

# A Practical Early Math Observation and Coaching App

Kelley Durkin

Luke Rainey

Vanderbilt University

September 28, 2024

# 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

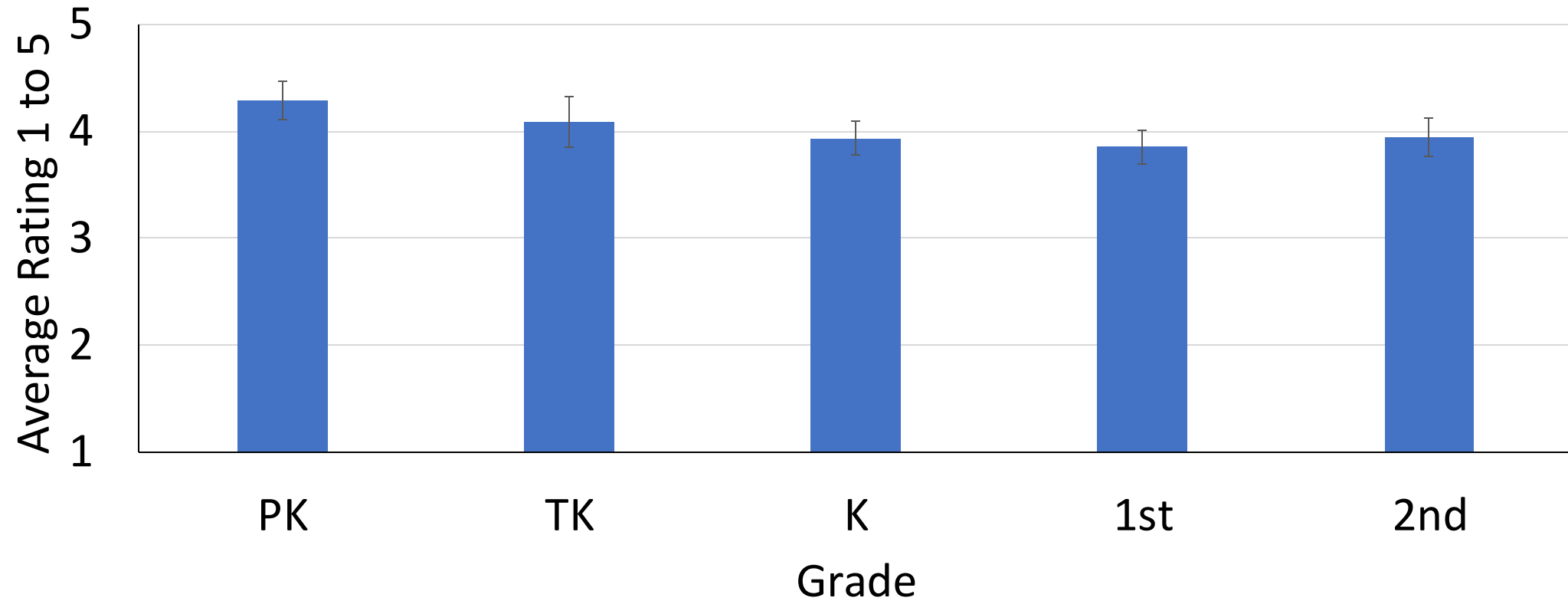
- In pre-k and early elementary classrooms, math often gets much less attention than literacy. But...
- Early math knowledge predicts later math AND literacy achievement (Fyfe et al., 2019; Jordan et al., 2009; Nelson et al., 2021)
- Connections with executive function (memory, flexible thinking, attention, 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?

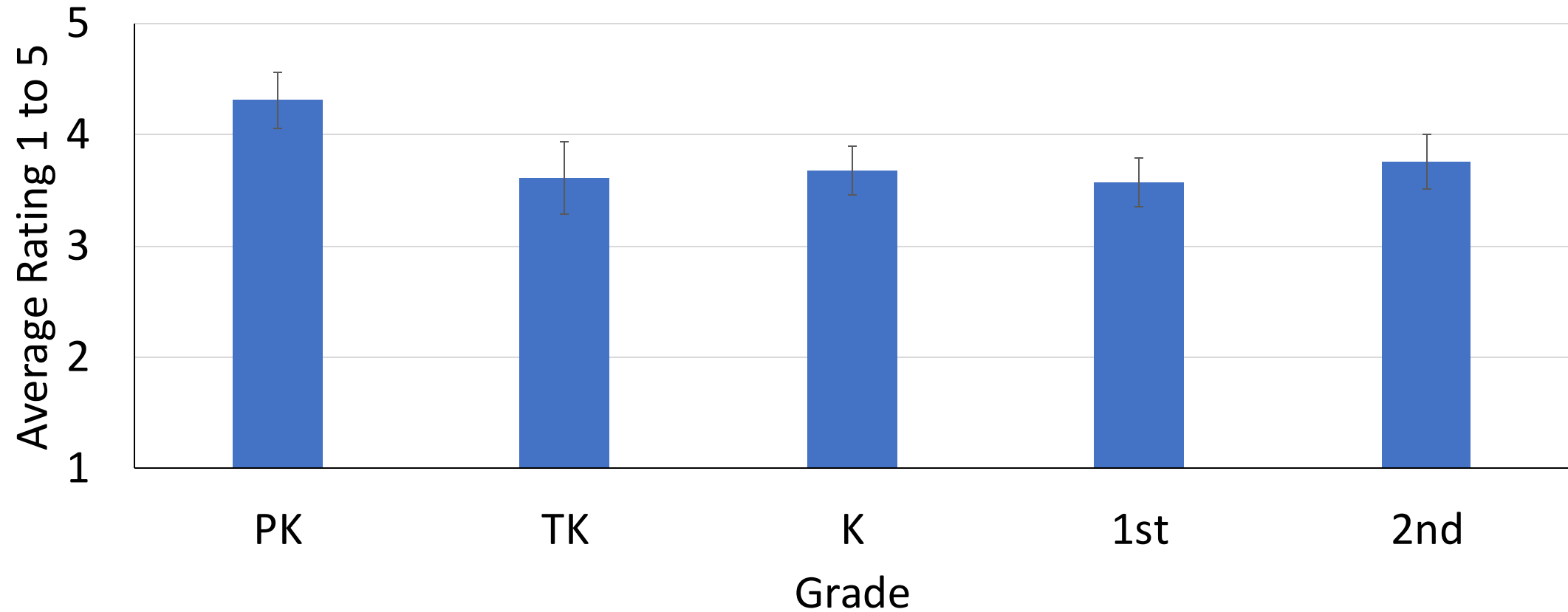
# Results Across Grades

## Student Engagement with Math



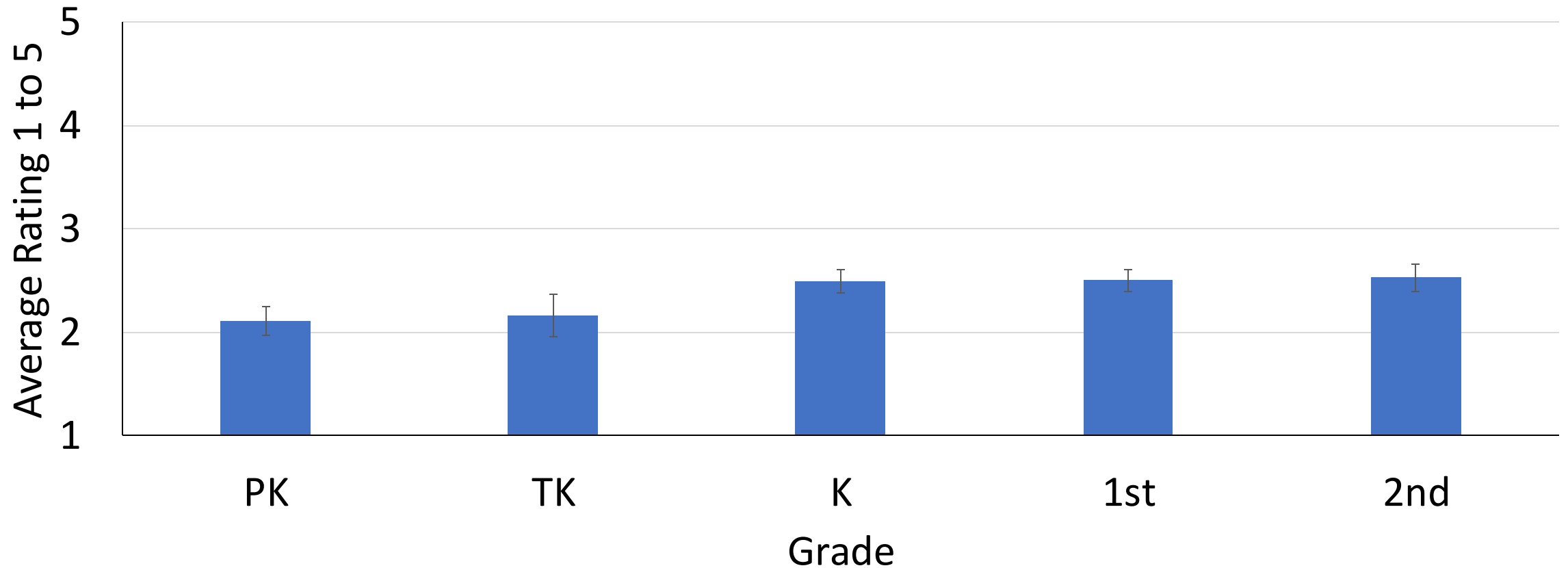
# Results Across Grades

## Classroom Atmosphere



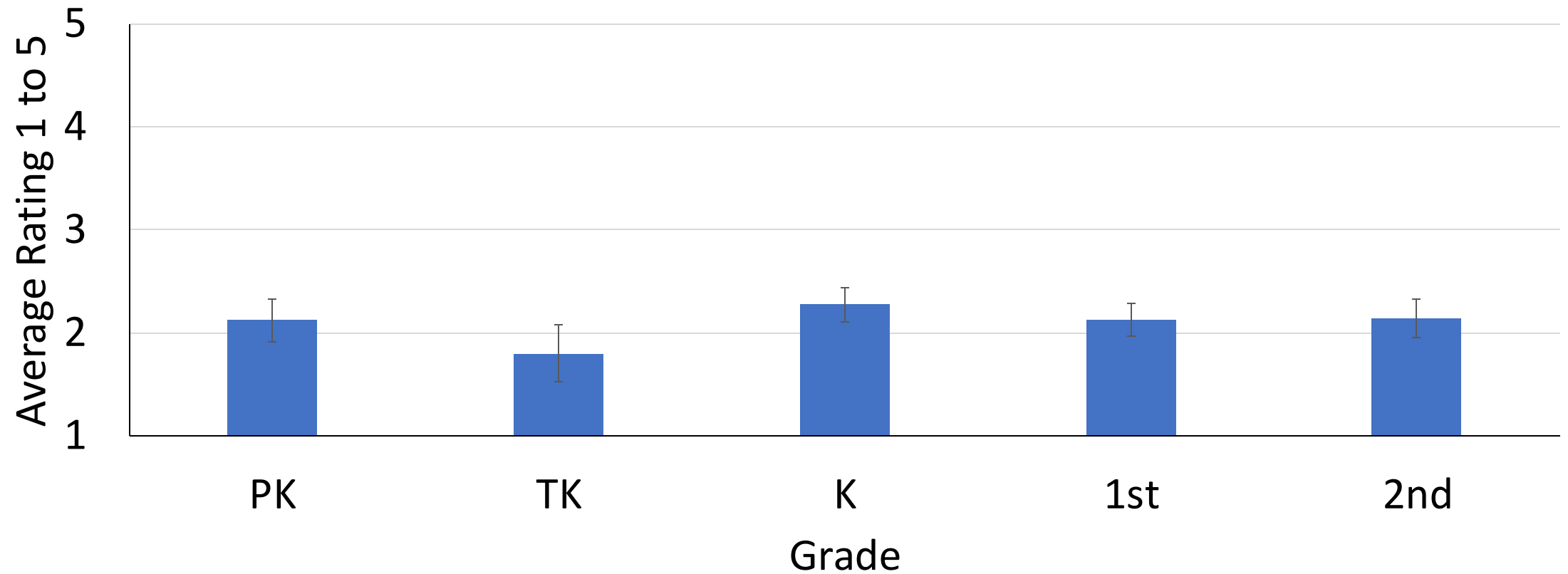
# Results Across Grades

## Teacher Responds to and Extends Student Math Thinking

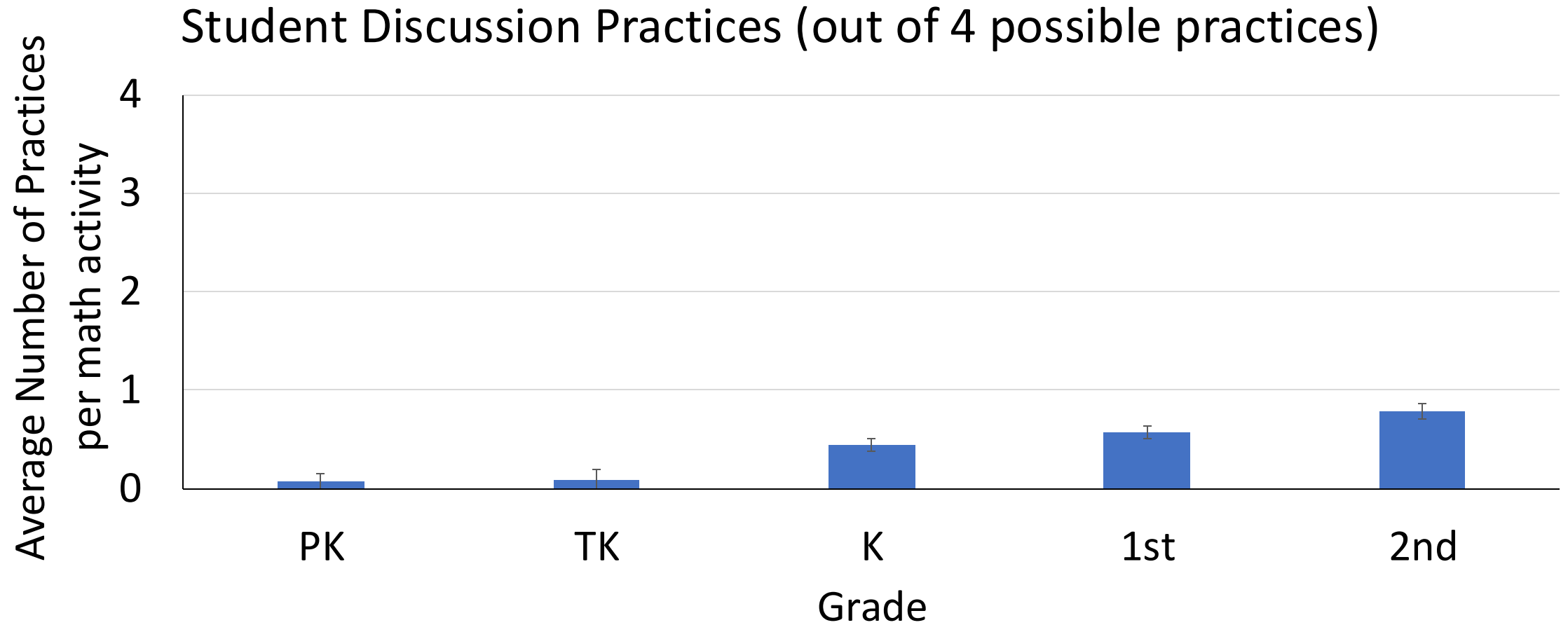


# Results Across Grades

## Differentiation Among Students

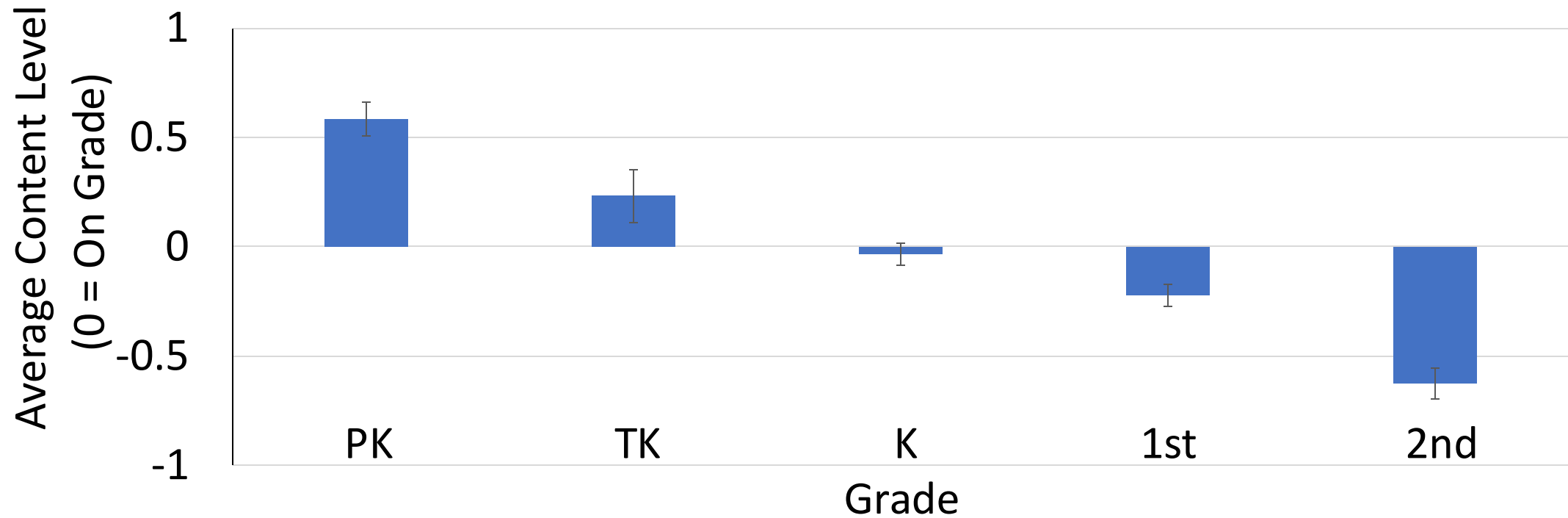


# Results Across Grades



# Results Across Grades

Mean Content Grade Level  
(Standardized across Grades)



# Implications

- Warm classrooms, high levels of student engagement during math.
- 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.

# Implications

- These are a constellation of practices. Can't focus on just one and necessarily expect effects on students' experiences.
- Need ways to look for consistency across grades and to support teachers.
- Need new tools for measuring these practices in nuanced ways.
  - Particularly that practitioners can use.
- Need to have explicit, specific, observable practices with examples.

## 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
- Includes specific practices and specific examples

# For Teachers and Teacher Educators

- Observe one another's teaching
- Common language
- Professional learning communities
- Support pre-service teachers in developing their practice

# 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

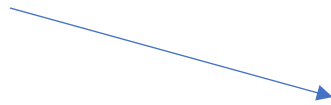
# Example Accountability Measure

	Significantly Above Expectations (5)	At Expectations (3)	Significantly Below Expectations (1)
Thinking	<ul style="list-style-type: none"> <li>The teacher thoroughly teaches <u>two or more</u> types of thinking:               <ul style="list-style-type: none"> <li>analytical thinking, where students analyze, compare and contrast, and evaluate and explain information;</li> <li>practical thinking, where students use, apply, and implement what they learn in real-life scenarios;</li> <li>creative thinking, where students create, design, imagine, and suppose; and</li> <li>research-based thinking, where students explore and review a variety of ideas, models, and solutions to problems.</li> </ul> </li> <li>The teacher provides opportunities where students:               <ul style="list-style-type: none"> <li>generate a variety of ideas and alternatives, analyze problems from multiple perspectives and viewpoints, and</li> <li>monitor their thinking to ensure that they understand what they are learning, are attending to critical information, and are aware of the learning strategies that they are using and why.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>The teacher thoroughly teaches one or more types of thinking:               <ul style="list-style-type: none"> <li>analytical thinking, where students analyze, compare and contrast, and evaluate and explain information;</li> <li>practical thinking, where students use, apply, and implement what they learn in real-life scenarios;</li> <li>creative thinking, where students create, design, imagine, and suppose; and</li> <li>research-based thinking, where students explore and review a variety of ideas, models, and solutions to problems.</li> </ul> </li> <li>The teacher provides opportunities where students:               <ul style="list-style-type: none"> <li>generate a variety of ideas and alternatives, and</li> <li>analyze problems from multiple perspectives and viewpoints.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>The teacher implements no learning experiences that thoroughly teach any type of thinking.</li> <li>The teacher provides no opportunities where students:               <ul style="list-style-type: none"> <li>generate a variety of ideas and alternatives, or</li> <li>analyze problems from multiple perspectives and viewpoints.</li> </ul> </li> </ul>

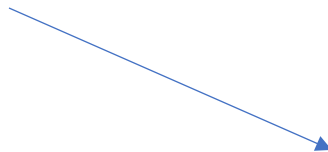
5



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

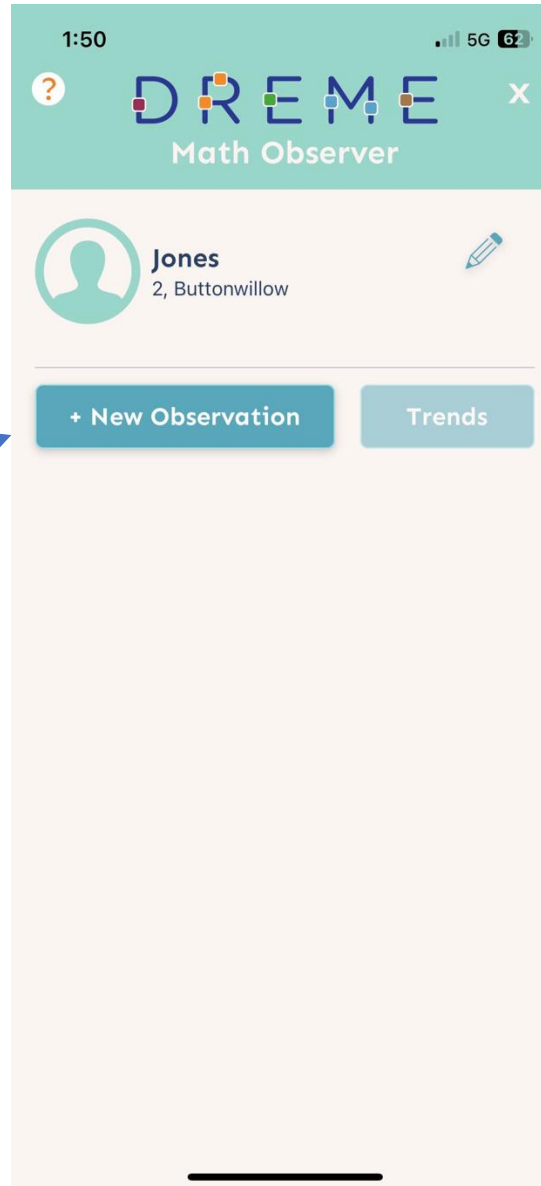


Create a profile for the teacher you're observing

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

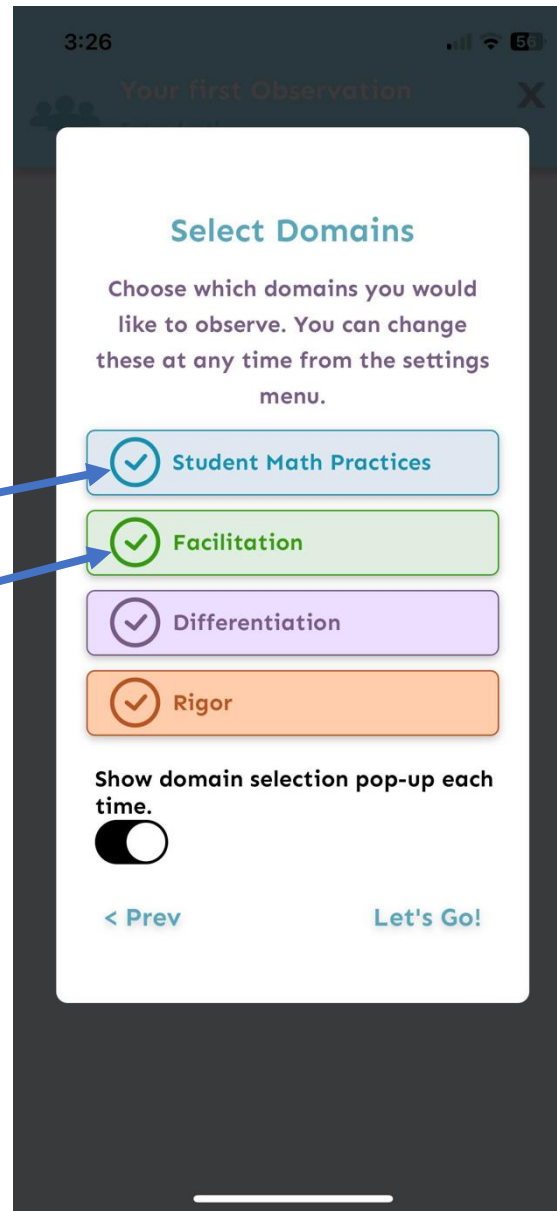


Observations can be as long as you want. If you're only interested in a particular activity, you might only stay for that part.

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

### 3. Select Domain(s)

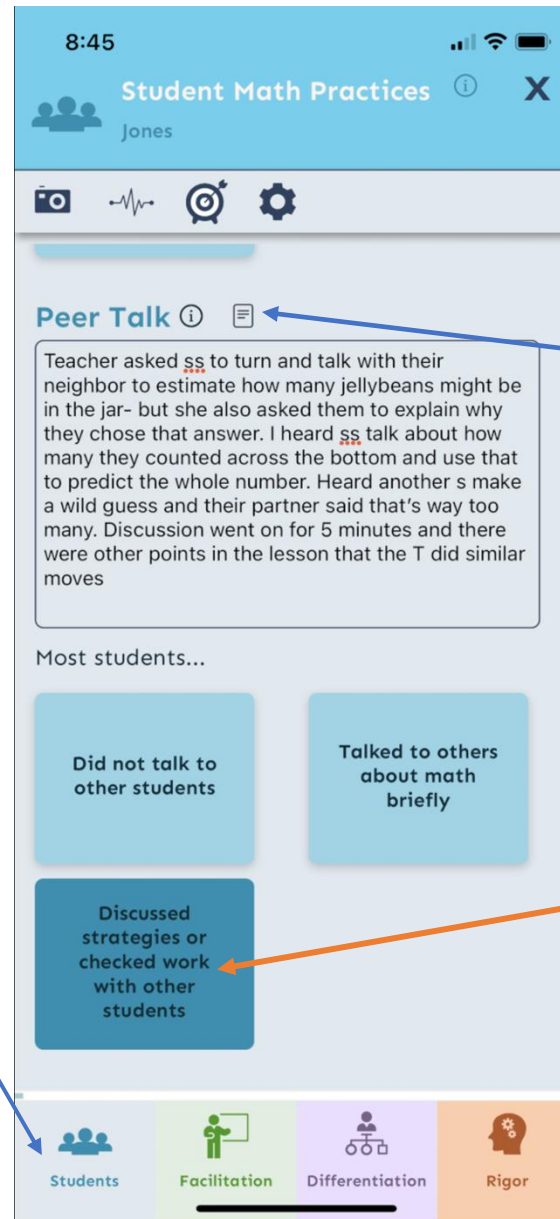
Check which types of practices you want to focus on this observation



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.



Toggle the notes field on and off here

Choose your rating here

# Student Engagement

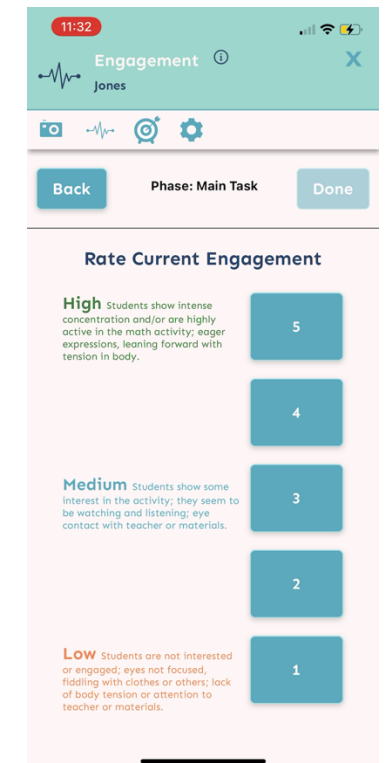
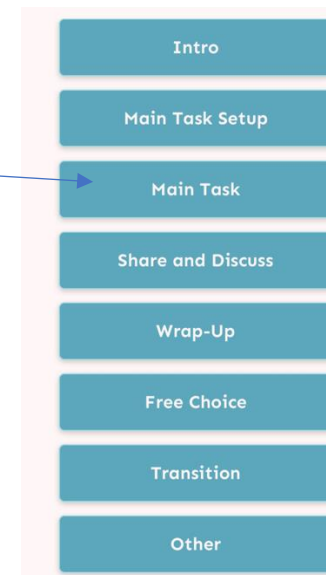
Will be automatically set to prompt for a rating every 3 minutes (see progress bar)

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

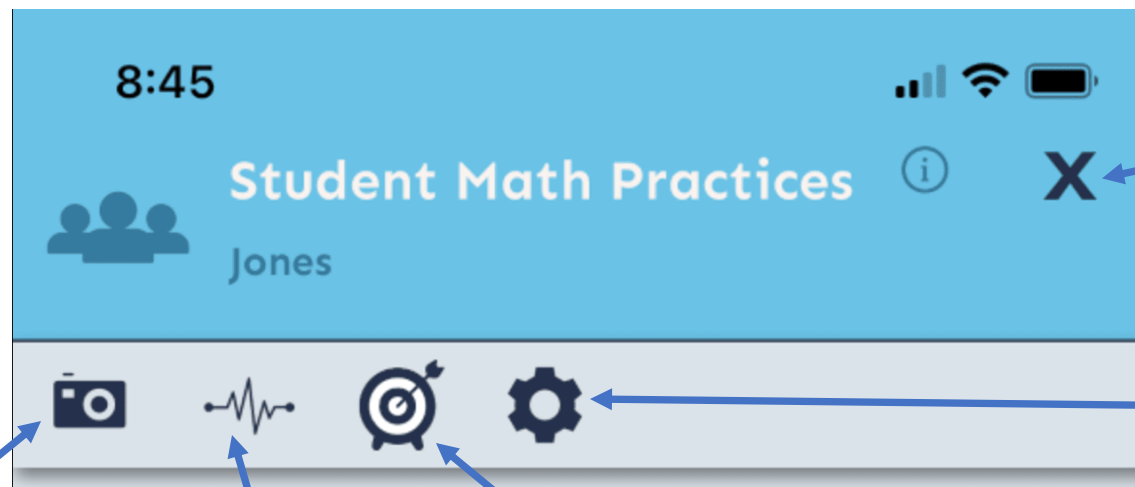
Rating 1-5

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

Can turn off if not interested



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

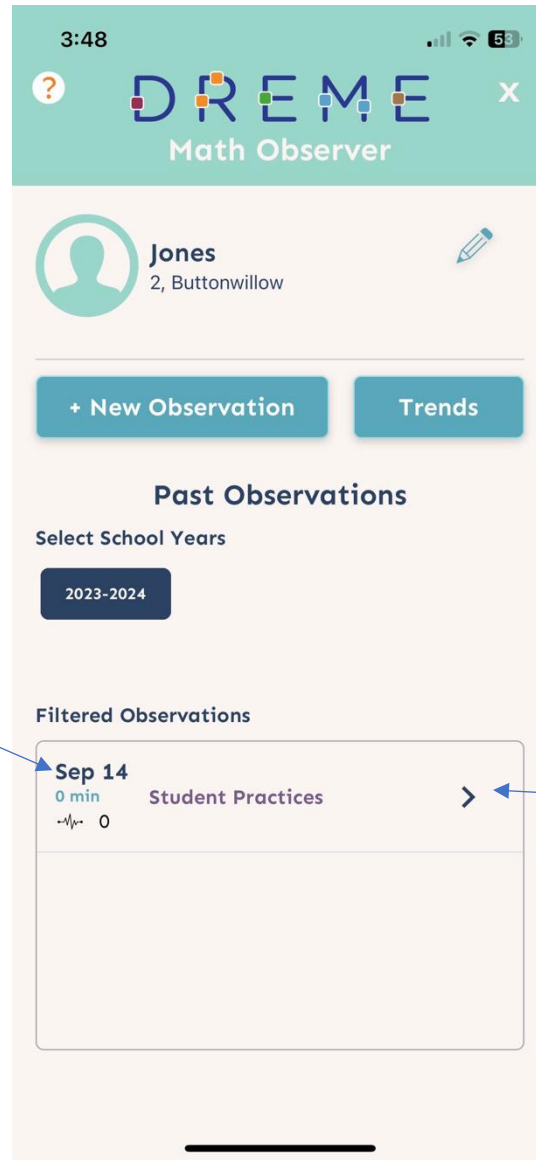
Write notes about the math objective

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

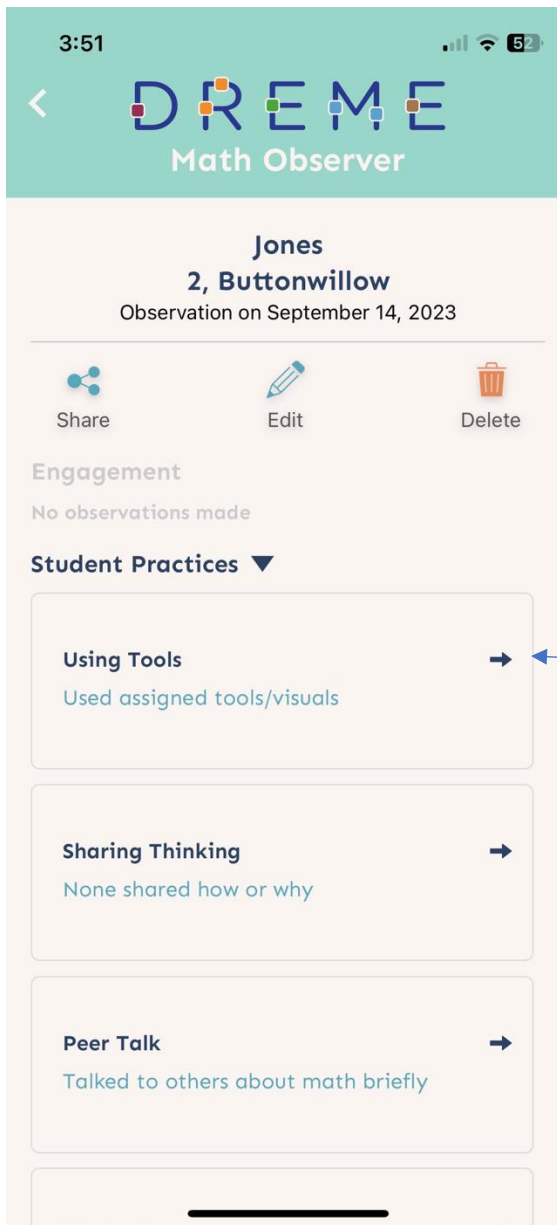


5. Review you observation

All your past observations will show up here



Click here to open

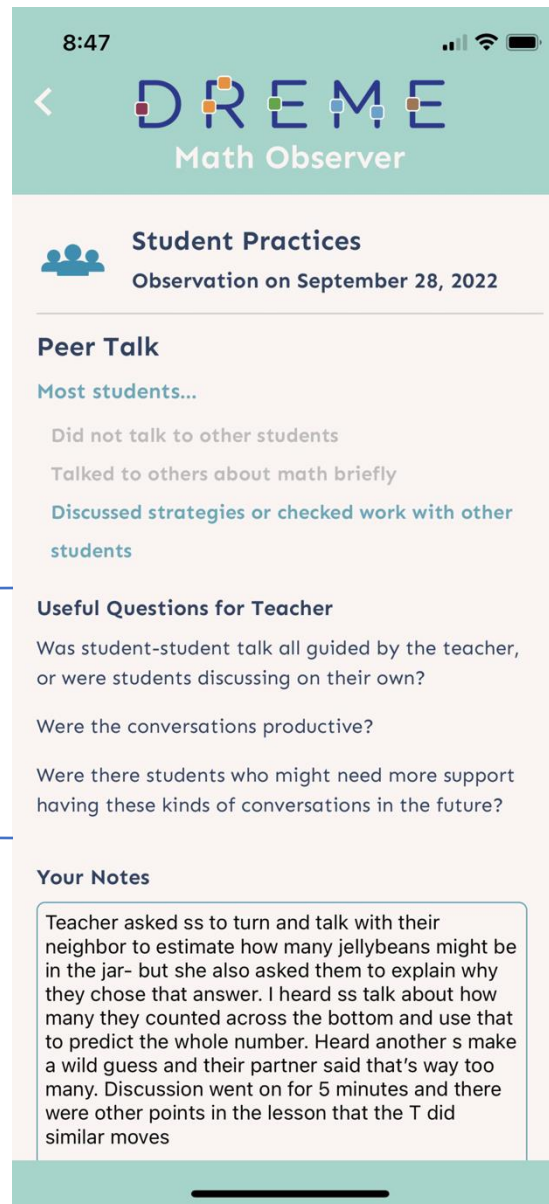


Under each domain you can see each subdomain and practice that you chose

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

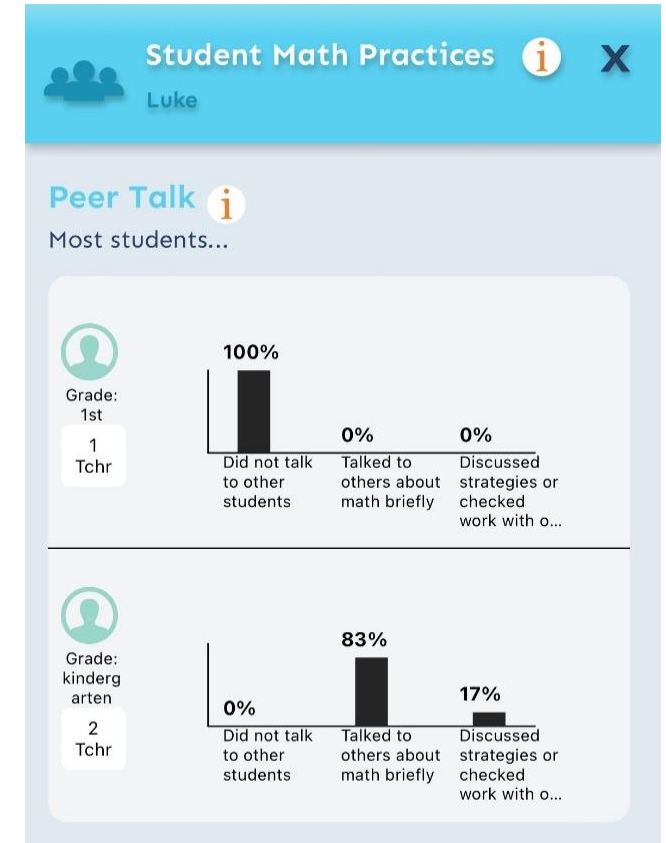
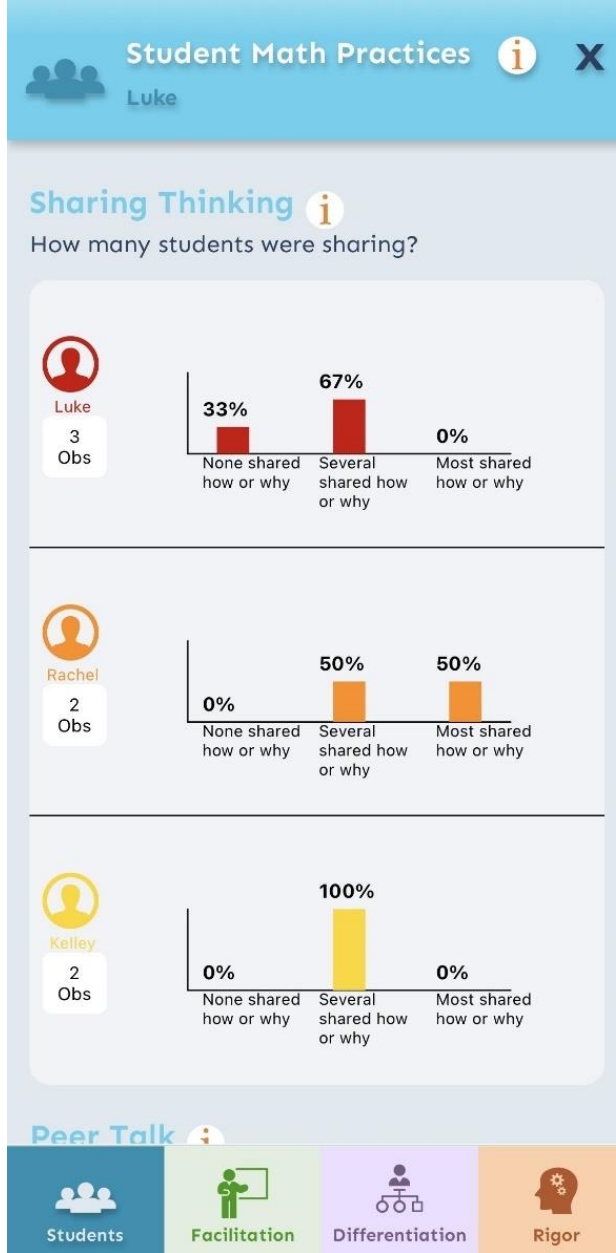
6. Use guiding questions to structure debrief after observing

These generate different questions based on your selections



You can keep notes about your debrief here

## 7. See overall Trends



## Overview of Domains

### Student Practices

- Using Tools
- Sharing Thinking
- Peer Talk
- Strategies



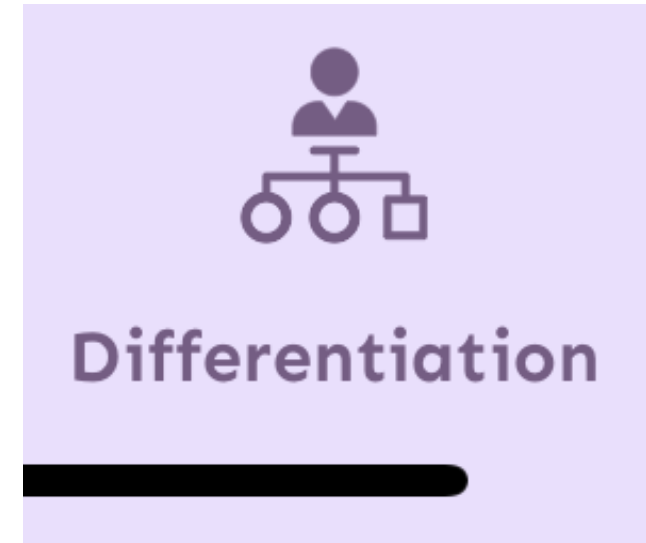
## Teacher Facilitation

- Responsiveness
- Student Errors
- Questioning
- Connections



## Differentiation

- Individualized Interactions
- Adaptation
- Planning For Differences



## Rigor

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



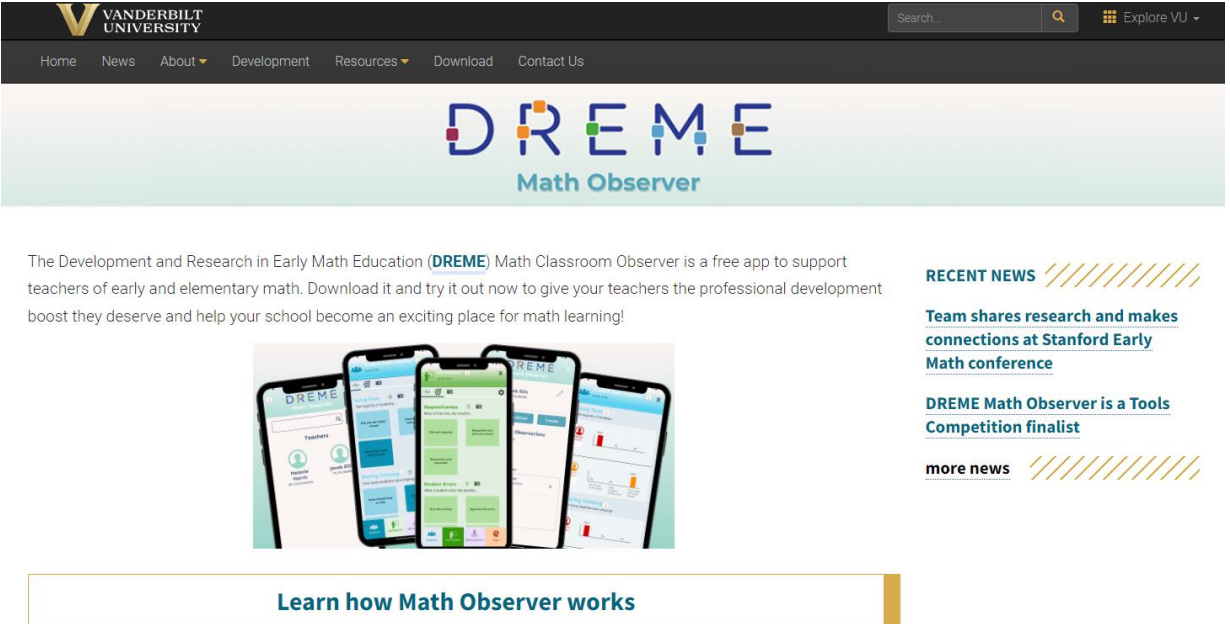
# Our Current Project

- 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 2024-2025 school year
- 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 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](#)

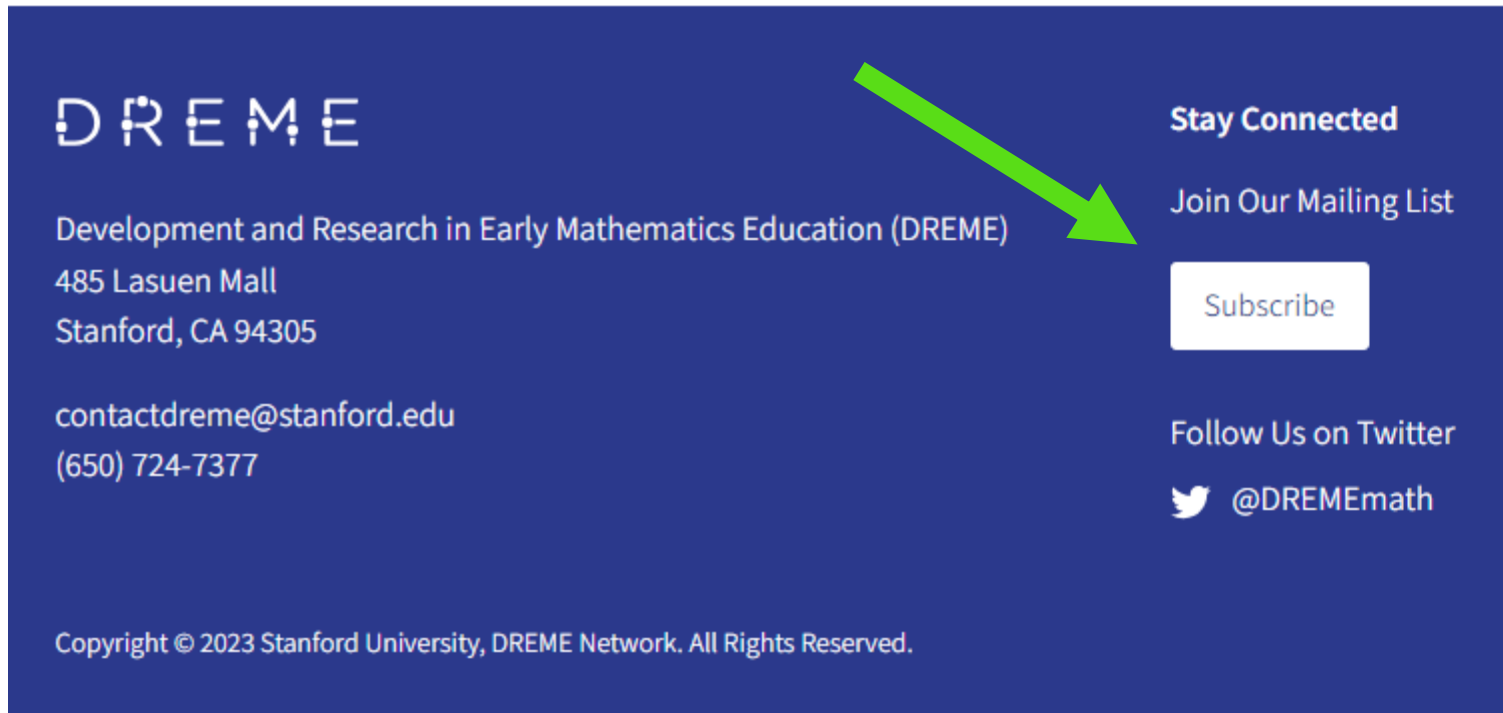
# Acknowledgements



- 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?

**Scroll down and click “Subscribe”**



**DREME**


Development and Research in Early Mathematics Education (DREME)  
485 Lasuen Mall  
Stanford, CA 94305

contactdreme@stanford.edu  
(650) 724-7377

Stay Connected

Join Our Mailing List

Follow Us on Twitter

 @DREMEmath

Copyright © 2023 Stanford University, DREME Network. All Rights Reserved.

**Kelley Durkin**

[kelley.durkin@vanderbilt.edu](mailto:kelley.durkin@vanderbilt.edu)

**Luke Rainey**

[luke.rainey@vanderbilt.edu](mailto:luke.rainey@vanderbilt.edu)

<https://dreme.stanford.edu>

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