither; 4=agree]		
A teacher's main priority is to teach all students the most efficient algorithm to always obtain the correct answer**	2.35	2.06
Students are not ready for "higher-order" learning until they have acquired the basics**	3.29	2.79
More important than extended math discussions, students need a lot of practice with math problems*	2.85	2.58

Changes in pre-conference discussions (solution paths)



Changes in pre-conference discussions (math specificity)



Coaches Adapt to Teacher Responsiveness

ADAPTIVE INTEGRATION IN ACTION?

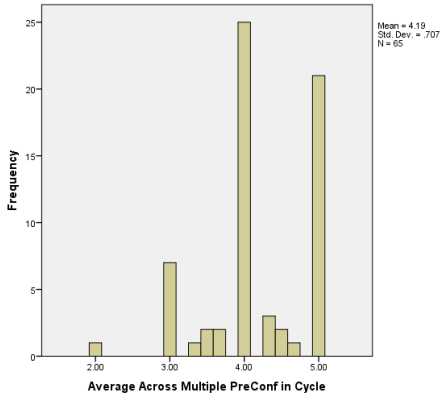
Teacher Responsiveness: Primary *Independent Variable*

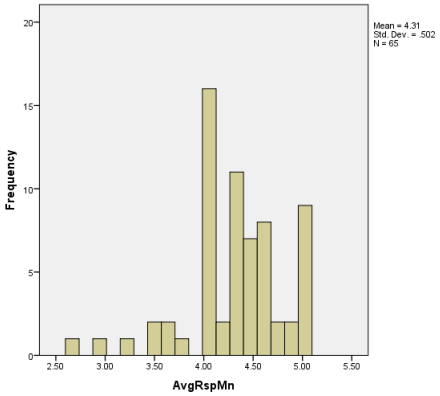
Coach Report Options:

- (1) Teacher exhibited behaviors that signaled explicit resistance;
- (2) No explicit resistance but teacher was not prepared and/or signaled low engagement;
- (3) Teacher was compliant, but wasn't open to suggestions and/or I don't expect any follow through;
- (4) Exhibited behaviors that signaled engagement, yet I am uncertain about their level of follow through; and
- (5) Exceeded expectations for engagement and I have high confidence they will follow through.

Distribution:

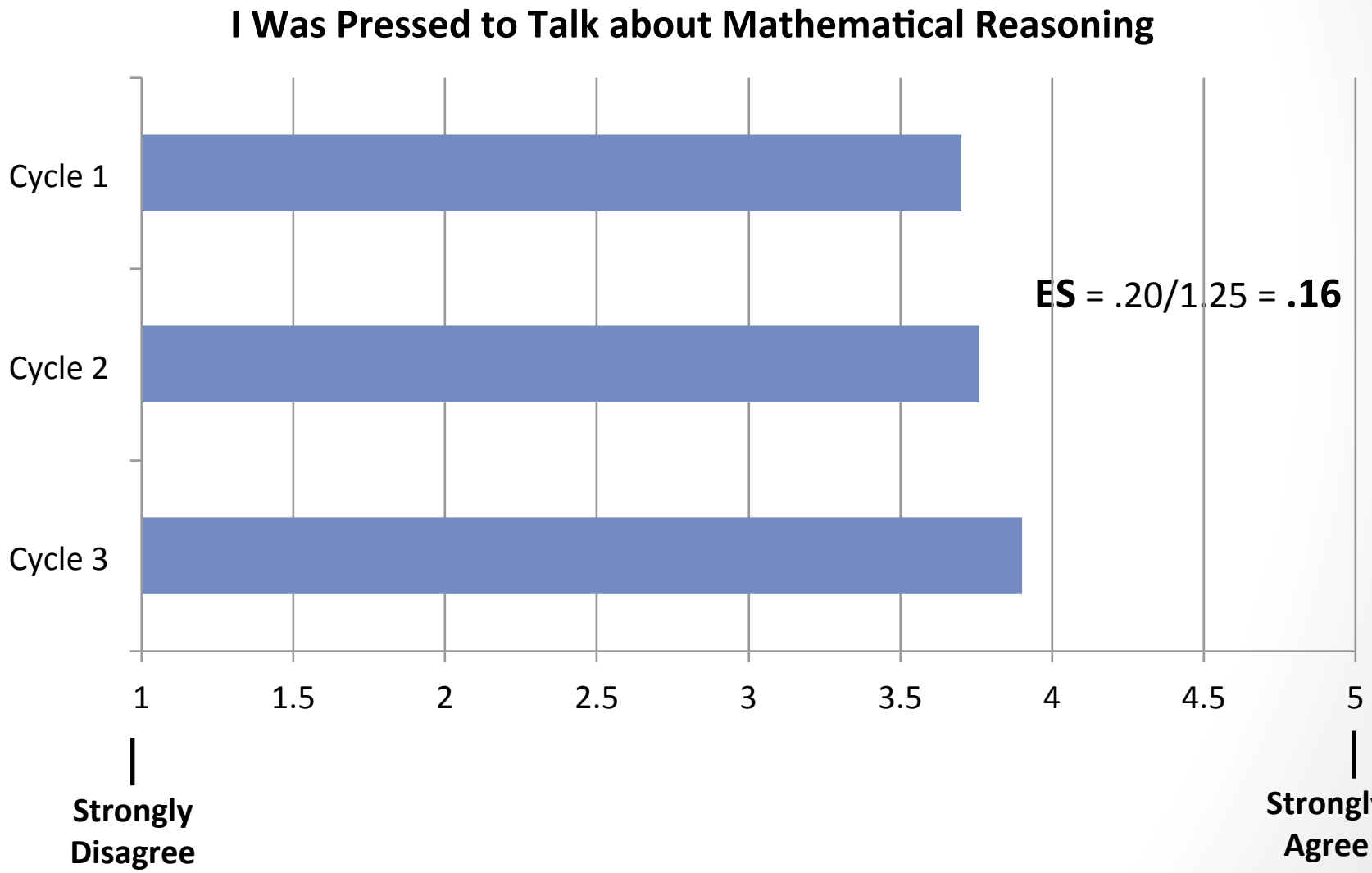
Initial (Top); Average Across Year (Bottom)



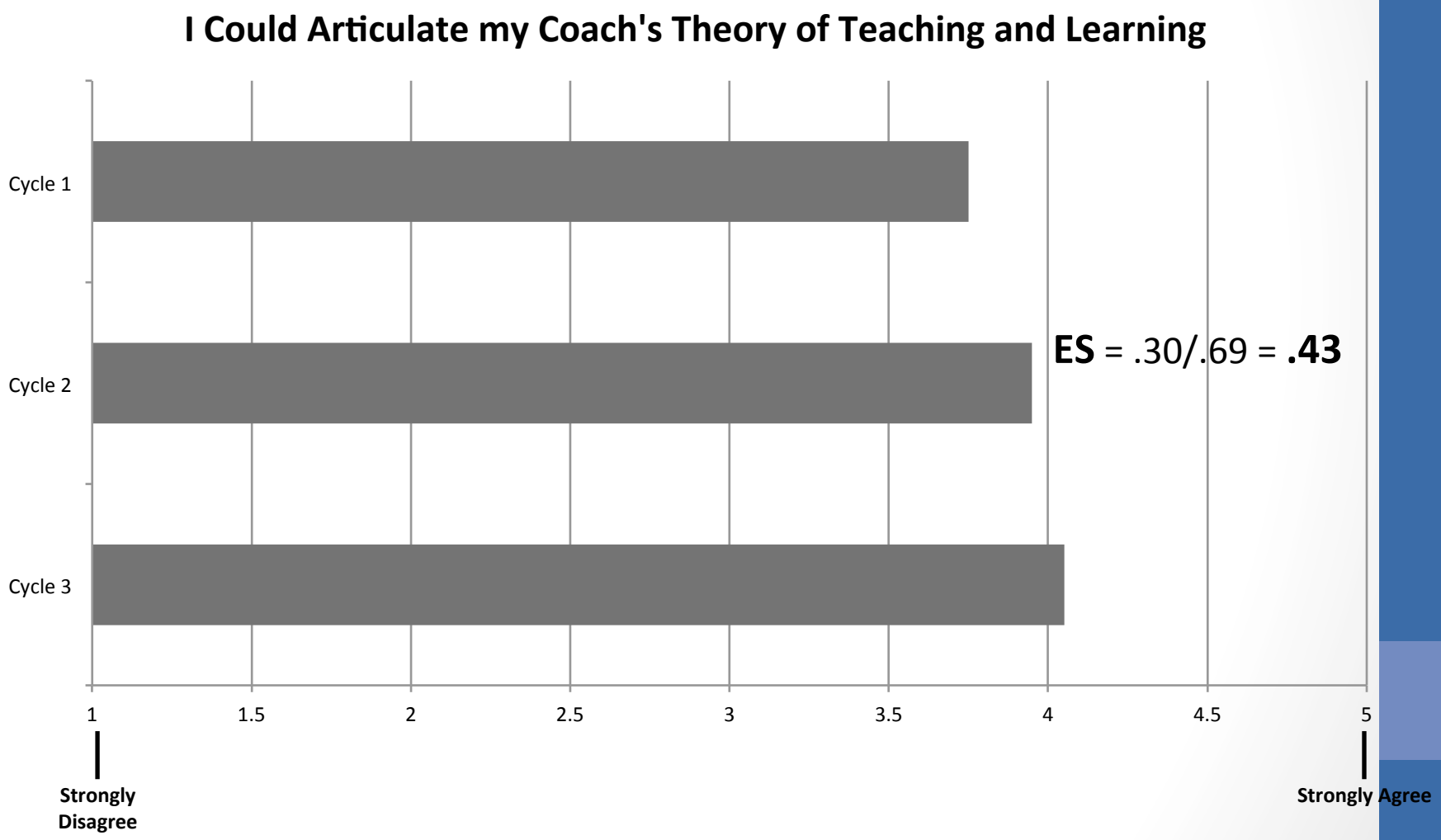


Press Factor (1 Item)

Primary *Dependent Variable 1*



Prescriptive Factor (1 Item)
Primary *Dependent Variable 2*



Primary Analytic Questions

- Are teacher reports of their coaching interactions changing over the course of the year?
  - Press
  - Prescriptive
- Are coaches initial judgments of teacher responsiveness a predictor of status and change for teacher judgments about coaching interactions?

Coaches adjust practice based on teacher responsiveness

Table 1: Effects of Coach Judgments on Partner Teacher Perceptions of Change in Interactions Over 1 Year of Coaching

	Partner Teacher Report of Press for Mathematical Ideas/ Reasoning (Learning through Discussion)				***Partner Teacher Report of Specificity with Clarity (Coach Prescriptiveness)***			
	Coeff.	**s.e.**	**Coeff.**	**s.e.**	**Coeff.**	**s.e.**	**Coeff.**	**s.e.**
At First Cycle								
Average ($\beta_{100;}\beta_{200}$)	.02	.19	.02	.20	-.09	.14	-.09	.12
Tch. Resp. ($\beta_{101;}\beta_{201}$)‡	-.06	.27	-.06	.28	.34 *	.16	.34 *	.16
PC Effcncy ($\beta_{102;}\beta_{202}$)‡‡			.14	.54			-.84 *	.31
Growth Slope								
Average ($\beta_{110;}\beta_{210}$)	-.04	.21	-.06	.18	.10	.17	.11	.16
Tch. Resp. ($\beta_{111;}\beta_{211}$) ‡	.48 ~	.28	.48 ~	.28	-.56 *	.21	-.56 *	.20
PC Effcncy ($\beta_{112;}\beta_{212}$) ‡‡			-.54	.59			1.14 *	.51
Task Length (As Implemented)	.01 *	.00	.01 *	.00	.00	.00	.00 *	.00

‡ Coaches' reports of the likelihood teacher follows through on the reported interaction in coach tracker during all reported interactions during the first cycle.

‡‡ Efficiency of the pre-conference rigor score. The sum of items on the pre-conference rubric divided by the length of time in pre-conference. More efficient ratings tended to be short pre-conferences.

Overcoming Contextual Challenges with PDSAs

ADAPTIVE INTEGRATION IN ACTION

Coaches work is shaped by different contextual conditions

Challenge	Coaches
Helping teacher prep for state assessments detracts from time spent coaching	25
District responsibilities detract from time spent coaching	23
Administrative duties detract from time spent coaching	16
Reported feeling of being unsupported by principal or conflict between principal's vision of math instruction and coach's vision of math instruction.	15
Coaching in more than 3 schools	9

Coaches work is shaped by different contextual conditions

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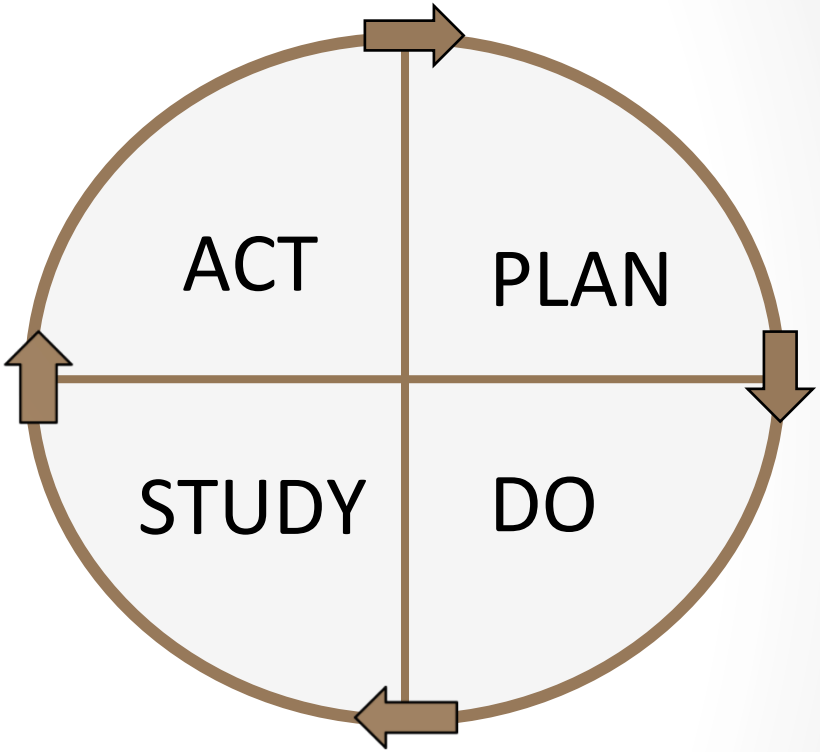
Reported feeling of being unsupported by principal or conflict between principal's vision of math instruction and coach's vision of math instruction.	15

"The goals were different. My principal's goal is we need to make our growth [on state achievement tests], and my coach's goal for me was to deepen my understanding in mathematics content and work on teaching in that Common Core style."

Plan, Do, Study, Act (PDSAs)

- A method for improving work processes (e.g., coaching)
- Rapid cycles aimed at learning from practice
- A way to test new coaching strategies on a small scale (e.g., by one coach) to learn what works under different conditions



PDSAs in our coaching work

- Expand use of PDSA routine to learn more about coaching under different conditions
- Experiment with ways to overcome challenging conditions while preserving the integrity of the **core coaching practices**

Core Coaching Practices

- Deep and specific conversations about the instructional triangle
- Setting mathematical goals
- Providing evidence-based feedback

Implications

- Generating large-scale change with limited resources will require the expert judgments of on-the-ground professionals
- Innovative practices must be adapted to local conditions in order to be implemented beyond sites that resemble initial development sites
- Improvement requires building a measurement system with the potential to:
  - Surface important relationships that would help build theories of teaching development within specific contexts
  - Help coaches (and teachers) monitor different aspects of their teaching as they work toward improvements in teaching together