

Carnegie Summit 2018

A Lesson Study Network to Improve K-8 Mathematics
Learning: Progress, Challenges, Next Steps



**Strand: Networks
in Practice
4.4.18**

Facilitator Introductions



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Director, Lesson Study Group at Mills College, and Principal Investigator

Outcomes

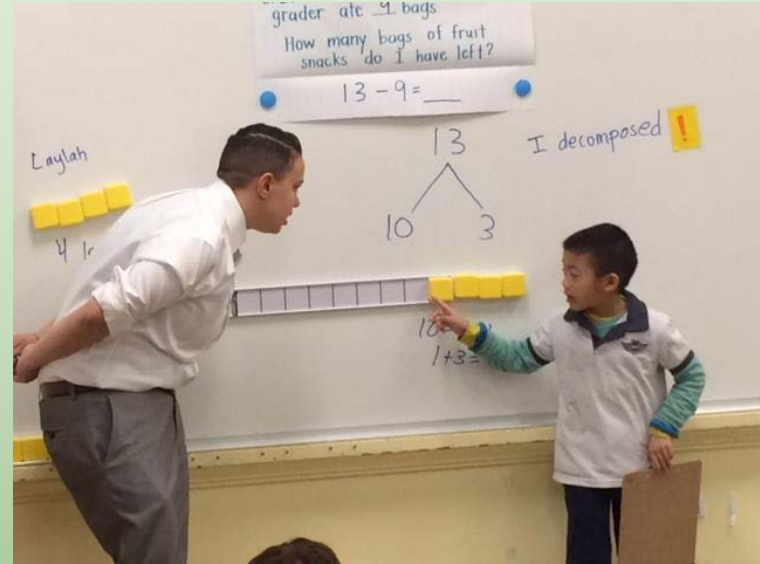
Understand 3 key challenges faced by the network and examine solution strategies. The challenges:



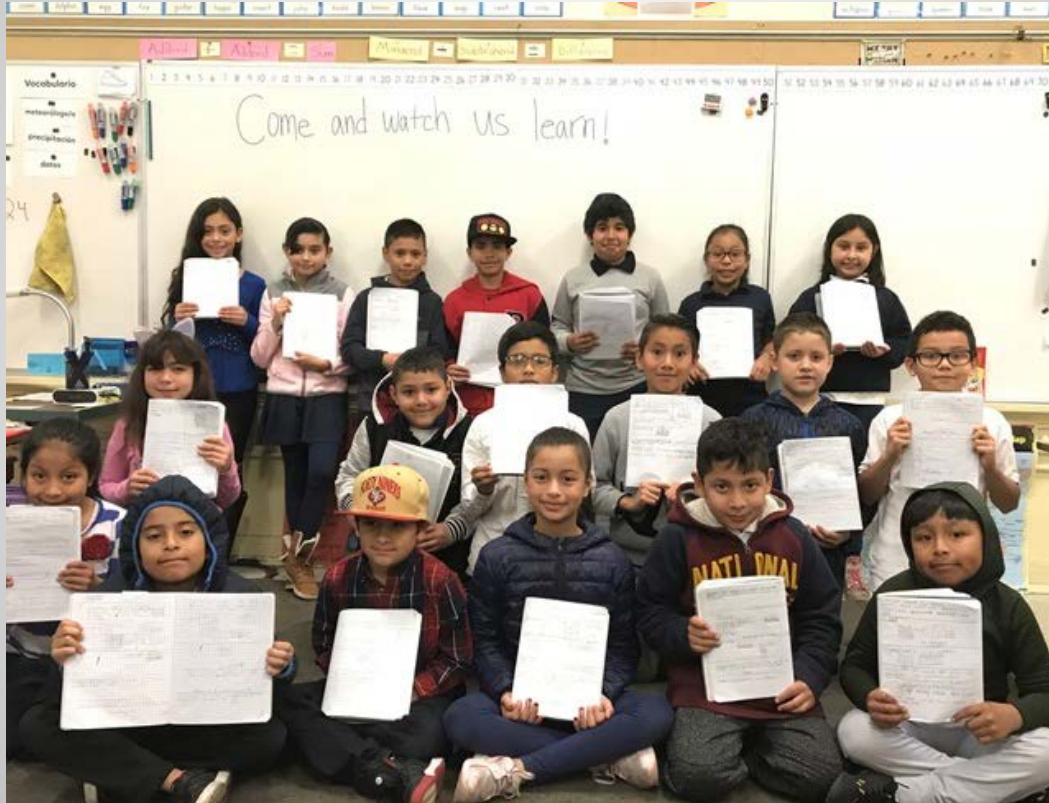
- 1) Building and sustaining collective energy to improve.
- 2) Improving mathematical reasoning and problem-solving
- 3) Establishing feedback loops between teachers' learning and districts' learning, for ongoing improvement

Session Structure

- 1) Present (40 minutes)
- 2) Examine resources (20 minutes)
- 3) Discuss (15 minutes)



And at the heart of the matter...



Norms

- Keep EQUITY at the center
- Model the behavior you would desire from a student in a math classroom
- What's learned here, leaves here



The Network

- 12 elementary and middle schools in 3 urban districts
- Focused on improvement of mathematics learning
- Funded by Bill and Melinda Gates Foundation, starting in 2015
- Lesson study (school-wide or department-wide) is one shared strategy to improve instruction



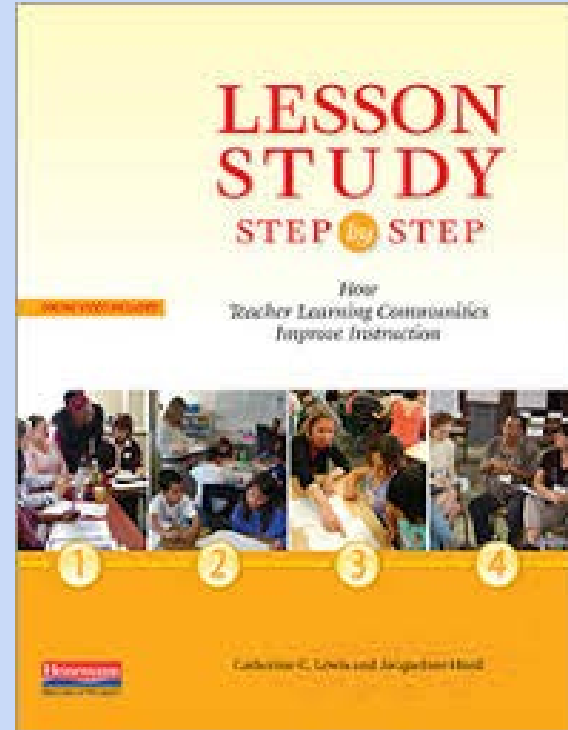
What is Lesson Study?

Team-based collaborative study of content and instruction

Cycle of Inquiry / ROCI cycle focused around a “research lesson”

Focus on student thinking rather than teacher moves

Question and investigate the impact of lessons - rather than assume that lessons “work”



4. REFLECT

Share data from lesson,
discuss implications for
this unit and school's
instruction more broadly.



3. TEACH

One team member
teaches, others
observe and collect
data on student
responses to lesson



1. STUDY

Content, curriculum, standards
Consider long-term goals and
content area goals



2. PLAN

Unit and “research
lesson” within it, based
on anticipated student
thinking
Plan data collection

School-wide Lesson Study (Collaborative Lesson Research)

School-wide Research Theme

- Expresses teachers' vision for the qualities of successful graduates
- Research Question(s) and Theory of Action to get there

Lesson Study Cycles Throughout School

- Build and share knowledge about how to achieve the vision

Challenge 1: Building and Sustaining Collective Energy to Improve

Two promising strategies:

- Research Theme (Research Questions, Theory of Action)
- District Master Teacher Program

Generating a Research Question



For Collaborative Lesson Research, a research question:

- Is BROAD
- Ideally targets ONE or TWO elements within your vision for student success
- Is an authentic question without “an answer”, worthy of life-long exploration

Sample: How will using Teaching Through Problem-Solving in the math classroom strengthen students' math comprehension and number sense?

Sample Research Question

How do we develop students' ability to construct viable arguments and critique the reasoning of others in the math classroom?



Generating a Theory of Action



A Theory of Action (or hypothesis):

- Is **NARROW** (focused on a particular skill, strategy, or intervention)
- Identifies **TARGET STUDENTS** (all students? K/1 students? struggling students? English language learners? etc.)
- **NAMES STRATEGIES** teacher will use to increase student learning (teaching moves, shared routines, etc.)
- Has **CLEAR, MEASURABLE OUTCOMES** (you know you will have reached goal when...)

IF/THEN/RESULTING IN
framework:

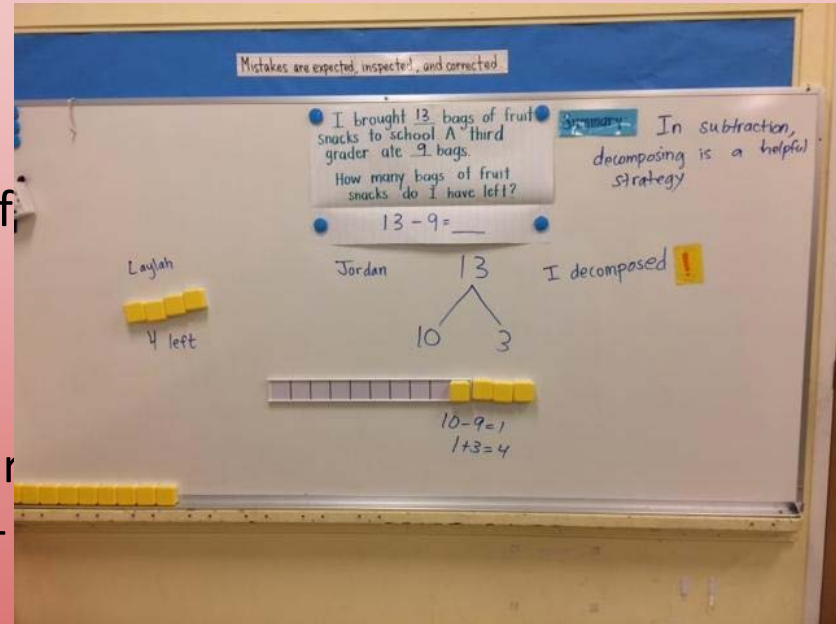
IF WE AS TEACHERS _____
(teaching moves),

THEN _____ (goals
for targeted students),

RESULTING IN _____
(how student learning/experience
will improve).

Sample Theory of Action

If we implement routines and teach strategies within our K/1 math classroom designed to strengthen students' abilities to construct viable arguments and critique the reasoning of others when solving math problems **then** students will be able to justify/explain their thinking, help their partners by teaching not telling, use a variety of strategies to share their thinking, and utilize specific (developmentally-appropriate) academic vocabulary **resulting in** deeper math conceptual understanding and stronger math reasoning skills.



Measuring Success - Sample

Metrics to Measure Viability of Our ToA & Success of Our Work

- Observable data from partner talks and class discussions (students say, “I know this because...” or otherwise explain their reasoning; students explain *how* they found a solution rather than simply naming the solution; appropriate use of academic vocabulary)
- Student Journals (students use a variety of methods/strategies to solve a problem and justify their answer; steps are shown when problem-solving)
- Math assessment data (performance tasks, summative assessments)



The Power of Teacher-Generated Research Theme/Questions

- **Motivation.** Reconnects teachers with their “why”—the ideals that brought them into teaching
- **Agency.** “Puts a professional part back in teaching that we have to battle for all the time...Being able to say ‘This is like a science, and we can figure these things out and get better at them’.”

Case Study: SFUSD Master Teacher Program

Key Features

- 4 year teacher development program
 - 4 years of teaching experience required
- Demonstration of strong classroom practice required
 - Commitment to further equity
 - Commitment to teacher leadership
 - Willingness to lead lesson study



Mission of the MTP



The **SFUSD Master Teacher Program** strives to identify and develop strong teachers committed to equity-centered leadership, in order to:

- Support teachers to create, foster and sustain equity-centered professional learning communities that will transform individual teacher practice and increase student success - impacting both student achievement and student experience.
- Support teachers to develop as responsive facilitators for equity and social justice, able to lead professional development and change initiatives at their sites that are contextual, responsive, and strategic

Toward the goal of: Ensuring all students have access to personalized, equitable and high performing schools that believe and demonstrate each student can, should and will succeed

And ultimately: Interrupting and transforming current and systemic educational inequities through a belief in grassroots change (ground up)

SFUSD Master Teacher Program: Primary Purpose

Master Teachers recruit and lead a lesson study team at their site, focused on instructional improvement & teacher ownership



A Tale of 3 Schools: Growing Lesson Study from the Ground Up

From Single Teams



To Whole School



To Cross Site Collaboration



Hillcrest Elementary by the Numbers

Previous Years (2012-2016)

- 1 Master Teacher
- 1 math lesson study team
- 1 public research lesson

Last Year (2016-2017)

- 2 Master Teachers
- 2 math lesson study teams
- 4 public research lessons
- 3 teachers attended Japan IMPULS program

This Year (2017-2018)

- 4 Master Teachers
- 4 math lesson study teams across K-5
- 8 public research lessons
- 1 research lesson presented to whole school
- Hosted and taught district wide research lesson
- Ongoing Professional Development on TTP and Lesson Study
- 5 teachers attending Japan IMPULS Program



Muir Elementary by the Numbers

Previous Years (2010-2016)

- 1 Master Teacher
- 1 math lesson study team
- 2 public research lessons

Last Year (2016-2017)

- 1 Master Teacher
- 3 math lesson study teams
- 4 public research lessons
- 1 teacher attended Japan IMPULS program

This Year (2017-2018)

- 4 Master Teachers
- 3 math lesson study teams across K-5
- 6 public research lessons
- 1 research lesson presented to whole school
- Hosted and taught district wide research lesson
- Ongoing Professional Development on TTP and Lesson Study
- 11 teachers attending Japan IMPULS Program



SF Community K-8 by the Numbers

Last Year (2016-2017)

- 1 Master Teacher
- 1 math lesson study team (K/1 only)
- 2 public research lessons
- 3 teachers attended Japan IMPULS Program

This Year (2017-2018)

- 3 Master Teachers
- 3 lesson study teams K-8
(K/1 math, 2-8 math, 4-8 ELA)
- 6 public research lessons
- 2 research lessons presented to whole school
- Ongoing Professional Development on TTP and Lesson Study
- 7 teachers + principal attending Japan IMPULS Program



Cross-Site Collaboration

Informal:

- Attending public research lessons cross site
- Utilizing planning templates from other sites to inform own practice
- Idea infusion through community-building (PLC, happy hours, etc.)

Collaborative Professional Learning:

- Math Summer Institute
- August Onboarding Institute



Cross-Site Collaboration

Supporting District Professional Learning and Lesson Study Growth:

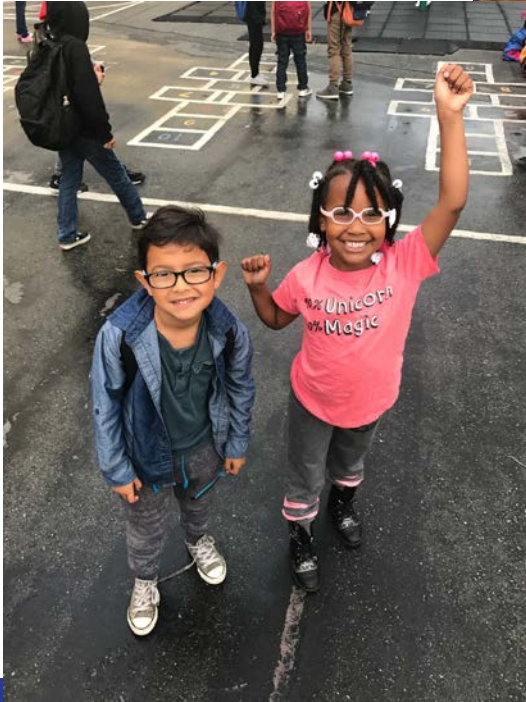
- Cross site public research lessons (open to district; 80+ attendees)
- Open invitations to above institutes to other schools
- Open classroom practice

Collaborating to Fund Resources and Learning:

- Impact Grant
- Proactive math proposal requesting a pilot



The Why



Challenge 2: Improve Students' Mathematical Reasoning and Problem-solving

The target of reform *for 4 decades* in the U.S.

Yet, on tasks involving models and mathematical reasoning, U.S. 15-year-olds continue to rank 26th among 34 countries studied (OECD, 2014).

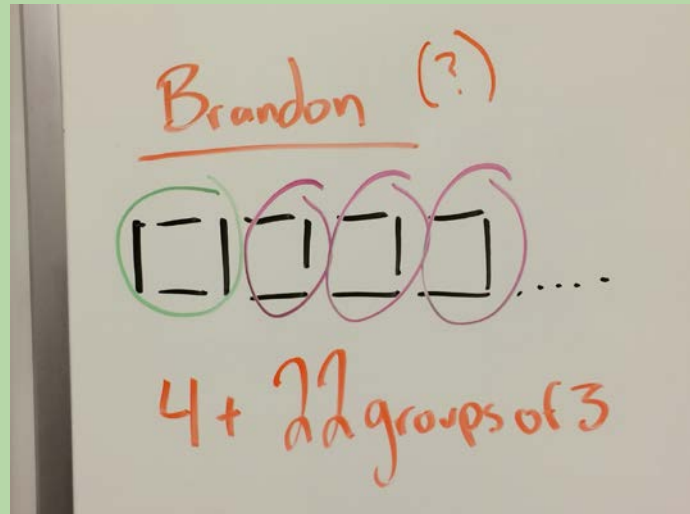
Why?

Current U.S. instruction: Teacher-led demonstration followed by student practice (Banilower et al., 2013)

Problem-solving as mathematicians define it: Solving a problem for which the solution method is not known in advance

Teaching Through Problem-solving

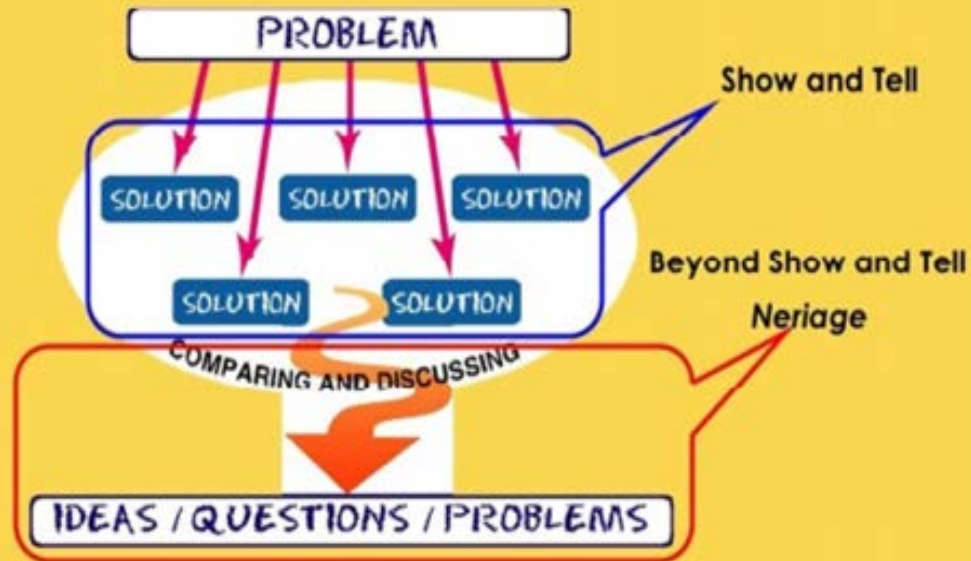
Each new mathematical concept or procedure is developed by solving and discussing a problem for which *no solution method has been taught in advance*



Teaching Through Problem-solving

- Widespread in Japan—developed partly in response to NCTM's 1980 *An Agenda for Action* and Polya's *How to Solve It*
- Similar to *5 Practices for Orchestrating Mathematics Discussions* (Stein & Smith, 2011), which credits Japanese lesson protocols

Figure 1: Teaching through Problem Solving



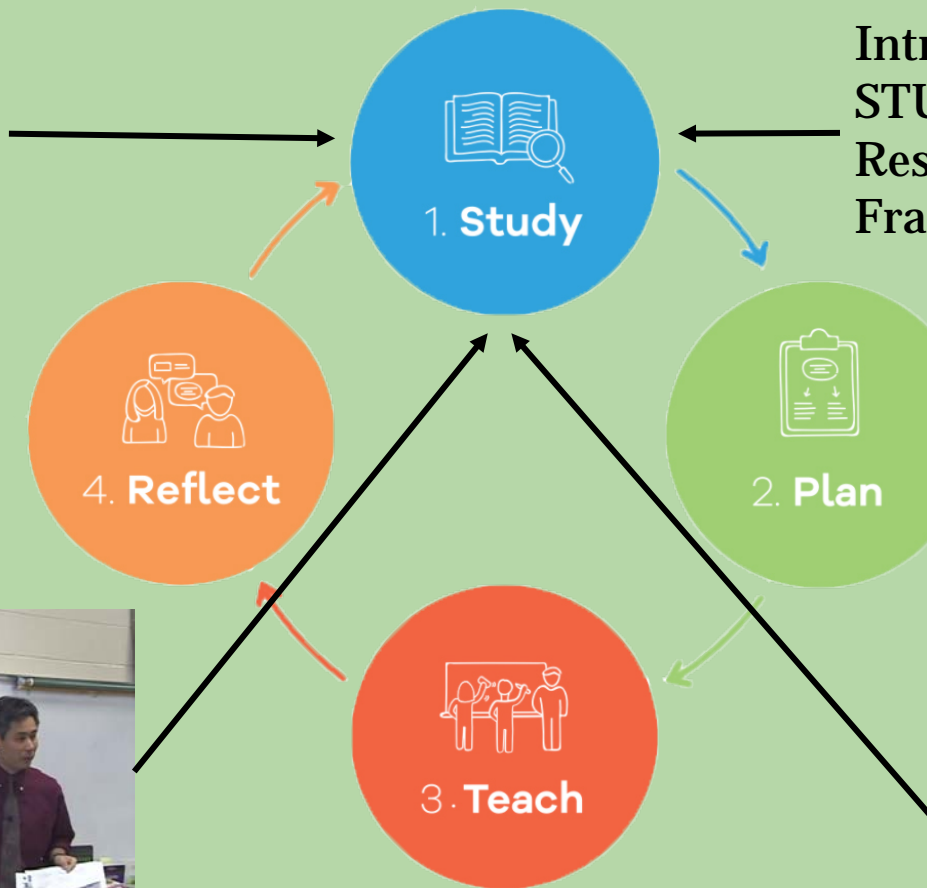
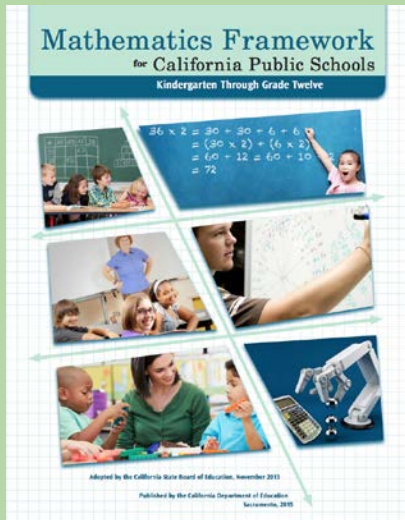
What Is Hard About Teaching Through Problem-solving?

Content knowledge needed to anticipate student thinking and use it to build next mathematics

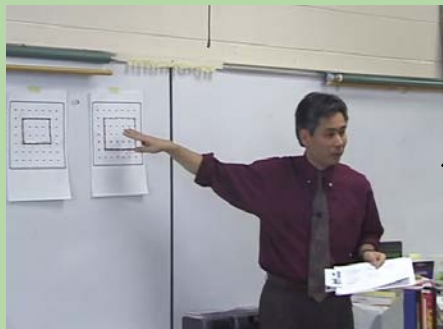
Comfort with allowing students to struggle and using student mistakes

Curriculum that enables students to use prior knowledge to build next mathematical idea

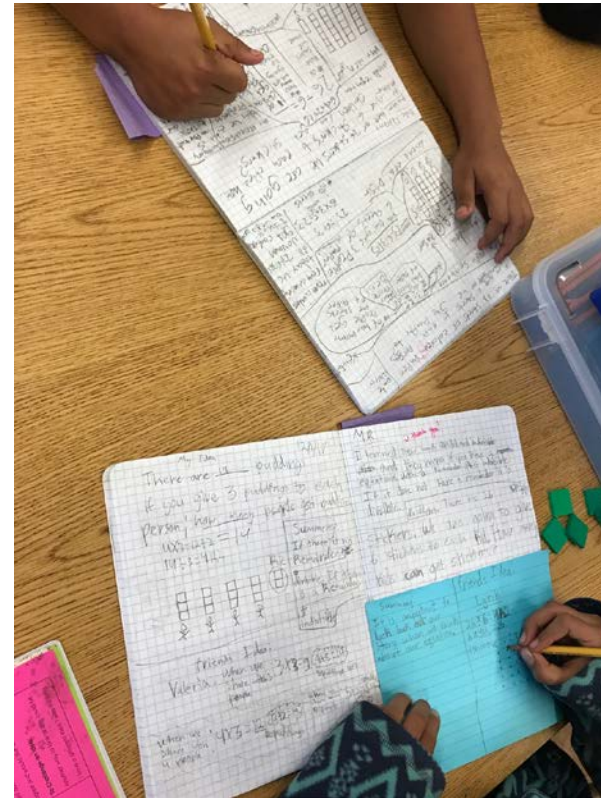
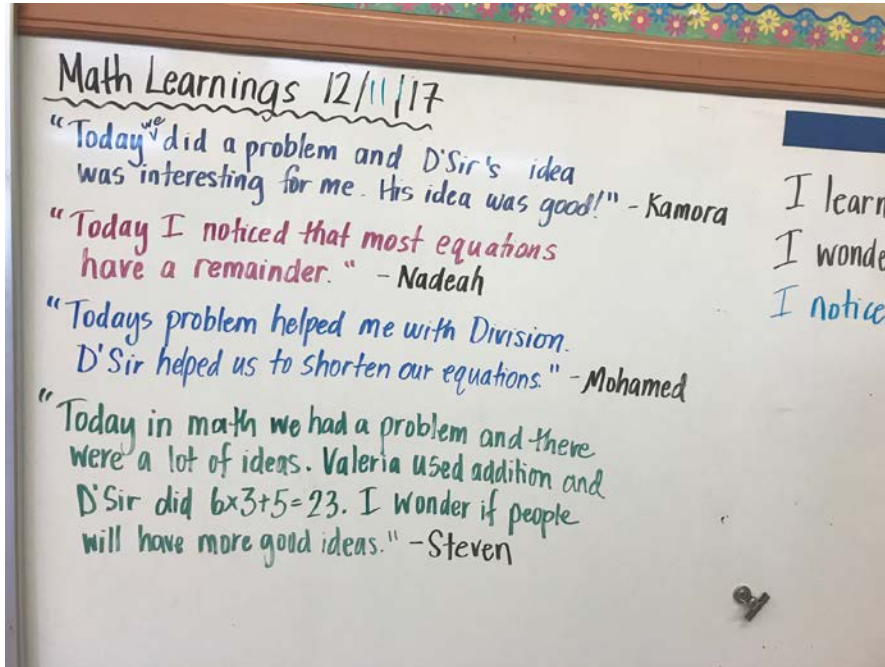
Building Content Knowledge



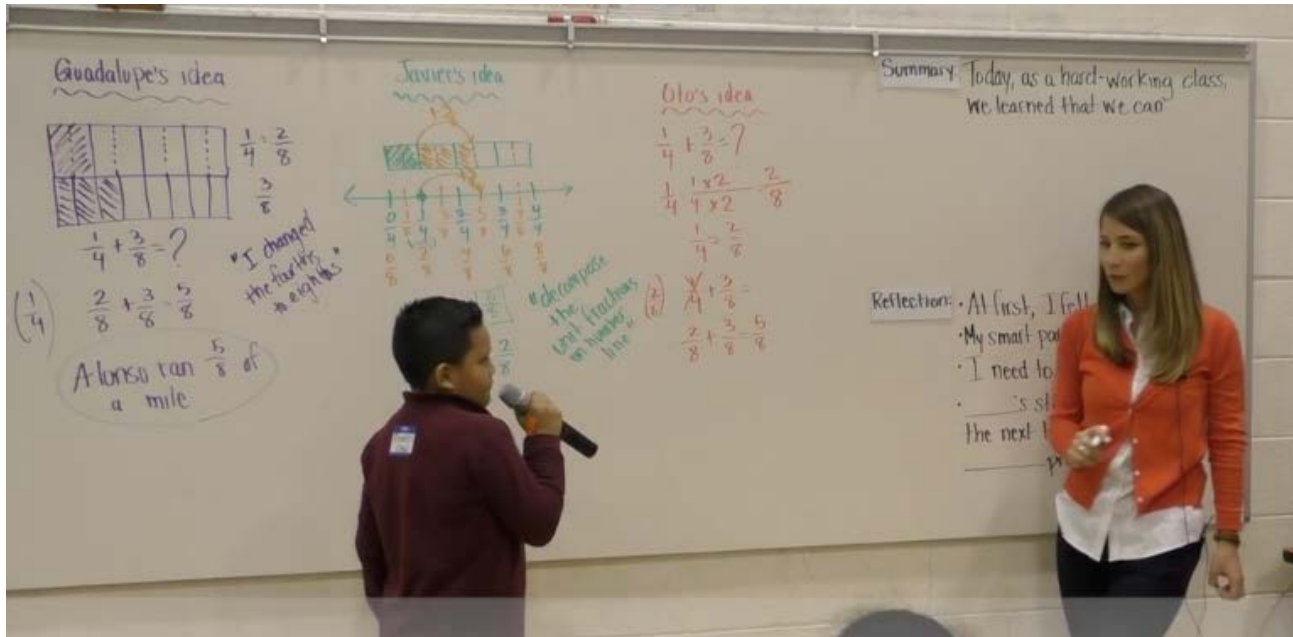
Introduce Resources to
STUDY phase: Video,
Research, Mathematics
Frameworks



Building Productive Struggle: Reflective Math Journals



Building Productive Struggle: Organizing Board to Support Comparison and Discussion



Impact



San Francisco Unified School District African American Achievement & Leadership Initiative 2017 ANNUAL REPORT

Professional Capacity

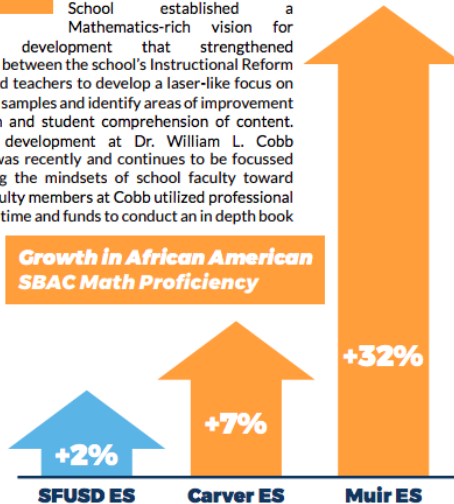
Educators focussing on African American student achievement are increasingly implementing high quality professional development opportunities to better serve their student and family communities. Beginning in the fall of 2016, Dr. George Washington Carver Elementary School established a Mathematics-rich vision for

professional development that strengthened collaboration between the school's Instructional Reform Facilitator and teachers to develop a laser-like focus on student work samples and identify areas of improvement in instruction and student comprehension of content. Professional development at Dr. William L. Cobb Elementary was recently and continues to be focussed on addressing the mindsets of school faculty toward students. Faculty members at Cobb utilized professional development time and funds to conduct an in depth book s t u d y

**Cobb ES
2016-2017
African American
Suspensions
-11%**

followed by a multi-day workshop centered on Zaretta L. Hammond's Culturally Responsive Teaching and the Brain text. The faculty members at John Muir Elementary fundamentally revamped their approach to mathematics instruction through dynamic use of professional development. Third and fourth grade teachers engaged in cycles of mathematics lesson studies and observations of high quality instruction followed by replication of best practices in classrooms. Through collaborating with the school's Instructional Reform Facilitator and employing a new, engaging mathematics curriculum, Muir elementary realized marked growth in African American student achievement.

Growth in African American SBAC Math Proficiency



The graphics depict the change in the percentage of African American students proficient in SBAC math in Spring 2017 compared to Spring 2016 for all elementary schools, Carver Elementary School, and John Muir Elementary School. Source: California Department of Education



Challenge 3: Establishing Feedback Loops Between Teachers' Learning and District Curriculum & Systems

Two Examples:

- Math Specialists' Lesson Study Cycle
- Integrating Lesson Study into Teacher Evaluation

In Japan...



Learning from Lesson Study Feeds Back into Textbooks

Over the past 3 decades, every Japanese elementary textbook series has shifted from didactic approach to teaching through problem-solving (Watanabe, 2014)

Math Specialists' Lesson Study Cycle

Goals (From Specialists' Written Plan)

“Gain experience adapting Math Expressions to be more problem solving...in order...to support teachers in making decisions...”

“Gain empathy for teacher experience using the Core Curriculum”

Math Specialists' Lesson Study Cycle

Discovered the Challenge of Using District Curriculum to Teach Through Problem-Solving

Text gave multiplication as procedure to create equivalent fractions

Model (8 of 12 bags of peaches) did not help students think about equivalent fractions as different names for same point on number line

Math Specialists' Lesson Study Cycle

Learnings (From Team's Written Summary)

- We are no longer willing to teach a math lesson without thinking about the models and how they connect to the core mathematics
- The board work is really important for mapping out how you want the lesson to go.
- ...before teaching a lesson, we need to understand where it fits on a progression
- Learning doesn't start and end in a lesson. Not just an exit ticket, boom did you get it or not? An exit ticket should inform the next day's lesson...

Changed District Curriculum Guide

4. Focus on the Lesson Series

Elementary

- In the Math Expressions Teacher Edition, read the Lesson Focus, and Activity Foci for each lesson. If necessary, skim lessons to understand strategies and models. How do these lessons contribute to developing student understanding of the essential mathematics of the unit, and prepare students to engage with the Key Learning Experiences? What opportunities are there in the lesson series to develop Mathematical Practices and Academic Discussion skills?
- Now that you have dug into the standards and progressions related to the unit, make decisions about which lessons to emphasize and spend more time on and which ones to go more quickly through or omit. The printed lesson series is just a starting place.

Suggestions for Adapting a Math Expressions Lesson to Raise the Cognitive Demand and Make it More Student-Centered:

- Determine a mathematical goal for the lesson. Do not feel the need to teach the entire lesson as written! Less can be more.
- Pick 1-2 problems to present during the lesson that address the mathematical goal. See [lesson planning template](#).
- Anticipate student responses for these problems. Allow students time to grapple with the problem on their own and develop their own strategies, rather than providing a procedure for them. Finally, select student work to share and compare, focusing on strategies that facilitate discussion that leads to the core math of the lesson.
- At the end of the lesson, summarize the new learning. You can also give students a chance to revise their thinking or apply their new understanding to a new problem.

Integrating Lesson Study into Teacher Evaluation

PROMISING PRACTICE | NO. 2

Build trust by connecting REACH with existing instructional improvement strategies.



Mariel Laureano, *School Leader*
Prieto Math and Science (Neighborhood
| PK-8)

1,043 students served

7 years as principal

7 years at school

164 total number of observations

82 observations per school leader

"One way we've approached REACH observations is to connect them to Lesson Study.¹⁴ This school-wide practice allows groups of teachers to participate in a research cycle and present their lessons to colleagues. My AP and I sit in on planning meetings, lessons and the final feedback session, which directly align to each aspect of the formal observation cycle. In fact, I was able to complete observations for all five of my second grade teachers with one cycle of Lesson Study. Not only do I save time, but the process helps improve trust with my teachers who see me as a thought partner instead

"Not only do I save time, but the process helps improve trust with my teachers who see me as a thought partner rather than someone there to check a box."

RESOURCE GALLERY WALK (20 min)

Videos of TTP public research lessons

Information on the SFUSD Master Teacher Program

Final Commentary Materials

SFUSD Lesson Study Resource Kit

Fractions Lesson Study Resource Kit

Student Reflective Mathematics Journals



GALLERY WALK DEBRIEF (5 min)

What struck you? What is resonating?

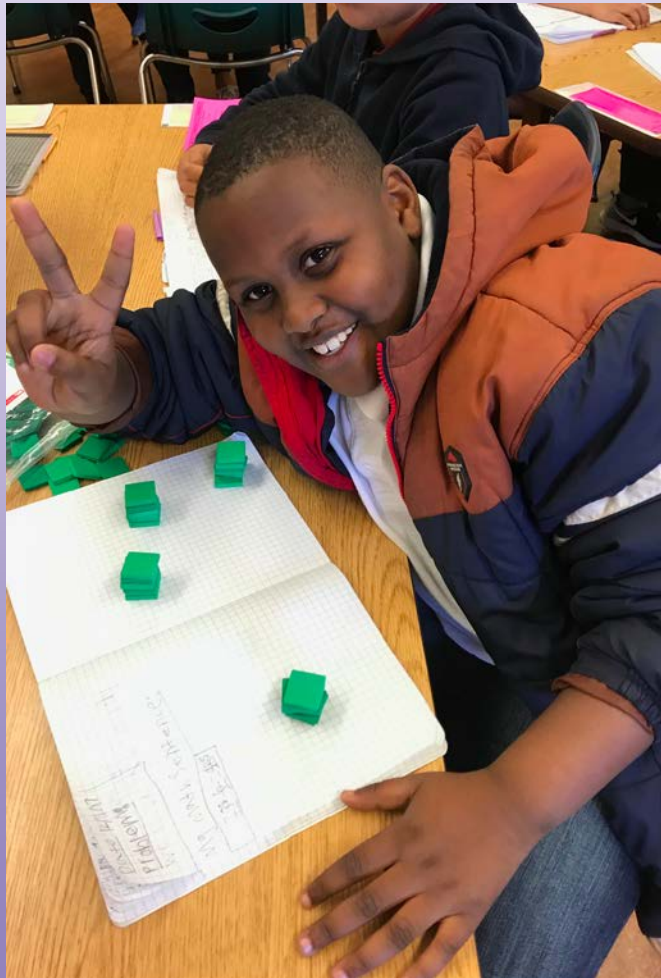
What resources might you adapt or utilize moving forward?

What questions or wonderings are you still holding?



Debrief of Today's Session





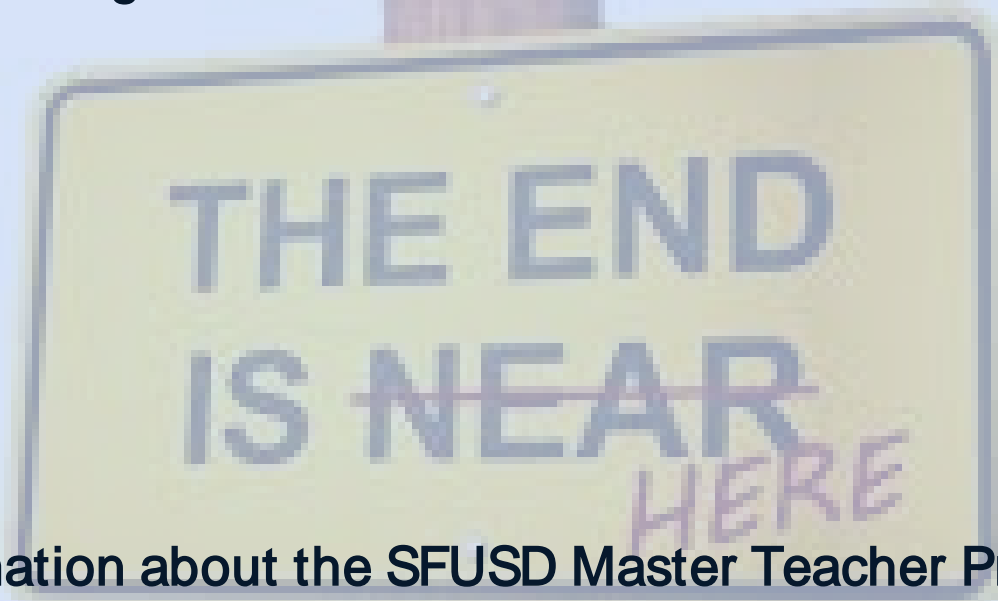
**THANK
YOU!**

Mills College Lesson Study Group www.lessonresearch.net

Catherine Lewis clewis@mills.edu

Teaching Through Problem-solving...for now: www.lessonresearch.net/ttp

New website launching in June



For more information about the SFUSD Master Teacher Program or Lesson Study Initiatives:

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Helpful Links

Teaching Through Problem-solving

<https://tinyurl.com/ttp-video>

<https://tinyurl.com/ttp-website>

Reflective Mathematics Journals

<https://tinyurl.com/reflective-math-journals>

Lesson Study (launch June 2018)

<http://lessonresearch.net/>

**SFUSD Master Teacher
Program and Resources**

[SFUSD Lesson Study
Resource Kit](#)

- [Forms for each step of
process](#)

[SFUSD Teaching Through
Problem-Solving Resource Kit](#)

[Master Teacher Program
website](#)