

# Practical Measures of the Mathematics Classroom Learning Environment

Kara Jackson  
University of Washington

<https://www.pmr2.org>

**Materials:**

[https://bit.ly/CADRE\\_PM](https://bit.ly/CADRE_PM)



September 28, 2023

CADRE Learning Series: Instructional Observations in Educational  
Research



This work was supported by the National Science Foundation (grants #1719744, #1620851, #1621238, & #1620863), the Spencer Foundation, and the Carnegie Foundation for the Advancement of Teaching. Any opinions, findings, and conclusions or recommendations expressed in these materials are those of the authors and do not necessarily reflect the views of the foundations.



## Clarifying the focal issue

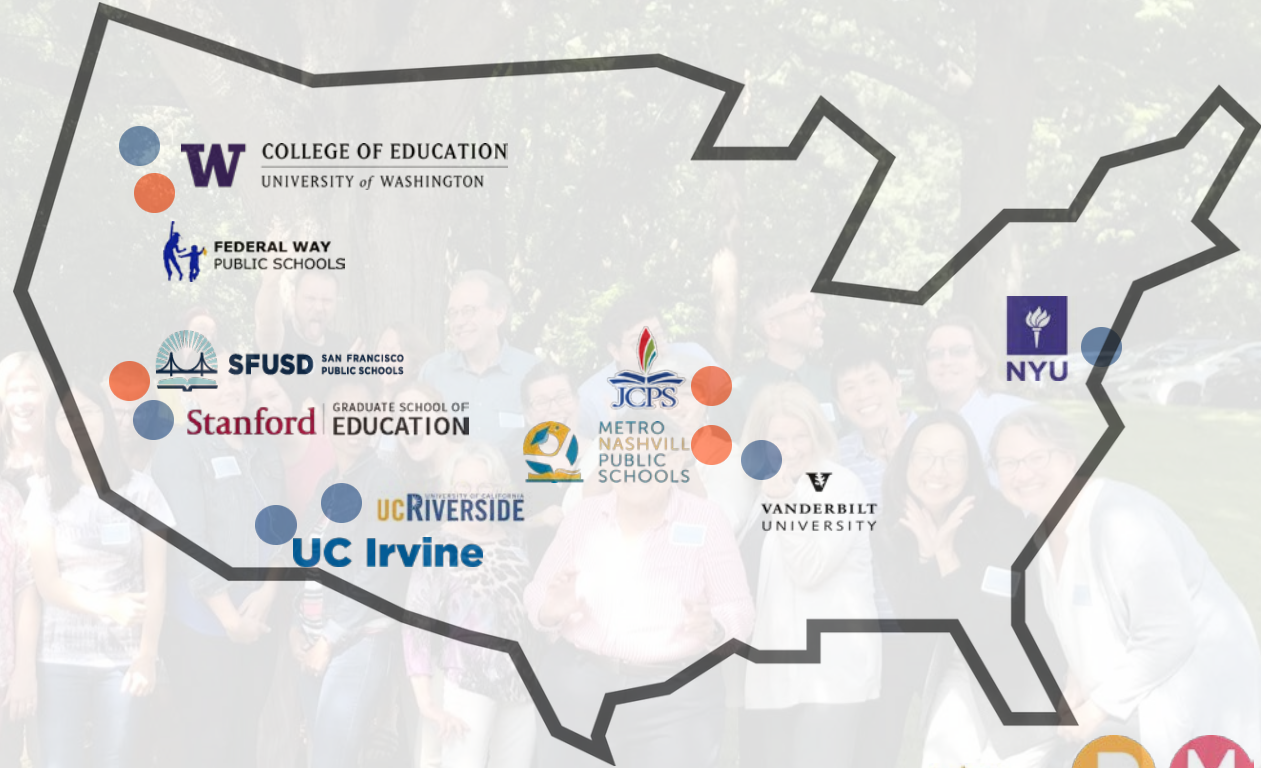
---

- Improving the **implementation** of instructional improvement strategies aimed at supporting secondary mathematics teachers' learning at some scale (e.g., coaching, teacher collaborative time)

### 3 research-practice partnerships focused on improving the implementation of ambitious instructional improvement strategies in secondary mathematics teaching and learning

Develop a system of practical measures, data representations & routines to support improvement of mathematics teaching

Investigate the use of the measures, data representations & routines in context



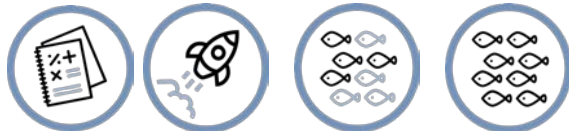
# Key features of “practical measures” (“measures for improvement”)

---

- tied to a working **theory of improvement**
- provide users with **timely** and **meaningful feedback** about targeted aspects of **practice** (i.e., things that make an important difference)
- easy to administer & resulting data is easy to analyze (i.e., ‘**practical**’)
- enable users to **set goals, identify changes, and consider whether a change in practice is moving in the desired direction**
- used for the purposes of **improvement**, not accountability or evaluation  
(e.g., Bryk et al., 2015; Takahashi et al., 2022)

# System of practical measures, representations, & routines

Practical measures of key aspects of the **mathematics classroom learning environment** that research has linked to *student learning*



Practical measures of key aspects of **professional learning supports** (e.g., collaborative professional development, one-on-one coaching) that research has linked to *teacher learning*



**multiple users**  
(e.g., teachers, PD  
facilitators, system  
leaders)



**routines for administering  
the measures, and  
analyzing the resulting  
data**

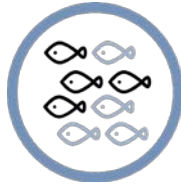


# Classroom practical measures: Student-facing surveys

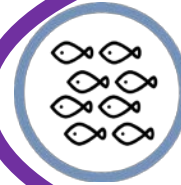
---



launch



small-group  
work



whole-class  
discussion

- Student-facing surveys that elicit students' perspectives on part of a lesson
- Focus on key aspects of a mathematics classroom learning environment that research indicates matters for equity in students' learning opportunities, and for students' identities.
- Quick, easy to administer (e.g., surveys are 2-3 minutes, **electronic** or **paper form**)
- Developed in **partnership** with students, teachers, coaches, professional learning facilitators, and district math specialists
- Available in **15 languages**

## Aspects of whole-class discussions that research indicates make a difference for students' learning opportunities

---

- A cognitively-demanding task is posed, and the level of challenge is maintained
- Discussions focus on students' ideas
- Students want to share their ideas and feel their ideas are valued
- Students feel they can share tentative (“rough draft”) ideas
- Students are held accountable for *reasoning* (not just answers or steps)
- Students have meaningful opportunities to listen to, reason about, and make sense of others' ideas

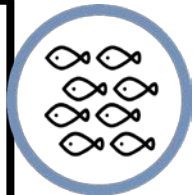
[https://bit.ly/CADRE\\_PM](https://bit.ly/CADRE_PM)



- A cognitively demanding problem is posed, and the level of challenge is maintained

Whole Class Discussion | Survey

For each question, select one response that best describes your experience in the whole class discussion in today's math class.



1) What did you need to do in order to be successful in your math class today?

- Solve problems using the steps the teacher showed us
- Listen to and make sense of other students' reasoning

2) Was there only one right way to solve the problem(s) today?

- Yes
- No

CONTINUED on PAGE 2

p. 1



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Survey Version 201120, pmwcd11, Whole Class Discussion 11



## Aspects of whole-class discussions that research indicates make a difference for students' learning opportunities

---

- A cognitively-demanding task is posed, and the level of challenge is maintained
- Discussions focus on students' ideas
- Students want to share their ideas and feel their ideas are valued
- Students feel they can share tentative (“rough draft”) ideas
- Students are held accountable for *reasoning* (not just answers or steps)
- Students have meaningful opportunities to listen to, reason about, and make sense of others' ideas

[https://bit.ly/CADRE\\_PM](https://bit.ly/CADRE_PM)



- **Students have meaningful opportunities to listen to, reason about, and make sense of others' ideas**

Whole Class Discussion | Survey

For each question, select one response that best describes your experience in the whole class discussion in today's math class.

1) What did you need to do in order to be successful in your math class today?

5) Did you have trouble understanding other students' thinking in today's whole class discussion?

Yes


No

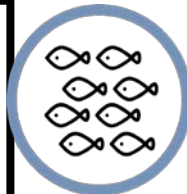
6) Did listening to other students in today's whole class discussion help make your thinking better?

Yes

No

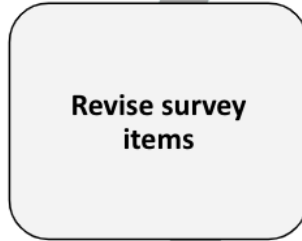
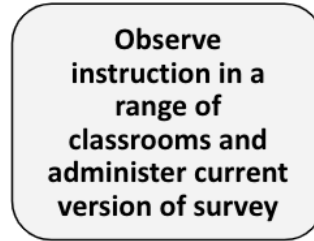
p. 1

 This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Survey Version 201120, pmwcd11, Whole Class Discussion 11



# Developing the practical measures of classroom learning environment

---

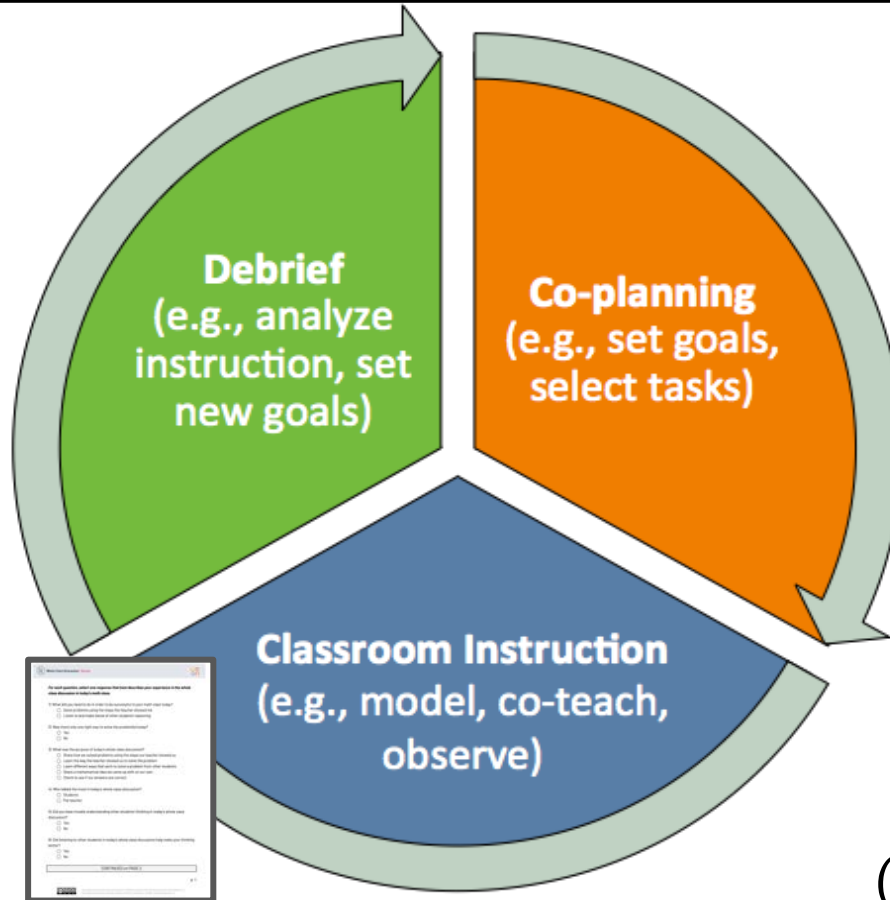


**Iterative Cycles of Revision**

*Development of whole class discussion survey*

- 5 cycles of revision
- ~4 classrooms in each cycle, multiple districts
- total of 125 cognitive interviews with students

# Example of use: Integrating classroom measures in coaching cycles



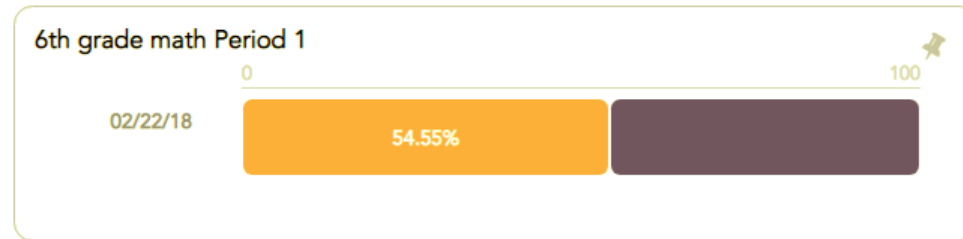
(Kochmanski, 2020)

## Example of use: Integrating classroom measures in coaching cycles

Did you have trouble understanding other students' thinking in today's whole class discussion?

■ Yes

■ No



**Coach:** *...I notice when a student will share, you would rephrase what they were sharing. I wonder if --"*

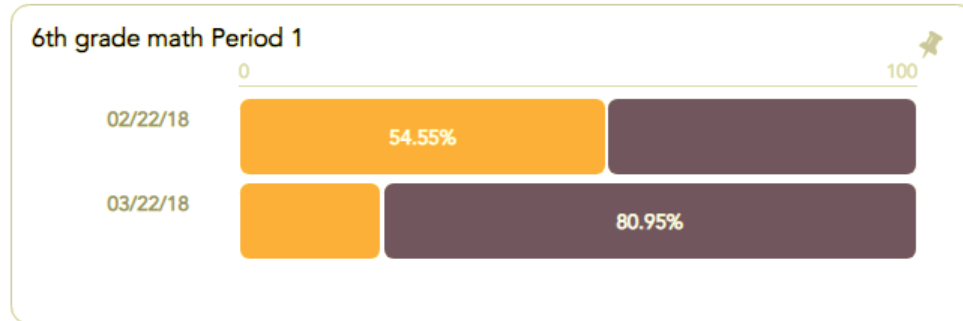
**Teacher:** *"-- Having another student rephrase?"*

(Kochmanski, 2020)

## Example of use: Integrating classroom measures in coaching cycles

Did you have trouble understanding other students' thinking in today's whole class discussion?

- Yes
- No



(Kochmanski, 2020)

# Technical (and social) challenges

---

## Development

- Failing to generate items that assess aspects of the classroom learning environment that we know matter for students' learning
  - e.g., conceptual versus calculational discourse (Thompson et al., 1994)

## Use

- Supporting productive social routines for analyzing the resulting data
  - e.g., how to respond if deficit narratives about students' capabilities are surfaced
- Aggregation / disaggregation of data: when is it "ok" to do so

# Response to “use” challenges

Studied use of the measures in multiple contexts, and on the basis of analyses, our team generated ...

- Conditions of use (minimal)
- Technical suggestions
- Protocols to support use of the measures in coaching cycles and in teacher collaborative time
- “Use cases”

<https://www.pmr2.org/resources>

Practical Measures,  
Routines and Representations

Home Team Measures & Resources Edsight Dissemination Contact

## Measures & Resources

### Practical measures and conditions of use

Are the PMRR practical measures right for your context?

**Conditions for Use**  
Learn what really matters for use of these practical measures

**Classroom Measures**  
Access the measures and the research underpinning them

**Professional Learning Measures**  
Access the measures and the research underpinning them

### Using the classroom practical measures

How can we use the classroom practical measures to support inquiry into and improve teaching?

**Technical Suggestions / FAQs**  
Brief answers to some technical and frequently asked questions when using the classroom measures

**Collaborative Professional Learning Contexts**  
Access a protocol that supports generative use in collaborative contexts

**One-on-one Coaching Cycles**  
Access a protocol that support generative use in coaching cycles





METRO  
NASHVILLE  
PUBLIC  
SCHOOLS

**Paul Cobb & Tom Smith**  
Vanderbilt University



**Nick Kochmanski**  
University of North Carolina-  
Greensboro

**Cara Haines**  
University of Nevada - Las Vegas

**Daniela DiGiacomo**  
University of Kentucky



**UC Irvine**

UNIVERSITY OF CALIFORNIA  
**UC RIVERSIDE**



**Marsha Ing**  
University of California - Riverside

**Zuhal Yilmaz**  
Louisiana State University

**Hilda Borko & Victoria Doherty**  
Stanford University

**Michael Jarry Shore**  
North Carolina State University

**Stanford**  
GRADUATE SCHOOL OF  
EDUCATION



**FEDERAL WAY  
PUBLIC SCHOOLS**

**Kara Jackson, Anita Lenges, Hannah  
Nieman, Starlie Chinen, Maria Hays, &  
Elham Kazemi**  
University of Washington

**June Ahn**  
University of California - Irvine

**Fabio Campos**  
New York University

**Ha Nguyen**  
Utah State University

**W** COLLEGE OF EDUCATION  
UNIVERSITY of WASHINGTON

**Sevim Sevgi**  
Erciyes University



# Appendix

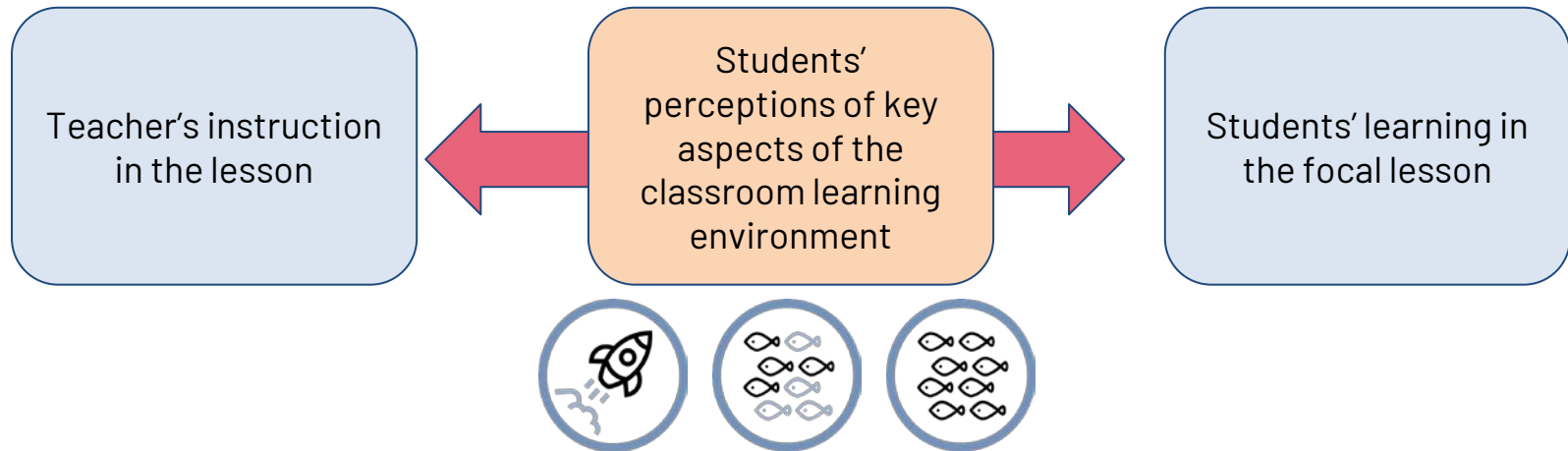
## Other examples of use

---

- A district-wide curriculum guide writing initiative (using students' perspectives on lessons as feedback to improve lessons)
- School-based collaborative professional development
- Disaggregation of data at the school level to investigate differences in students' experiences of mathematics lessons within and across grade levels to, in turn, inform professional learning needs

# Classroom measures data provide a “link” between instruction and students’ learning

---

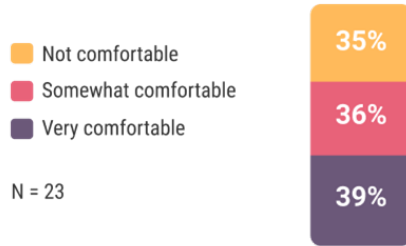


Jackson, K., Cobb, P., Ing, M., Ahn, J., Smith, T., Kochmanksi, N., Chinen, S., & Nieman, H. (accepted, estimated publication 2024). Developing and using practical measures to inform instructional improvement in mathematics at scale In P. LeMahieu & P. Cobb (Eds.), *Practical measurement for improvement*. Harvard Education Press.

# Challenge: Supporting productive sensemaking of students' responses

---

How comfortable were you sharing your thinking in today's whole-class discussion?



N = 23

*"[The date of the survey administration] is pretty far into the school year, so that makes me worry. Are there still that many students in that class that are not comfortable sharing? Are they not comfortable sharing because they didn't know exponents. ... I want to know more of the reason behind why they were not comfortable ... I wonder how much of it was the content. ... This is really making me reflect." - **Teacher Wanda***

How comfortable were you sharing your thinking in today's whole-class discussion?



N = 22

*"You always have those kids that always have their hands up in the air first. ... You have the kids that are kind of there, and you have the kids who are just not willing for whatever reason. Some of them don't know the answer, some of them just don't talk." - **Teacher Nicole***