

# DREME Math Observer: A Practical Tool for Early Math Observations and Coaching

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# Overview

- Linking early math learning and algebra readiness
- Supporting later learning and instructional coherence
- Importance of focusing on instructional practices
- Supporting math learning and teaching with the DREME Math Observer tool
- Q&A Discussion

# What is the DREME Network?



- Development and Research in Early Math Education
  - The DREME Network seeks to advance the field of early mathematics research and improve young children's opportunities to develop math skills
  - Scholars from 12+ universities all over the country
  - Created in 2014
  - Birth to 8 years, emphasis on preschool/PreK years
  - [dreme.stanford.edu](http://dreme.stanford.edu)

# Early Math is Important

- In pre-k and early elementary classrooms, math often gets much less attention than literacy. But...
- Early math knowledge predicts later math AND literacy achievement (Fyfe et al., 2019; Jordan et al., 2009; Nelson et al., 2021)
- Early math learning provides the foundations for future math learning, including preparing students for algebra (Booth et al., 2014; Hornberg et al., 2022)
- Connections with executive function (memory, flexible thinking, attention, impulse control) (Ribner et al., 2017; ten Braak et al., 2022)

# Instructional Coherence

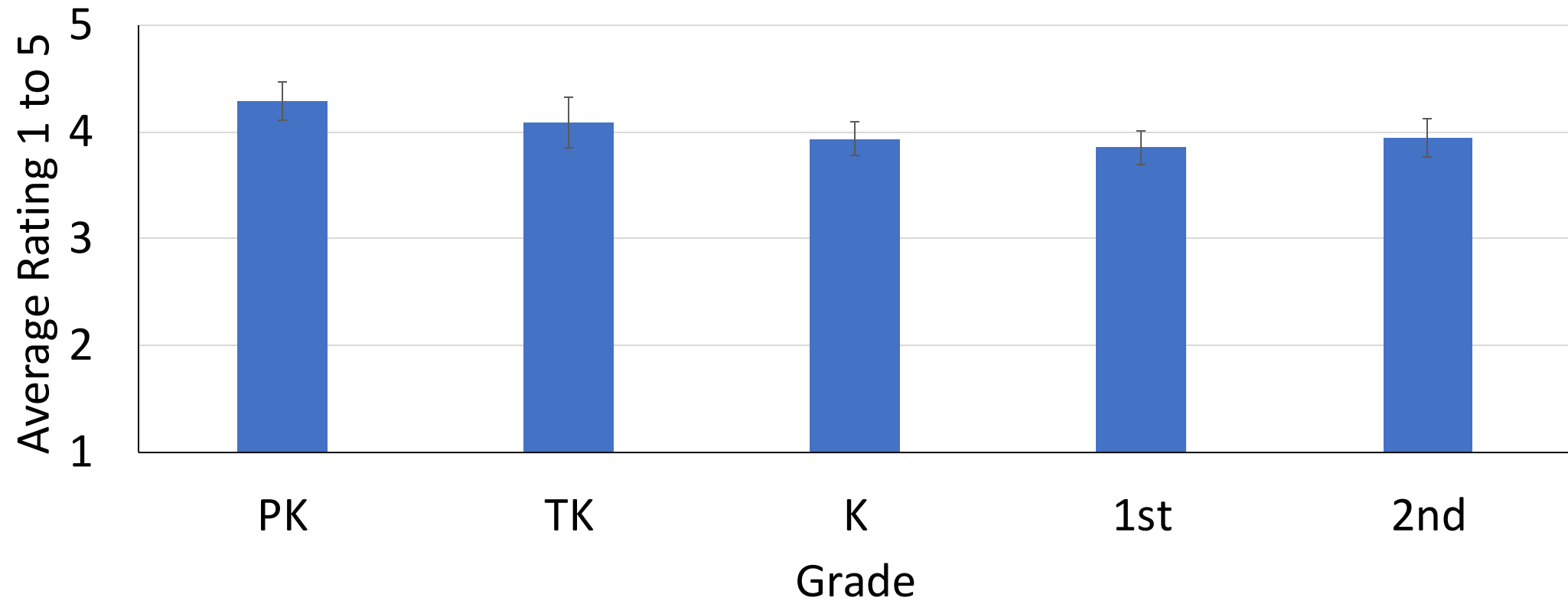
- Central to P-3 alignment is continuity in the **type** as well as the **quality** of math instruction.
- Coherence = degree to which classrooms comprise mathematical situations and interactions that are connected in terms of the mathematics and in terms of the development of children's mathematical understanding (desirable!)
- Can also have consistency that is undesirable
- Study with 2 CA Districts, we asked:
  - How does math instruction change across grades?
  - Do we find evidence of coherence?

# Focus on Practices

- How math is taught is as important as the scope and sequence of the content
- Few studies exist that describe what regular instructional practice looks like in the early grades during math in nuanced ways
- Observation system designed to focus on dimensions important for learning AND to reveal patterns and variability across grades

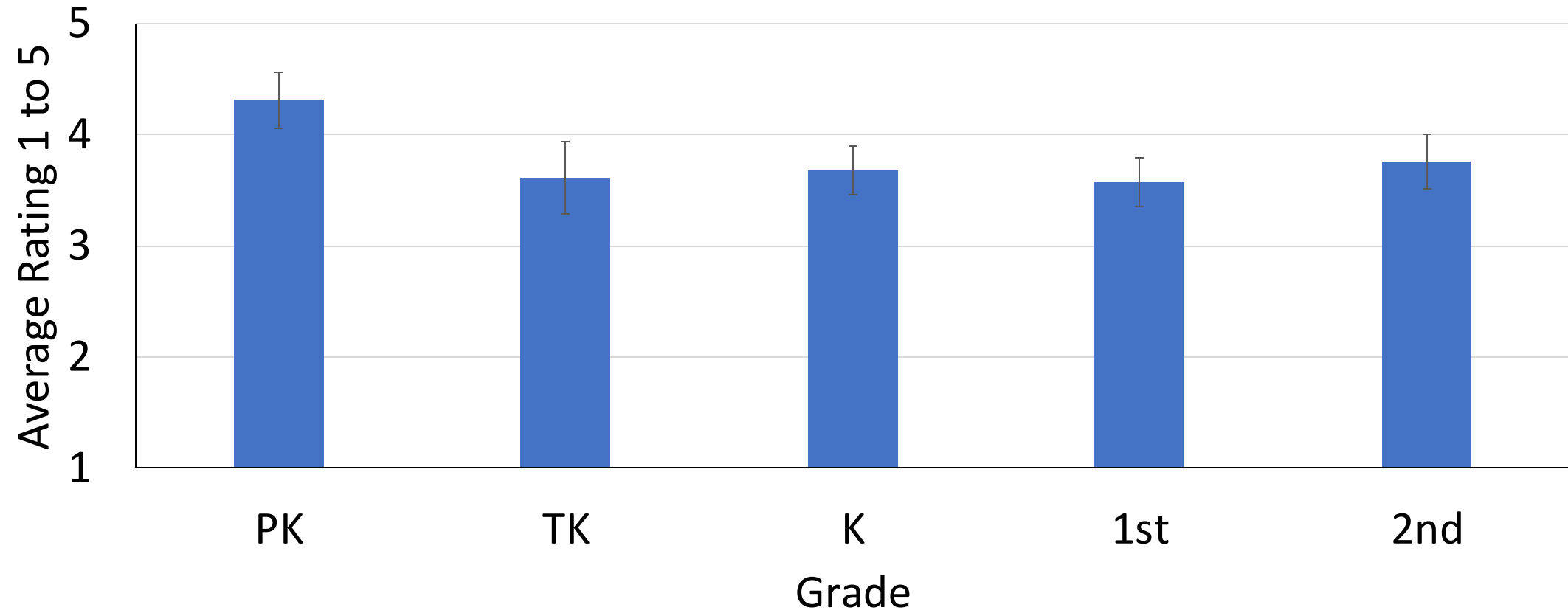
# Results Across Grades

## Student Engagement with Math



# Results Across Grades

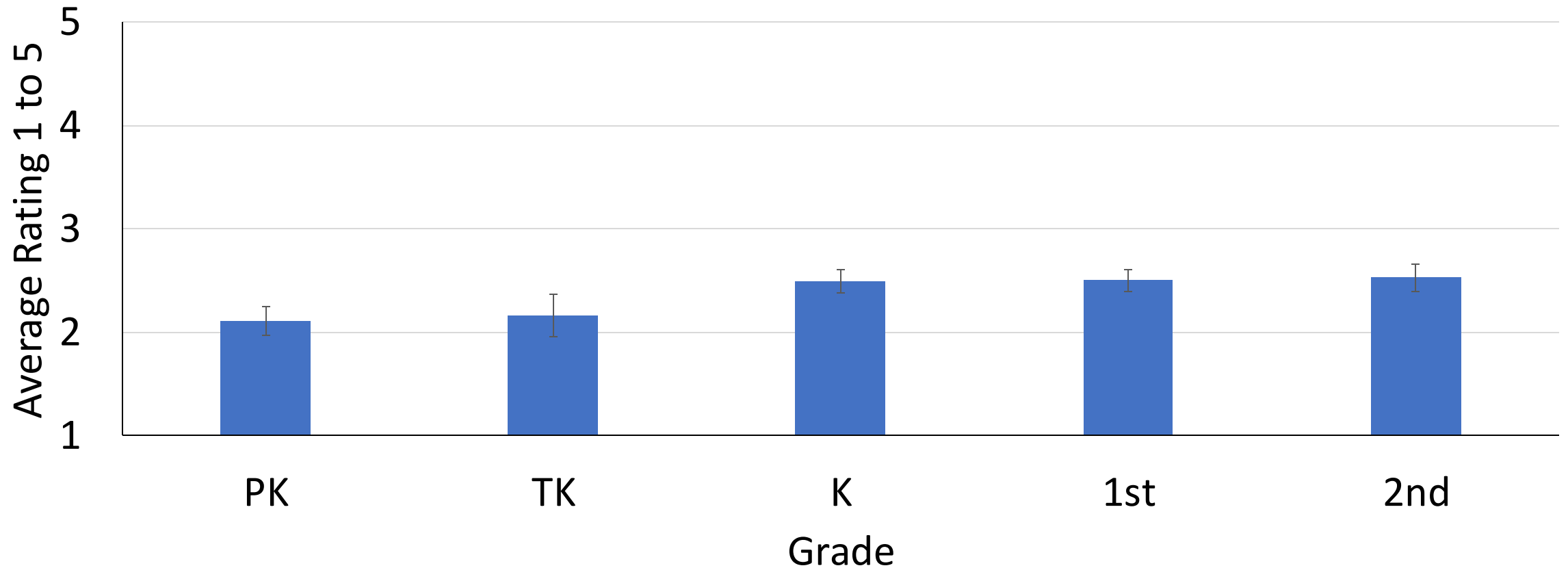
## Classroom Atmosphere





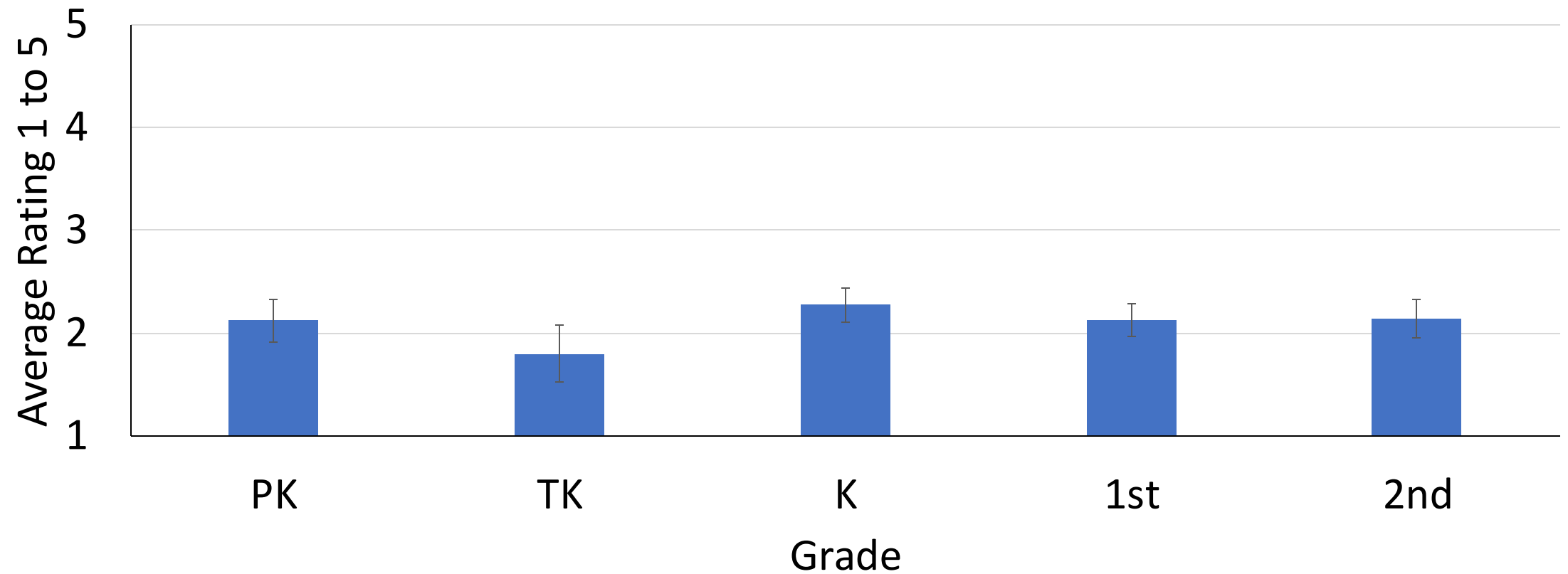
# Results Across Grades

Teacher Responds to and Extends Student Math Thinking

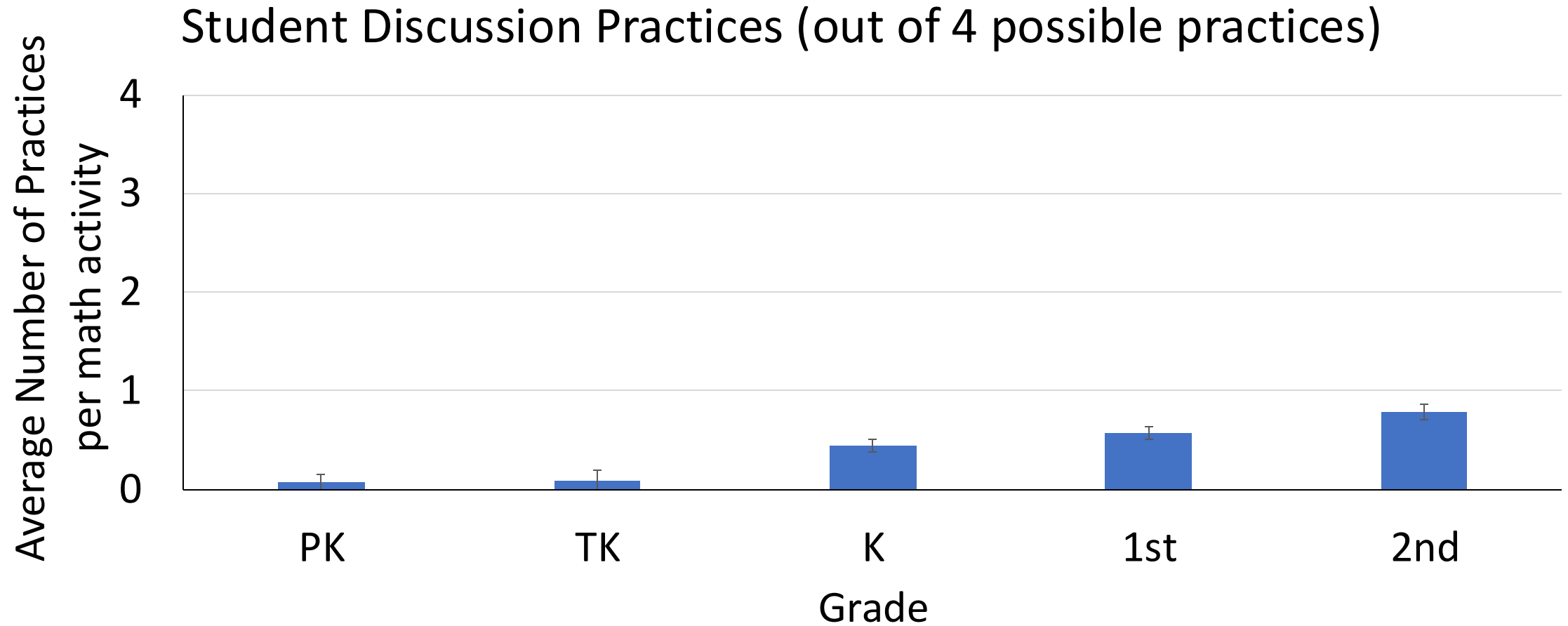


# Results Across Grades

## Differentiation Among Students

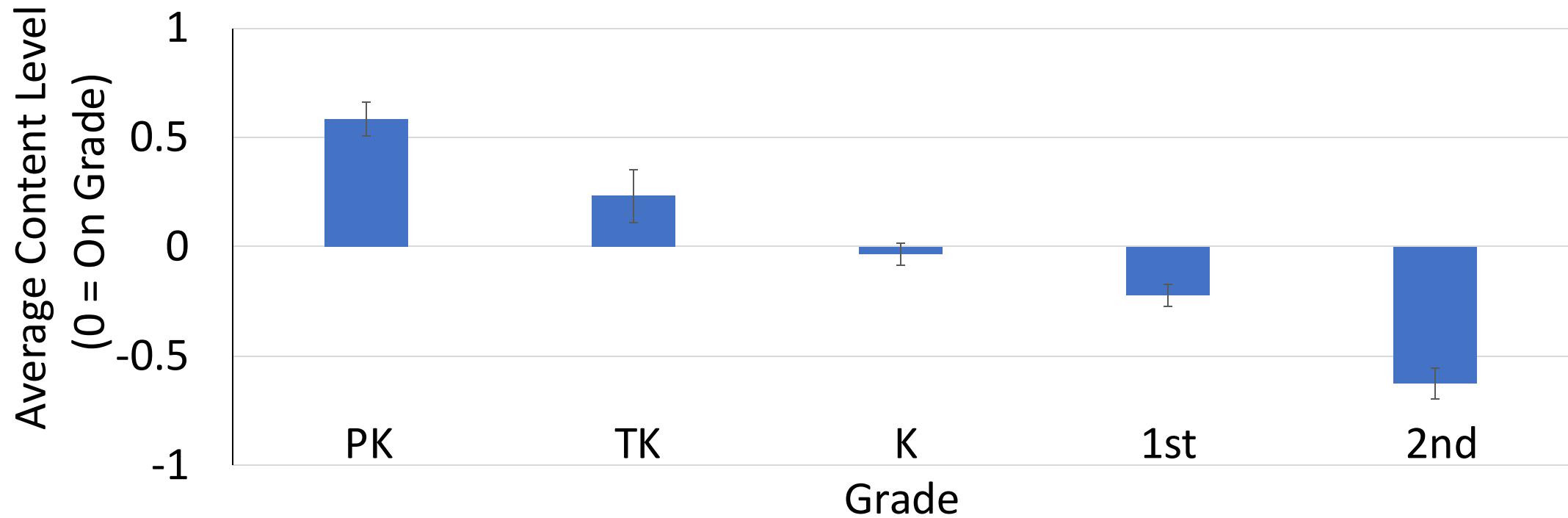


# Results Across Grades



# Results Across Grades

Mean Content Grade Level  
(Standardized across Grades)



# Implications

- Positive atmosphere may be easier for teachers to implement than differentiating learning and fostering student discussion practices.
- Teachers may underestimate what younger students are capable of (e.g., answering more open-ended questions).
- Of concern is the increasing amount of time spent on content below grade level as students get older and the little individual differentiation.
- Supporting early grades math can lead to better learning in later grades.
- This same focus on a constellation of high-quality practices can apply to all grades.
- Need new tools for measuring these practices in nuanced ways with actionable and specific feedback.

# Introduction

## DREME Math Observer App (free)



Apple



Android



# DREME Math Observer App

- Adapted research tool into a practitioner-friendly tool
- Free app available on the Google Play and Apple Stores for mobile devices and tablets
- For coaches, administrators, instructional leaders, and teachers
- Developed in partnership with practitioners
- Used to conduct *formative* assessments, for peer learning, and to support teachers to improve their math instruction
- A practical measure (vs. accountability measure)
- Includes specific practices and specific examples

# Practical Measures vs Accountability Measures

## Accountability Measures

- Goal to evaluate
- Often too broad for actionable steps
- Often not helpful for what comes next

## Practical Measures

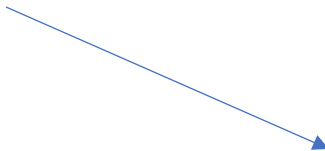
- Goal to support professional development
- Focused on specific practices
- Actionable



Short, mutually  
exclusive,  
behaviorally  
anchored



Generative –  
questions to build  
on observed  
practice



## Student Practices

Observation on September 28, 2022

### Peer Talk

#### Most students...

Did not talk to other students

Talked to others about math briefly

Discussed strategies or checked work with other  
students

### Useful Questions for Teacher

Was student-student talk all guided by the teacher,  
or were students discussing on their own?

Were the conversations productive?

Were there students who might need more support  
having these kinds of conversations in the future?

Our app:  
A Practical  
Measure

# The DREME Math Observer



Modeled on research-based early and elementary classroom math practices



Observe full or partial lessons, focus on what's relevant



Generate guiding questions to debrief



Track trends over time

## 1. Create a Teacher Profile

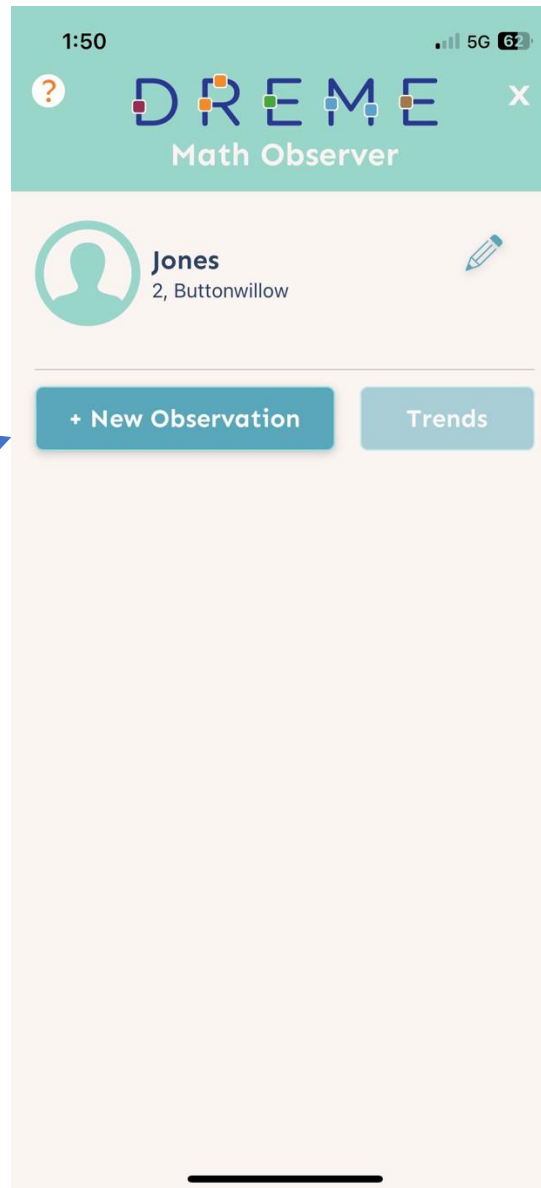


Create a profile for the teacher you're observing

You can setup a bunch of profiles if you observe a lot of teachers, or you may just setup one.

## 2. Start an Observation

Just tap here



Observations can be as long as you want. If you're only interested in a particular activity, you might only stay for that part.

Or you can stay for a whole math lesson to get a more holistic view.

### 3. Select Domain(s)

Check which types of practices you want to focus on this observation

3:26 5G

Your first Observation X

### Select Domains

Choose which domains you would like to observe. You can change these at any time from the settings menu.

- ☒ Student Math Practices
- ☒ Facilitation
- ☐ Differentiation
- ☐ Rigor

Show domain selection pop-up each time.  
☐

[< Prev](#) [Let's Go!](#)

You can choose to hide the ones that you are not interested in right now... but you can always turn them back on in Settings

4. Take notes and select the option that best fits.

Each domain you turned on is at the bottom of the screen. You can toggle between them.

The screenshot shows the 'Student Math Practices' app interface for a user named Jones. At the top, the status bar shows 8:45 and signal/battery icons. Below the header, there are icons for a camera, a pulse line, a target, and a gear. The main content area is titled 'Peer Talk' with an information icon and a list icon. A text box contains a note: 'Teacher asked ss to turn and talk with their neighbor to estimate how many jellybeans might be in the jar- but she also asked them to explain why they chose that answer. I heard ss talk about how many they counted across the bottom and use that to predict the whole number. Heard another s make a wild guess and their partner said that's way too many. Discussion went on for 5 minutes and there were other points in the lesson that the T did similar moves'. Below the note, it says 'Most students...' and shows three rating options: 'Did not talk to other students', 'Talked to others about math briefly', and 'Discussed strategies or checked work with other students'. The 'Discussed strategies...' option is highlighted. At the bottom, there is a navigation bar with four icons: 'Students' (people icon), 'Facilitation' (person at board icon), 'Differentiation' (person with arrows icon), and 'Rigor' (head with gear icon). The 'Facilitation' icon is currently selected.

Toggle the notes field on and off here

Choose your rating here

# Student Engagement

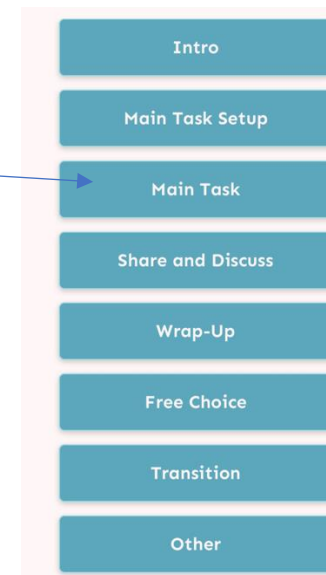
Will be automatically set to prompt for a rating every 3 minutes (see progress bar)

Choose the “Lesson Phase” for example “Main Task”

Rating 1-5

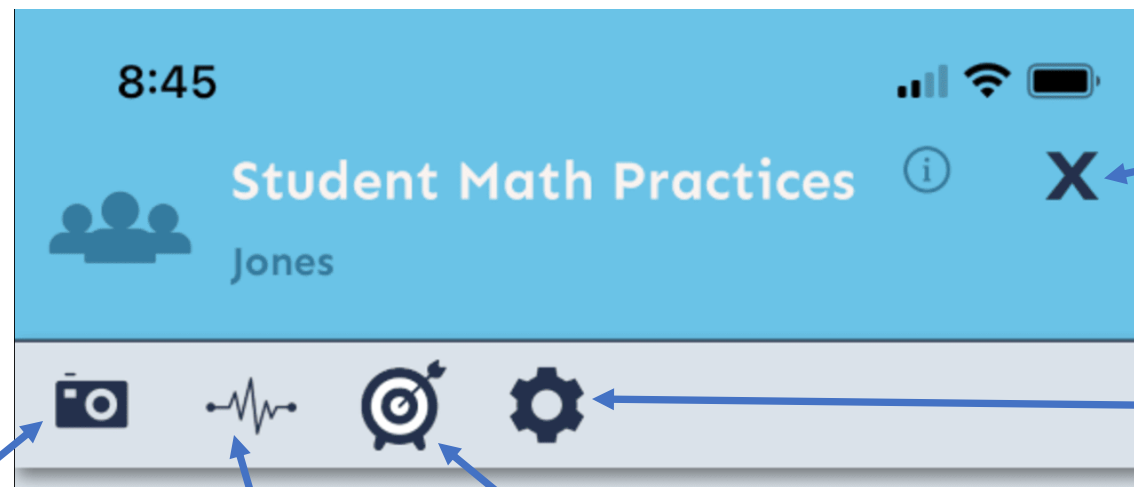
Provides affective dimension – which parts of the lesson were kids excited about?

Can turn off if not interested



The screenshot shows a mobile app interface. At the top, there's a status bar with the time 11:32 and battery level. Below that, a header bar says 'Engagement Jones' with a close button (X). Underneath, there are icons for a camera, a heart rate monitor, a target, and a gear. A navigation bar shows 'Back', 'Phase: Main Task', and 'Done'. The main content area is titled 'Rate Current Engagement'. It features three sections: 'High' (intense concentration), 'Medium' (some interest), and 'Low' (not interested or engaged). Each section has a description and a rating scale from 1 to 5. The 'High' section has a rating of 5, 'Medium' has a rating of 3, and 'Low' has a rating of 1.

There's a toolbar with other things you might want to do at the top of each screen



Click the X to save and close

More settings

Take photos of things you want to remember

Rate the class engagement

Write notes about the math objective

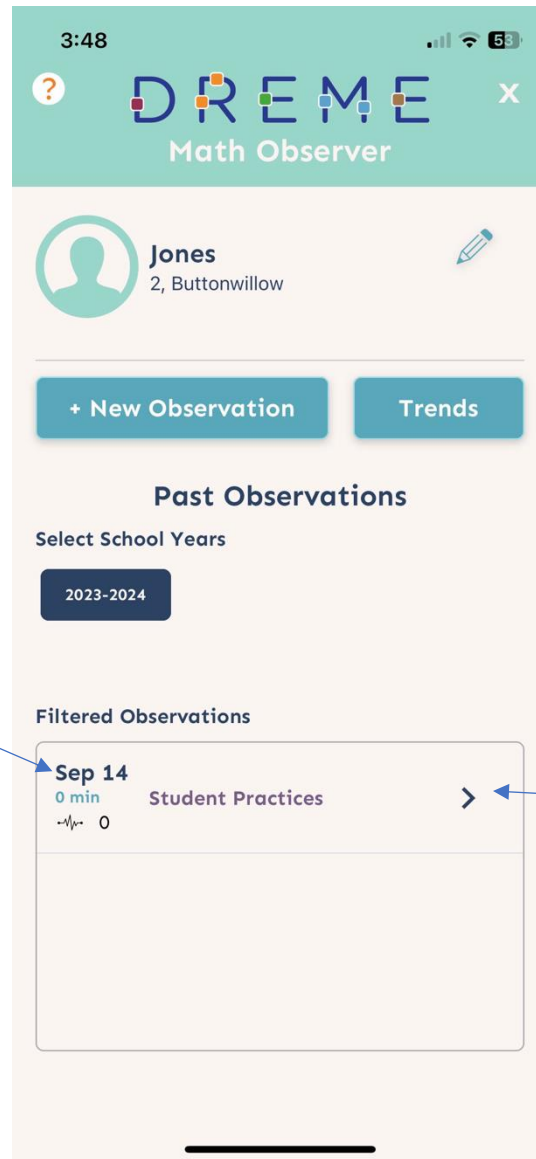


Wherever you see this icon,  
there's a menu with more  
information. In many places  
there are tutorial videos!

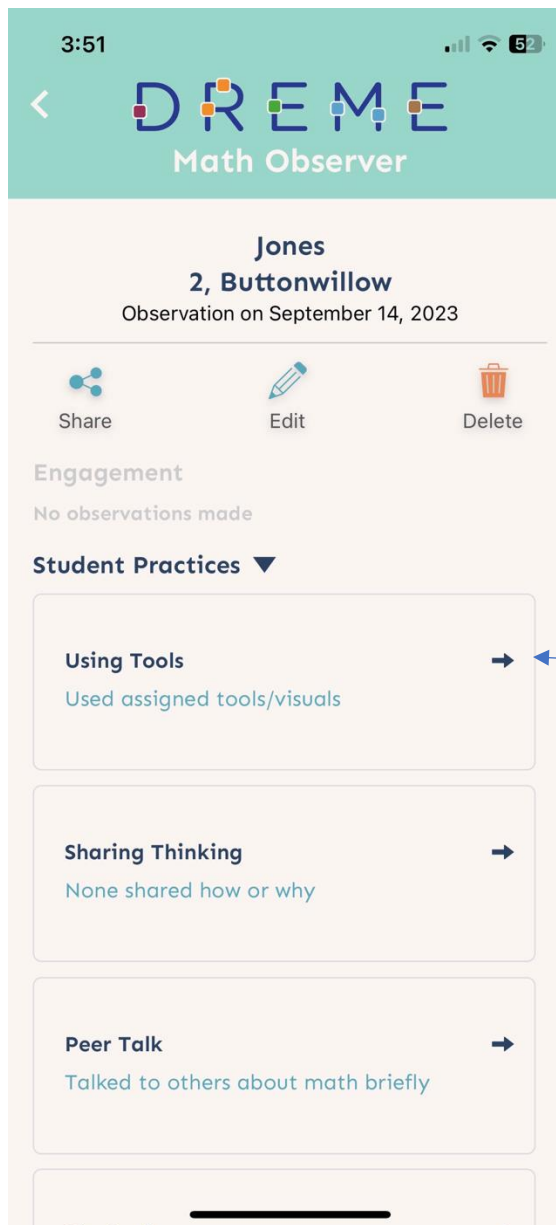


## 5. Review your observation

All your past observations  
will show up here



Click here to open



Under each domain you can see each subdomain and practice that you chose

Tap the arrow to get some guiding questions related to your selection

6. Use guiding questions to structure debrief after observing

These generate different questions based on your selections

The screenshot shows the DREME Math Observer app interface. At the top, the status bar shows 8:47, signal strength, Wi-Fi, and battery. Below the header, the app title 'DREME Math Observer' is displayed. The main section is titled 'Student Practices' with a subtitle 'Observation on September 28, 2022'. Under 'Peer Talk', there are three options: 'Did not talk to other students', 'Talked to others about math briefly', and 'Discussed strategies or checked work with other students'. The 'Useful Questions for Teacher' section contains three questions: 'Was student-student talk all guided by the teacher, or were students discussing on their own?', 'Were the conversations productive?', and 'Were there students who might need more support having these kinds of conversations in the future?'. The 'Your Notes' section has a text box containing a detailed note about a teacher's activity and student discussion.

8:47

< DREME Math Observer

Student Practices  
Observation on September 28, 2022

Peer Talk

Most students...

Did not talk to other students

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Useful Questions for Teacher

Was student-student talk all guided by the teacher, or were students discussing on their own?

Were the conversations productive?

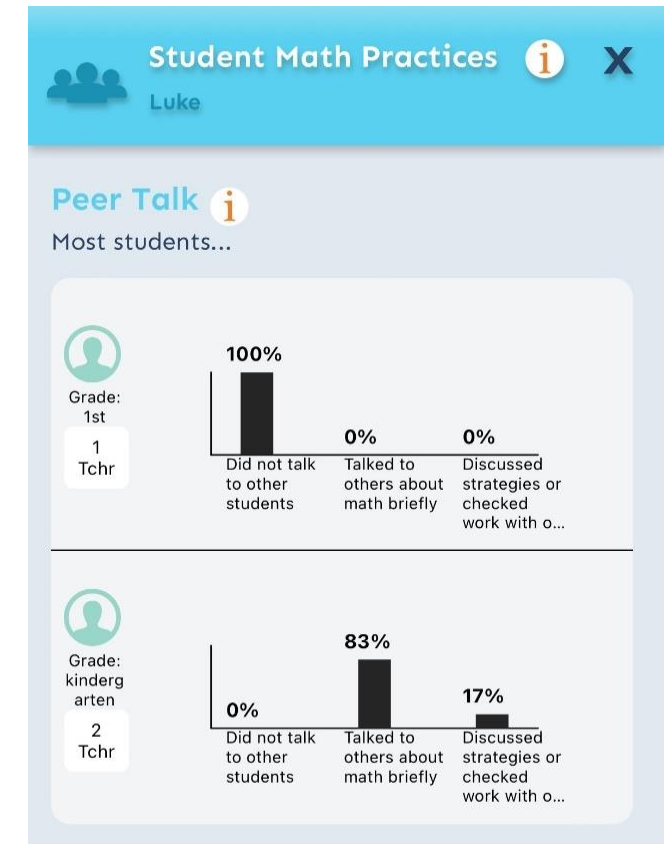
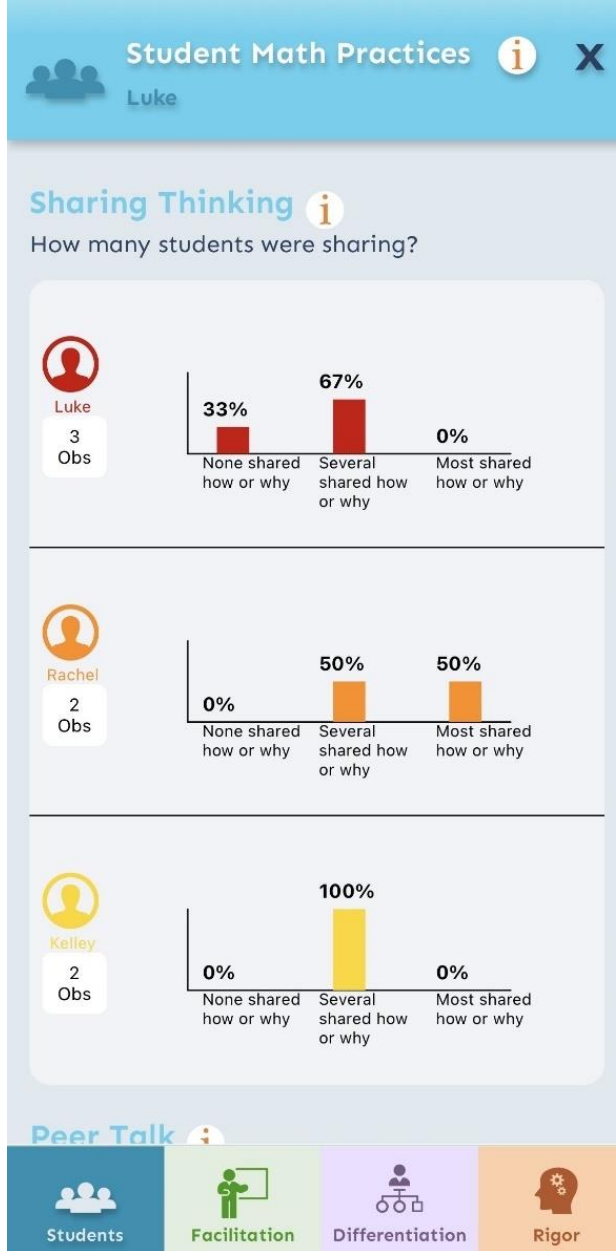
Were there students who might need more support having these kinds of conversations in the future?

Your Notes

Teacher asked ss to turn and talk with their neighbor to estimate how many jellybeans might be in the jar- but she also asked them to explain why they chose that answer. I heard ss talk about how many they counted across the bottom and use that to predict the whole number. Heard another s make a wild guess and their partner said that's way too many. Discussion went on for 5 minutes and there were other points in the lesson that the T did similar moves

You can keep notes about your debrief here

## 7. See overall Trends



## Overview of Domains

### Student Practices

- Using Tools
- Sharing Thinking
- Peer Talk
- Strategies



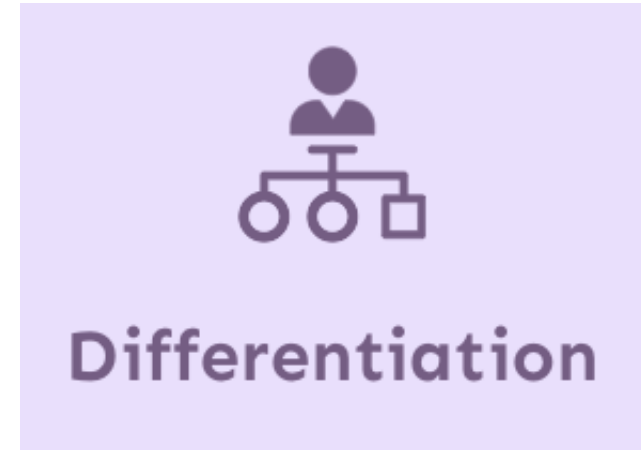
## Teacher Facilitation

- Responsiveness
- Student Errors
- Questioning
- Connections



# Differentiation

- Individualized Interactions
- Adaptation
- Planning For Differences





## Rigor

- Math Fluency
- Math Procedures
- Math Concepts
- Problem Solving



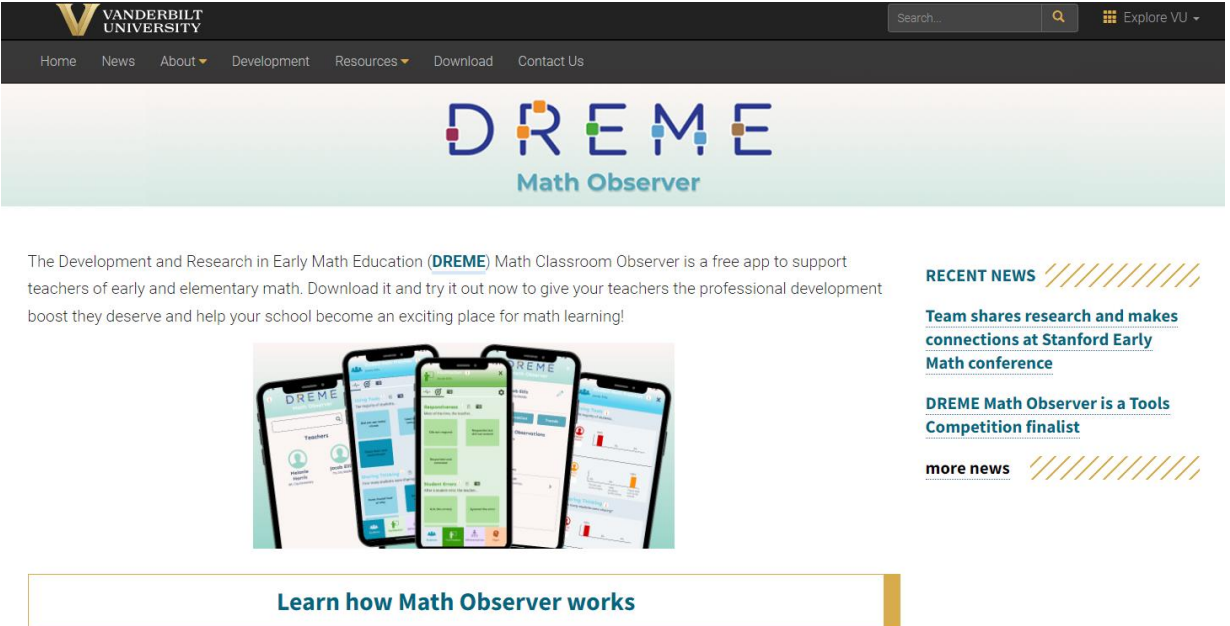
# Our Current Project

- Please reach out to [kelley.durkin@vanderbilt.edu](mailto:kelley.durkin@vanderbilt.edu) or [luke.rainey@vanderbilt.edu](mailto:luke.rainey@vanderbilt.edu) if you're interested in joining our pilot study
- Regular feedback about using the app across the school year and beyond
- Incentives offered

Visit our lab website to learn more:


<https://lab.vanderbilt.edu/dremeobserver/>

- Tutorial videos
- Ideas for how to use
- Detailed user guide



The screenshot shows the website for the Development and Research in Early Math Education (DREME) Math Classroom Observer. The header features the Vanderbilt University logo and a navigation menu with links to Home, News, About, Development, Resources, Download, and Contact Us. A search bar and an 'Explore VU' button are also present. The main banner displays the 'DREME Math Observer' logo. Below this, a paragraph describes the app as a free tool for supporting teachers of early and elementary math. To the right, a 'RECENT NEWS' section lists two articles: 'Team shares research and makes connections at Stanford Early Math conference' and 'DREME Math Observer is a Tools Competition finalist'. A central image shows four smartphones displaying the app's interface. At the bottom, a yellow button with the text 'Learn how Math Observer works' is visible.


VANDERBILT UNIVERSITY

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**DREME**  
Math Observer


The Development and Research in Early Math Education (DREME) Math Classroom Observer is a free app to support teachers of early and elementary math. Download it and try it out now to give your teachers the professional development boost they deserve and help your school become an exciting place for math learning!

**RECENT NEWS** 

[Team shares research and makes connections at Stanford Early Math conference](#)

[DREME Math Observer is a Tools Competition finalist](#)

**more news** 



**Learn how Math Observer works**

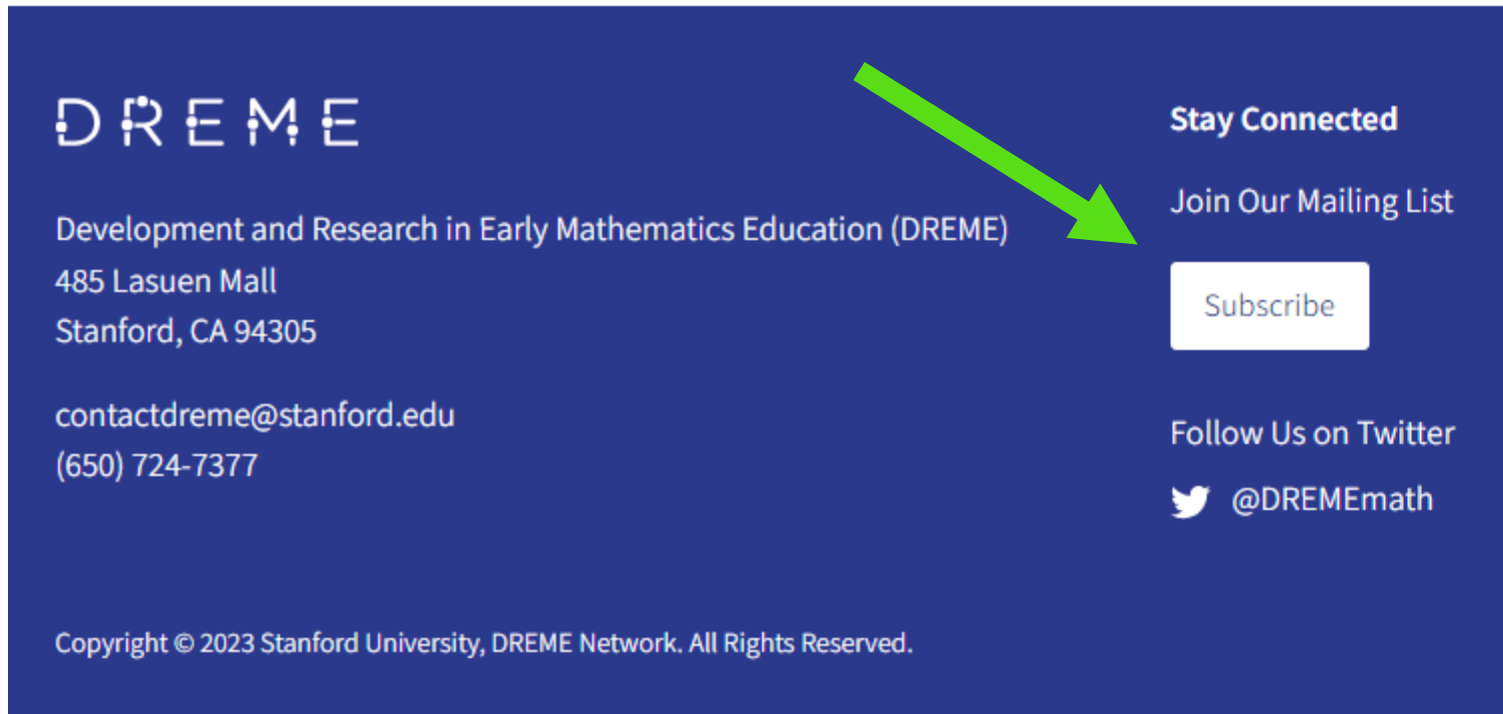
# Acknowledgements



- Many thanks to...
  - The Heising-Simons Foundation for funding this work
  - Dr. Dale Farran at Vanderbilt University
  - Practitioners across the country who have participated in the research and provided feedback
  - Other researchers at UCLA, the University of Denver, Northwestern University, and Stanford University who have contributed to the project work

# Want more DREME? Want to learn more about our app?

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<https://dreme.stanford.edu>

<https://lab.vanderbilt.edu/dremeobserver/>