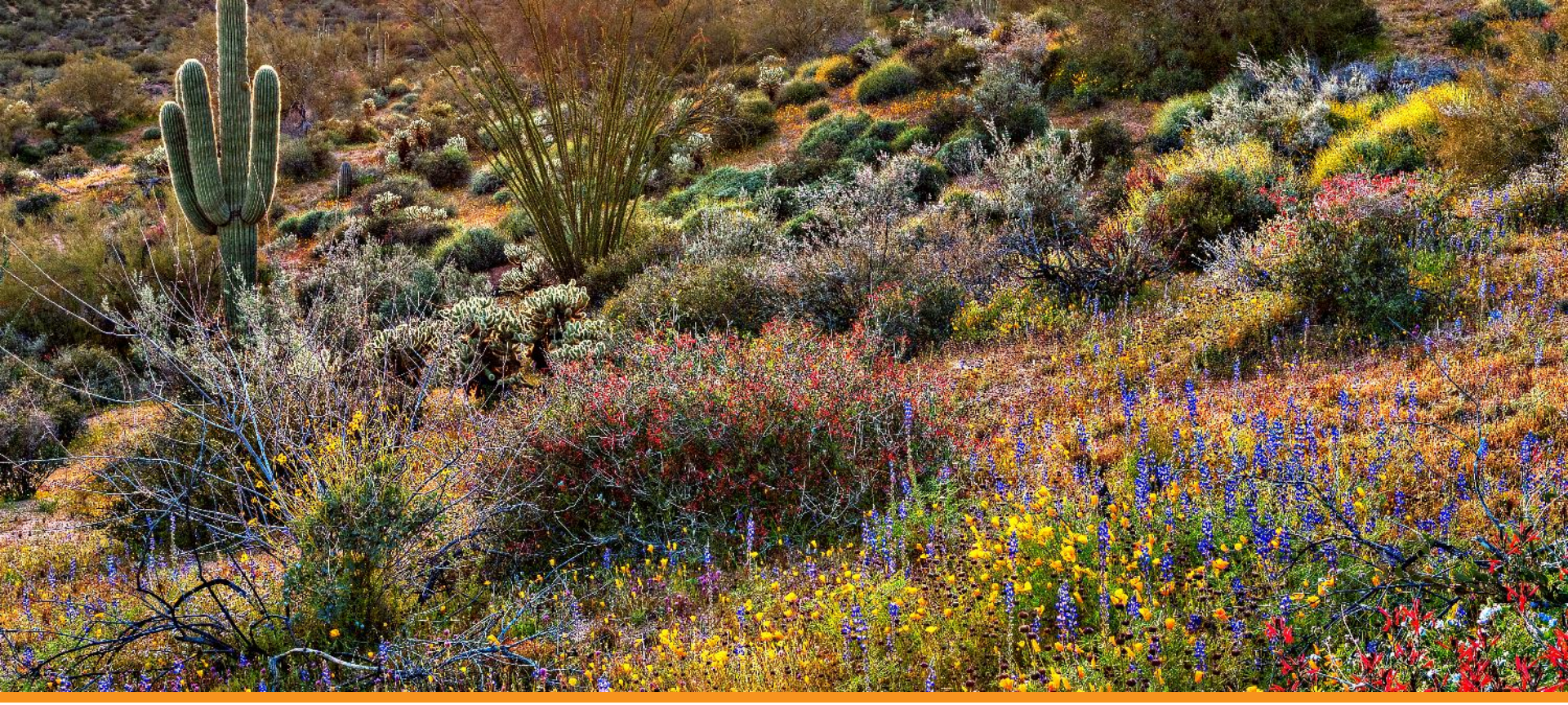
REL
SOUTHWEST



Building Improvement Networks to Support Educational Excellence in Oklahoma

Kirk Walters
REL Southwest, American Institutes for Research

11 / 6 / 18

REL SOUTHWEST

Meet the presenter

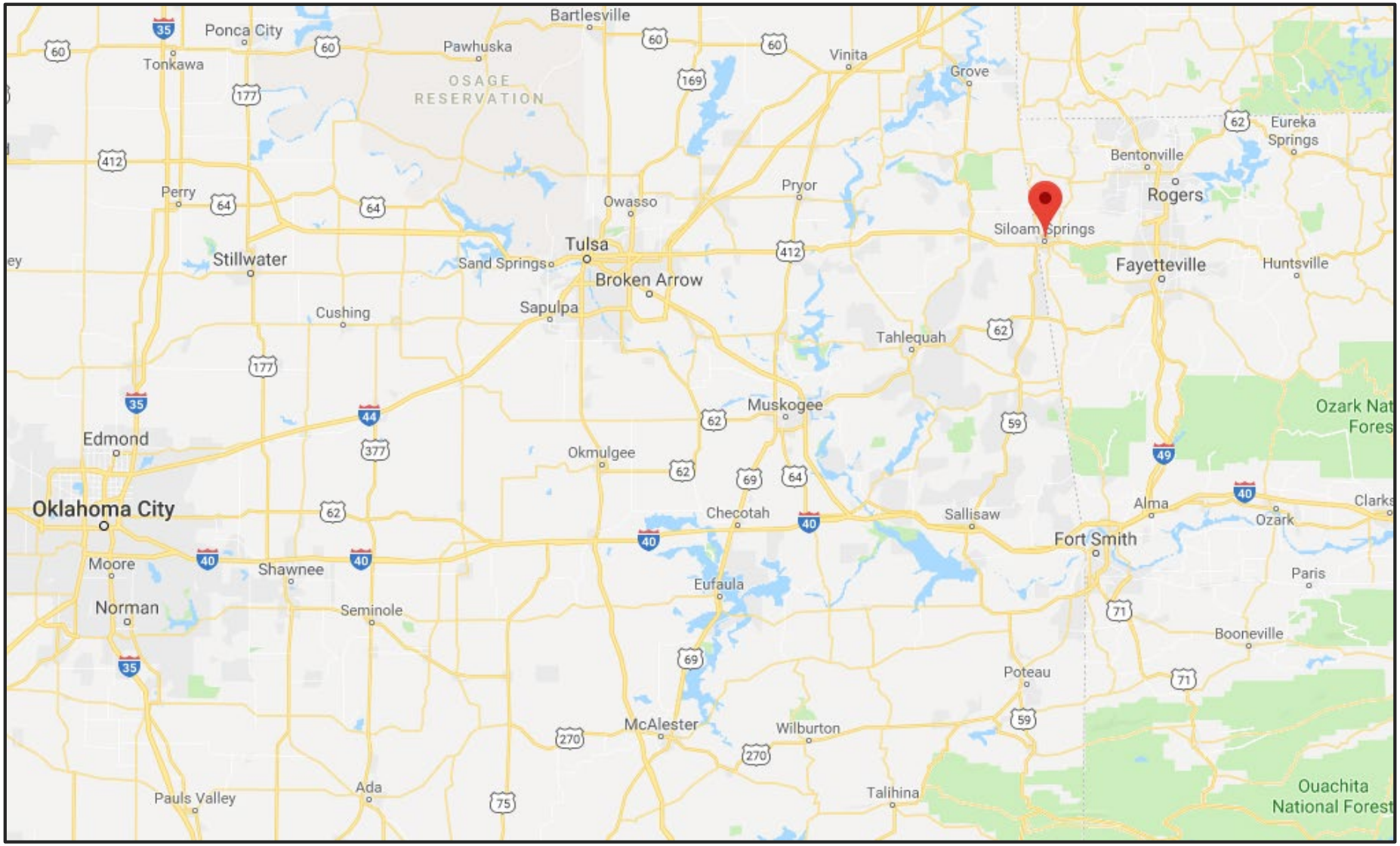
Kirk Walters

Managing Researcher

Senior Advisor, Southwest NIC Research Partnership

REL Southwest

American Institutes for Research


Bartlesville
Ponca City
Tonkawa
Pawhuska
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Vinita
Grove
Eureka Springs
Bentonville
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Siloam Springs
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Huntsville
Perry
Owasso
Pryor
Tulsa
Sand Springs
Broken Arrow
Stillwater
Cushing
Sapulpa
Tahlequah
Muskogee
Ozark Nat Fores
Edmond
Okmulgee
Oklahoma City
Checotah
Sallisaw
Alma
Ozark
Clarks
Fort Smith
Moore
Shawnee
Eufaula
Paris
Norman
Seminole
Booneville
Poteau
McAlester
Wilburton
Pauls Valley
Ada
Talihina
Ouachita National Forest

Goals

1. Learn about a **collaborative approach to continuous improvement** that is relatively new to education

2. Consider how you might **apply aspects of this approach** to your own improvement efforts

Reflect

I decided to **pursue a career in education** because _____.

1. Go to **goformative.com/join**
2. Enter this code:

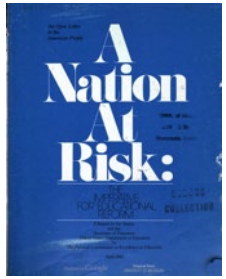
BYAOQO

Probably part of our motivation…

improvement – \im-’prüv-mənt
The act or process of improving

reform – \ri-’fȯrm
To put or change into an improved form or condition

Notable reform ideas and initiatives



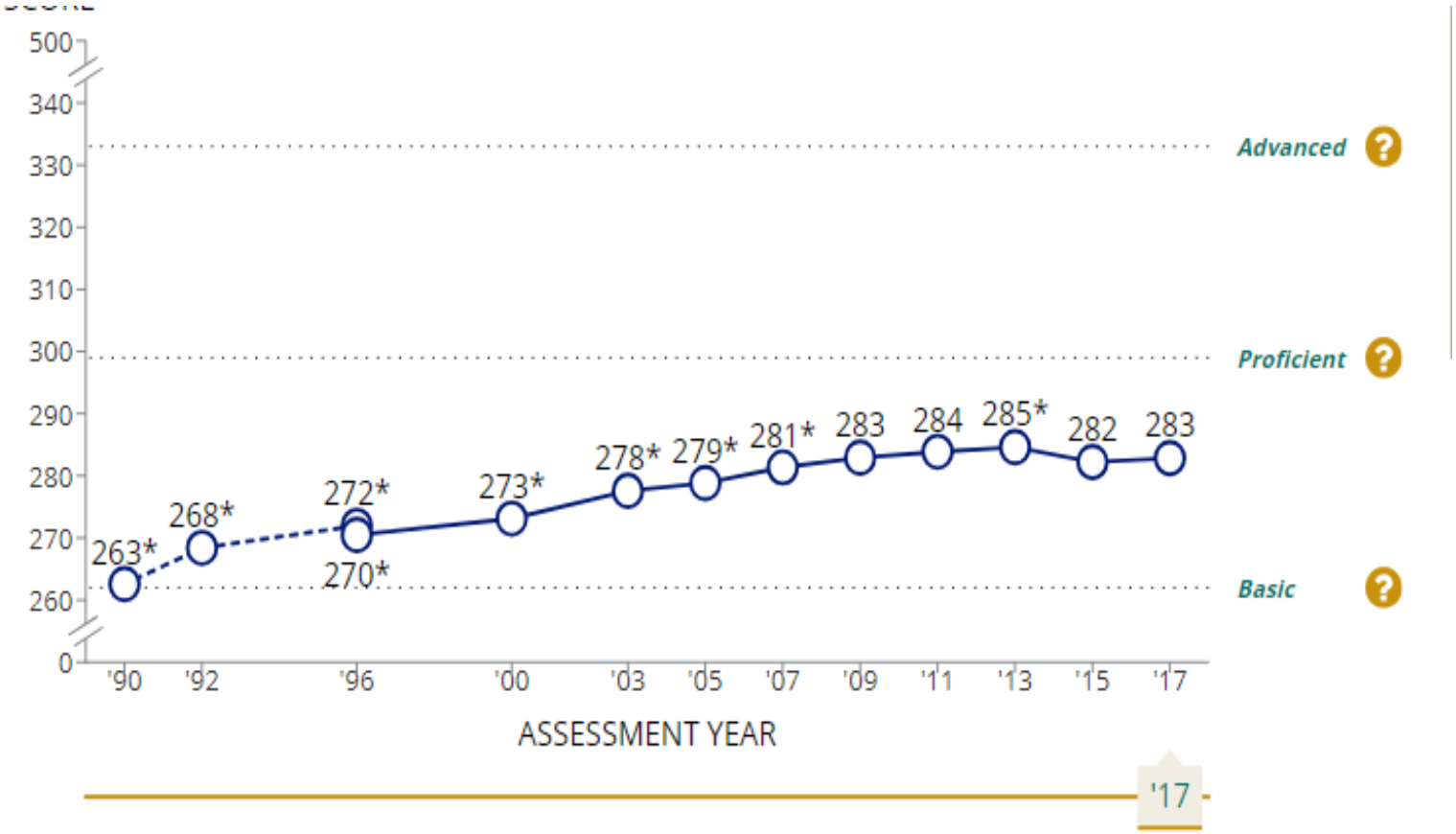
1950s–60s
- Sputnik
- New Math

1980s–90s
- A Nation At Risk
- Goals 2000
- Standards movement

2000s–10s
- No Child Left Behind
- Common Core State Standards Initiative

Now
- Every Student Succeeds Act

Grade 8 NAEP math average scores



Source: www.nationsreportcard.gov

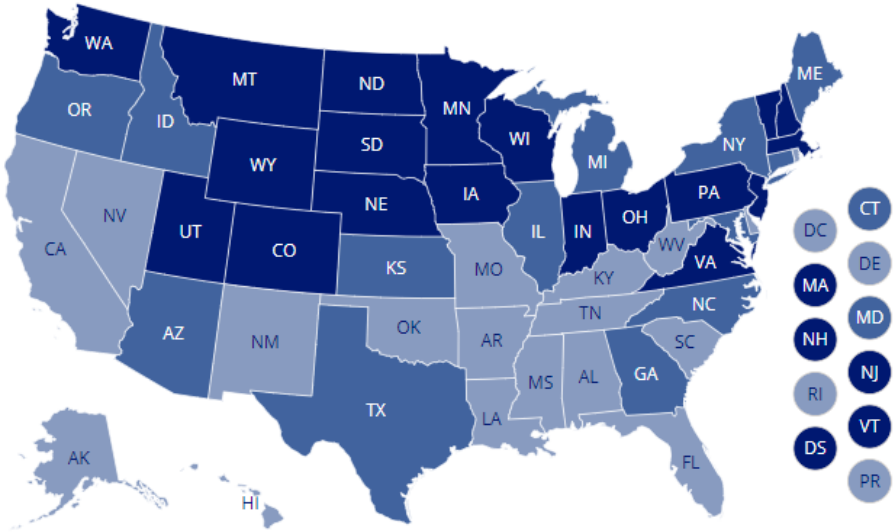
Grade 8 NAEP math proficiency scores, by state

The 2017 **nation (public)** percentage at or above ***Proficient*** was

NP 33%

20 states/jurisdictions	13 states/jurisdictions	20 states/jurisdictions	0 states/jurisdictions
↑	◆	↓	⊘
Higher percentage than the nation (public)	Percentage not significantly different from the nation (public)	Lower percentage than the nation (public)	No data or not applicable

Click on any state to see the percentage of students at or above *Proficient* compared to the nation



NOTE: DS = Department of Defense Education Activity, a federally-operated nonpublic school system responsible for educating children of military families. See more about DoDEA.

Source: www.nationsreportcard.gov

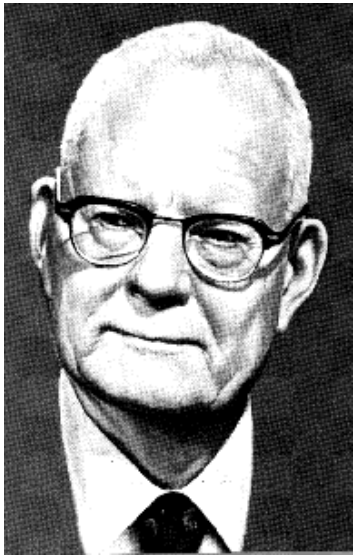
Is there a way to speed things up?

- The **slow pace of research** limits practitioners' ability to address problems in real time.
- Researchers are often **disconnected from educators' real work**.
- Educators want **tools to solve local problems** in context.

Improvement science

- Systematic application of **tools to improve "system" performance** or solve a problem
- Based on **Deming's** continuous improvement methods from the 1950s
- Applied in **multiple settings**, including industry, health care, and government

Deming



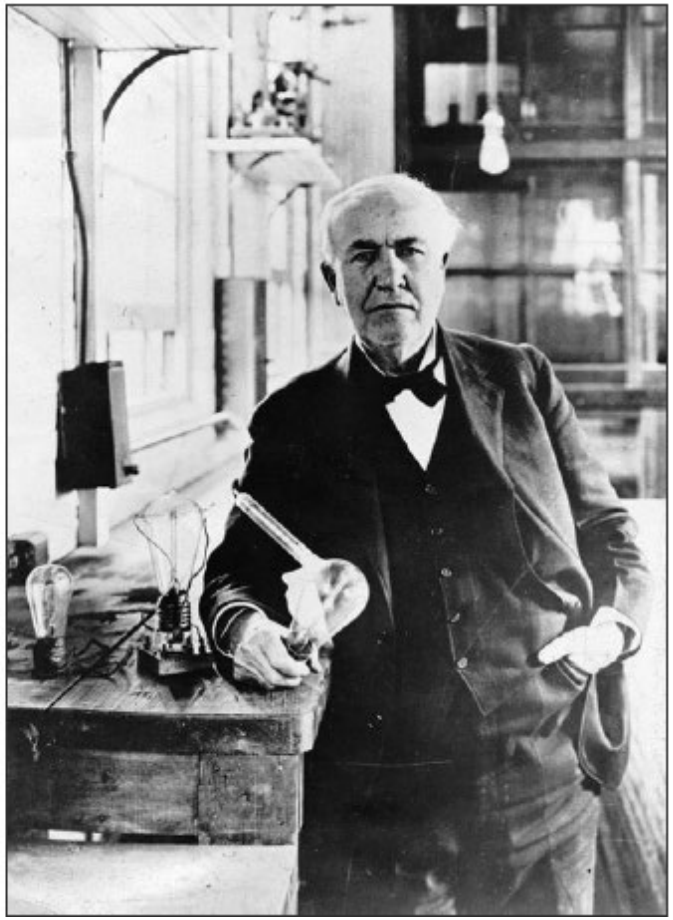
Helped companies like Toyota
improve quality

1950 — Today

Expect failure and learn from it

"I did not fail one thousand times; I found one thousand ways how not to make a light bulb."

Thomas Edison



Carnegie Foundation for the Advancement of Teaching

Google X rewards failure

"**Enthusiastic skepticism** is not the enemy of boundless optimism. It's optimism's perfect partner. It unlocks the potential in every idea."

Astro Teller, Google X

TED RADIO HOUR

Astro Teller: When A Project Fails, Should The Workers Get A Bonus?

Listen · 12:27 + Queue Download Embed

http://www.npr.org/programs/ted-radio-hour/487606750/failure-is-an-option

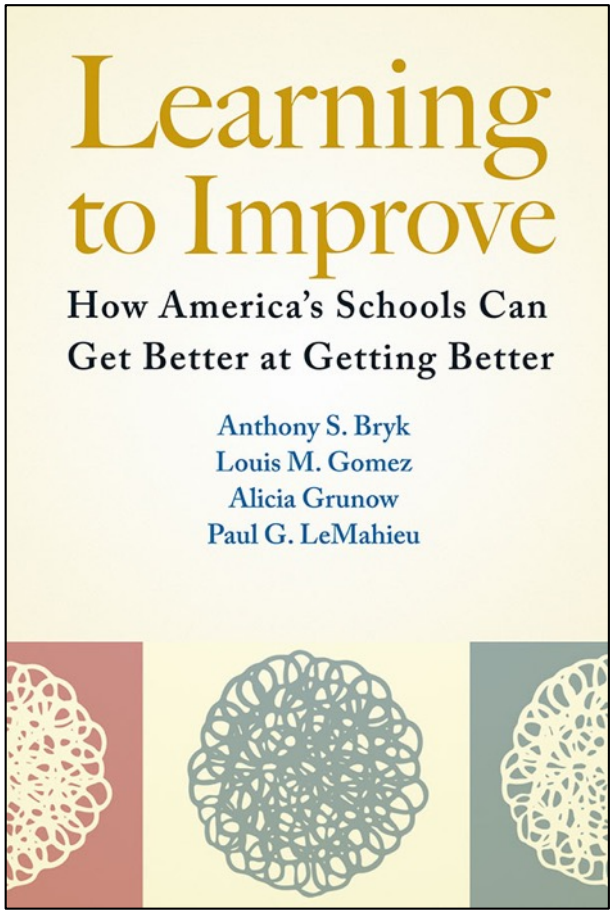
Improvement science comes to education

Networked improvement communities (NICs) are collaborative research partnerships that apply principles of improvement science and solve specific, common problems.

Carnegie Foundation
for the Advancement of Teaching

Key principles of NICs

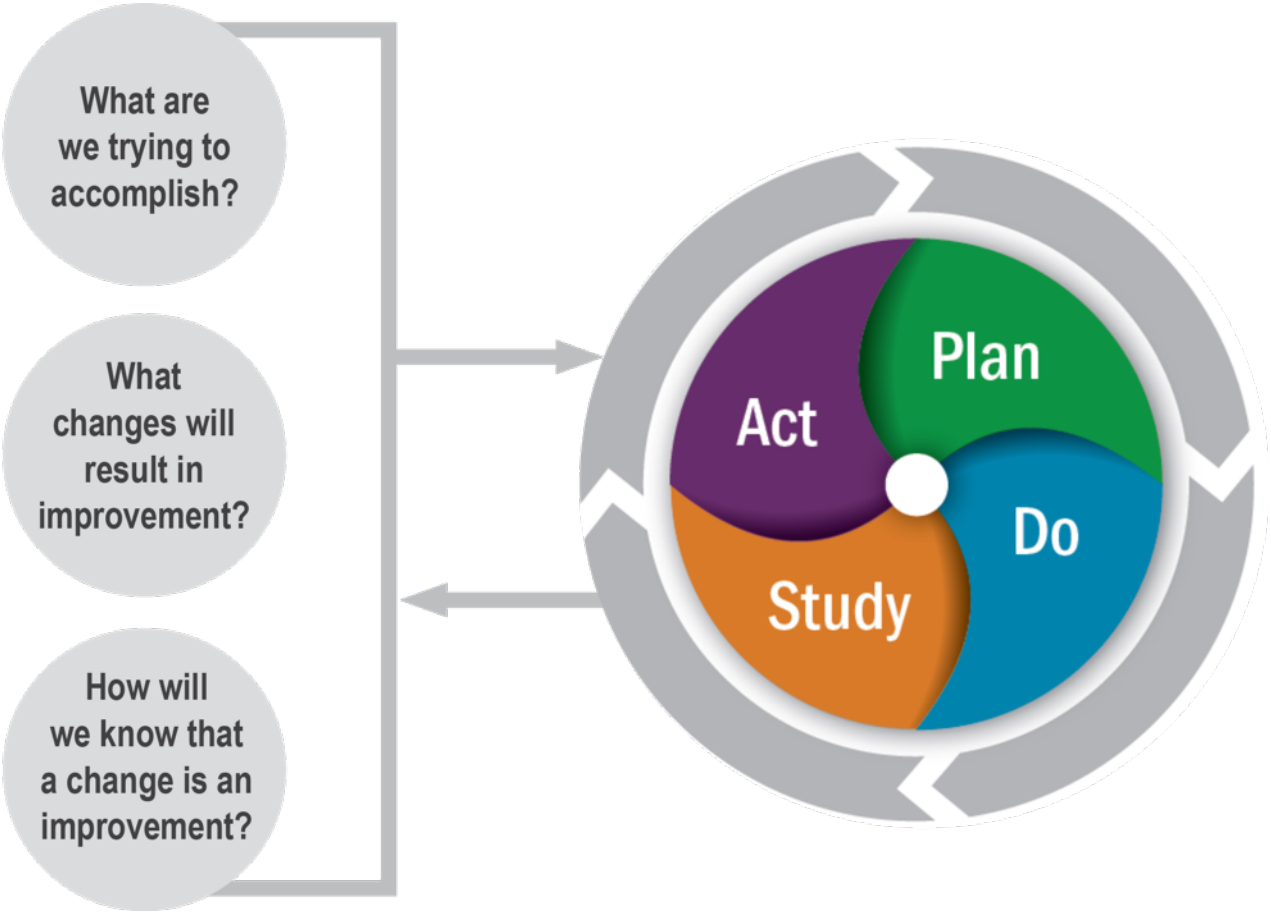
- Grounded in **authentic problems of practice** owned by educators
- **Rapidly test** locally developed change ideas
- Focus on **incremental improvement**



Key principles of NICs

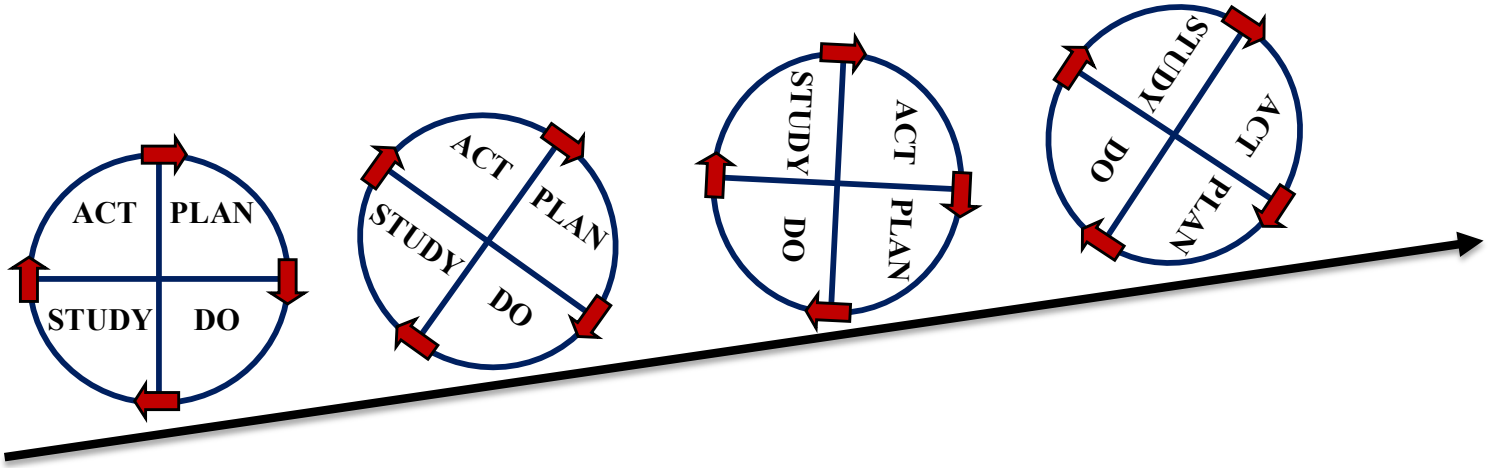
- Foster learning and **collaboration across contexts**
- Guided by a **common measurable aim** and a **working theory of action**
- Rapid testing follows disciplined **PDSA process**

PDSA cycle


What are we trying to accomplish?
What changes will result in improvement?
How will we know that a change is an improvement?
Plan
Act
Do
Study

Key principles of NICs

Ongoing testing and sharing of promising strategies enables network to reach aim



Reflect

Think about the last time you improved something. How did you know what you did **actually led to an improvement**?

1. Go to **goformative.com/join**
2. Enter this code:

BYAOQO

PDSA testing simulation

What is the **longest recorded coin spin** according to the Guinness World Records?

1. Go to **goformative.com/join**
2. Enter this code:

BYAOQO

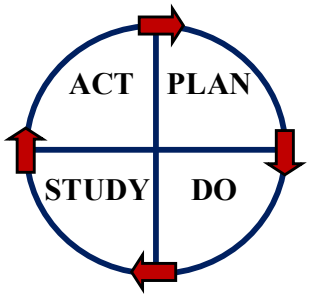
World Record

- Who: **Keita Hashimoto**
- What: **25.71 seconds**
- Where: **Japan Tochigi**
- When: **July 17, 2014**

Why?

What theories might explain how this person can spin a coin for that long?

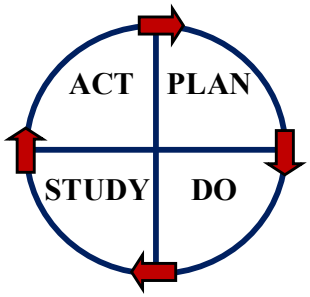
PLAN



- Turn to **1–2 people** sitting next to you.
- Record your **current theory** and **change idea**. Then **make a prediction**.

Theory: Large coins spin longer
Change idea: Spin a nickel
Prediction: 12 seconds

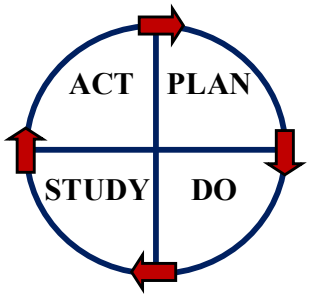
DO



- **Three groups** come to the stage.
- Carry out **three tests of your change idea** and record your results.

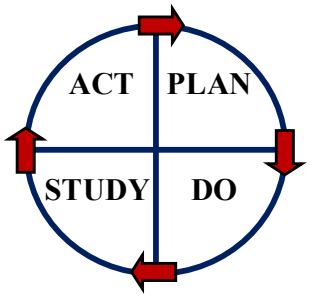
How long did it spin (average)?
What did you observe?

STUDY



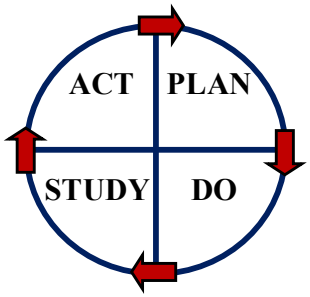
How did what you observed compare to your prediction?

ACT



What will you test next?

Discuss



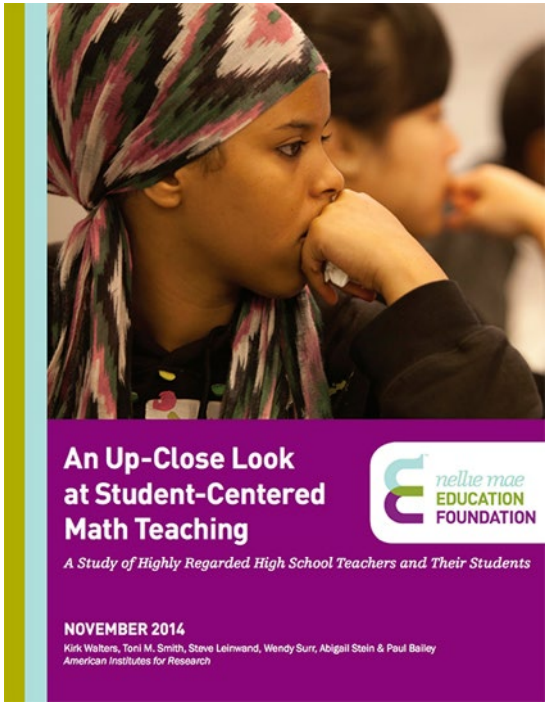
- How is this **process similar** to how you approach your improvement work?
- How is it **different**?

How does this play out in education settings?

Better Math Teaching Network

Why did we form this NIC?

Desire to **connect research** on student-centered math teaching **to practice**



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We established core principles

1. Teachers are **central to change**.
2. Student-centered **teaching is complex** and almost impossible to do well in isolation.
3. Teaching can be **continuously improved**.
4. Quick-cycle **improvement methods** provide opportunities to study and improve teaching.
5. Research and practice should be **seamlessly integrated**.

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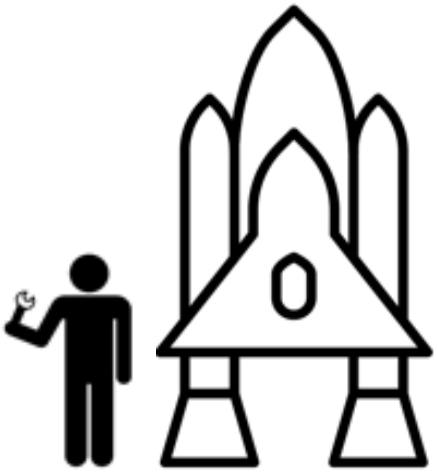
We prepared before we launched



We started **small and purposefully**:

12-month "learning lab"

- 3 researchers + 1 practitioner = **hub**
- 3 instructional leaders + 10 teachers = **initiation team**

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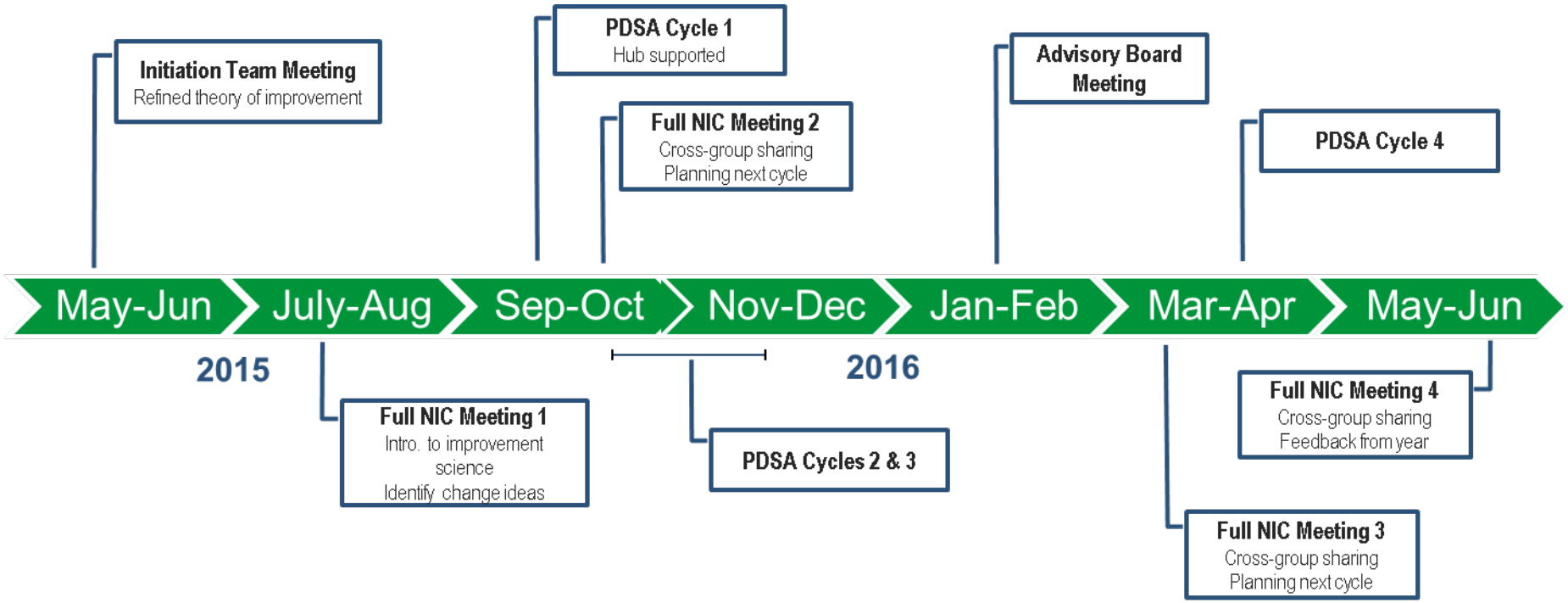
Learning lab structure



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What we initially learned

- **Teachers**
  - Liked the focus on **student-centered instruction**
  - Needed **time to reflect** on instruction and identify change ideas
  - Benefited from having an **improvement science coach**
- Refining the aim and theory of action are **ongoing processes**.

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What we initially learned *(cont.)*

- The network functions well as a **combination of small- and whole-group meetings**:
  - Small PDSA testing groups (3–4 teachers) focused on a **similar change idea** and facilitated by a hub coach
  - Periodic whole-group meetings to share and learn from each other—**spread what's working**
- We revised our **aim** and **driver diagram** for the official launch in 2016–17.

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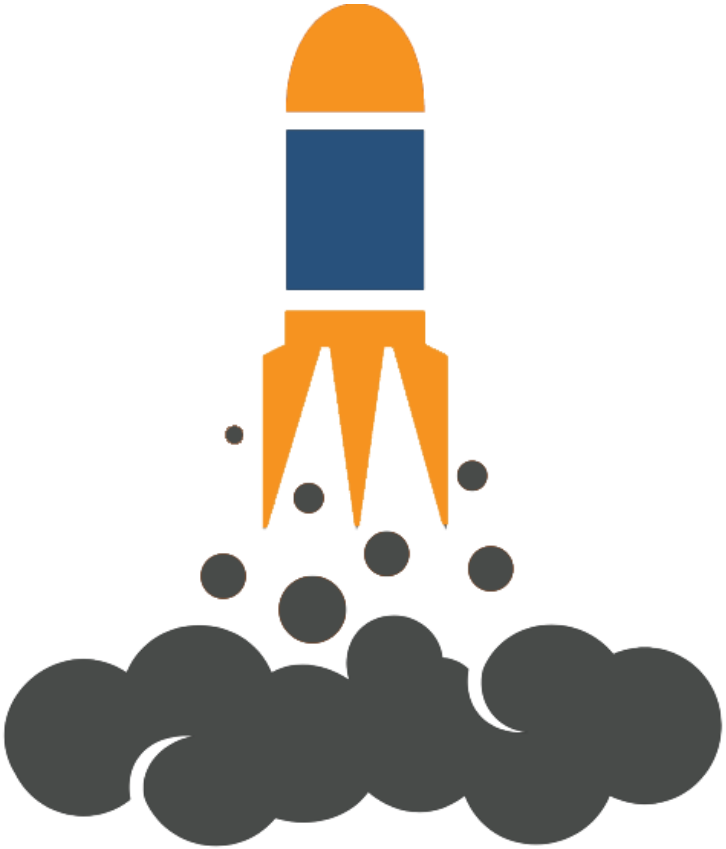
The actual launch: 2016–17



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Aim statement

2,019 in 2019

By **2019**, the number of students who ***connect***, ***justify***, and ***solve*** with depth in algebra will increase by **2,019**.

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Deep student engagement

- ***Connect***. Make connections among mathematical algorithms, concepts, and application to real-world contexts, where appropriate
- ***Justify***. Communicate and justify mathematical thinking as well as critique the reasoning of others
- ***Solve***. Make sense of and solve challenging math problems that extend beyond rote application of algorithm

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Driver Diagram

AIM Statement

Deep Student Engagement in Algebra

2,019 in 2019:
By 2019, the number of students who ***connect, justify*** and ***solve*** with depth in algebra will increase by 2,019.

.
.
.

Connect. Make connections among mathematical algorithms, concepts, and application to real-world contexts, where appropriate.

Justify. Communicate and justify mathematical thinking as well as critique the reasoning of others.

Solve. Make sense of and solve challenging math problems that extend beyond rote application of algorithm.

Primary Drivers (WHAT?)

Mathematics Instruction

Mathematical instruction provides ongoing opportunities for all students to ***connect, justify***, and ***solve*** in algebra through the ***choice of task/activity*** and by ***shifting the academic responsibility to the students.***

(Instruction is student-centered.)

Classroom Environment
Positive, caring learning environment for all students

Student Attitudes
Students see school and learning as important and valuable

Student Readiness
Students enter algebra with the requisite knowledge, skills, and dispositions to succeed

Secondary Drivers (WHERE?)

Instructional routines to introduce new material

Instructional routines to practice/reinforce previously introduced material

Change Ideas (HOW?)

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Network members

High school algebra teachers:

- Reflective and improvement-minded
- 23 teachers from New England, mostly rural and urban, in 2016–17

Improvement hub:

- 2 researchers
- 1 practitioner
- 2 research assistants

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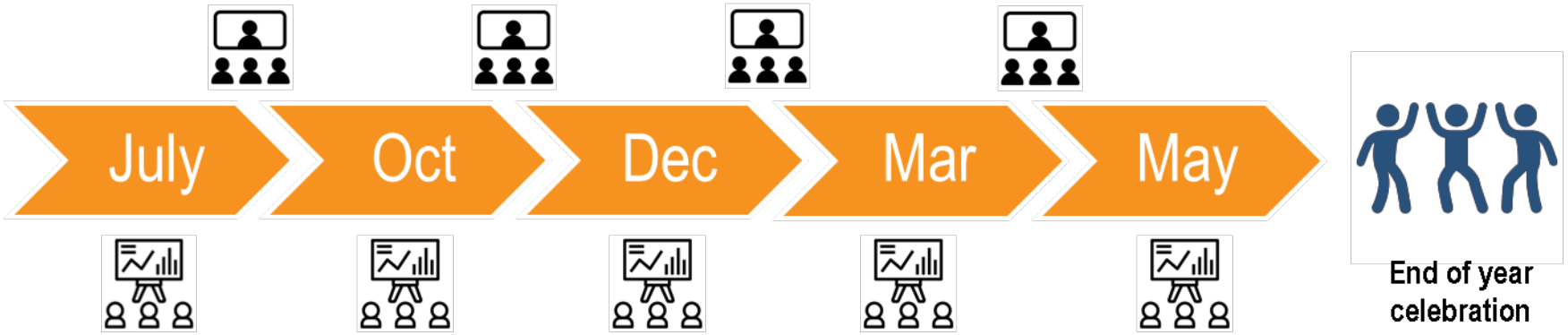
Our basic structure

Virtual meetings every six weeks with small groups of teachers testing similar instructional routines



End of year celebration teachers present refined routines

Five in-person meetings per year, anchored by a weeklong summer institute

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Discuss

- What aspects of this structure could be **applied to your local work**?
- What aspects **might not work** or would be difficult to implement without additional resources?

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What do the teachers think about it?

Video:
https://www.youtube.com/watch?v=ArMXhnLA_ac

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Network growth

- **2016–17: 23** teachers
- **2017–18: 41** teachers
  - Satellite PLC with 10 teachers
- **2018–19: 53** teachers
  - Satellite PLCs with 20–30 teachers

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What does this work look like in action?

1. Teachers **pick an instructional routine** that they would like to improve.

   But first, they need to map out what their instructional routines are—a **process map** is a useful improvement science tool.

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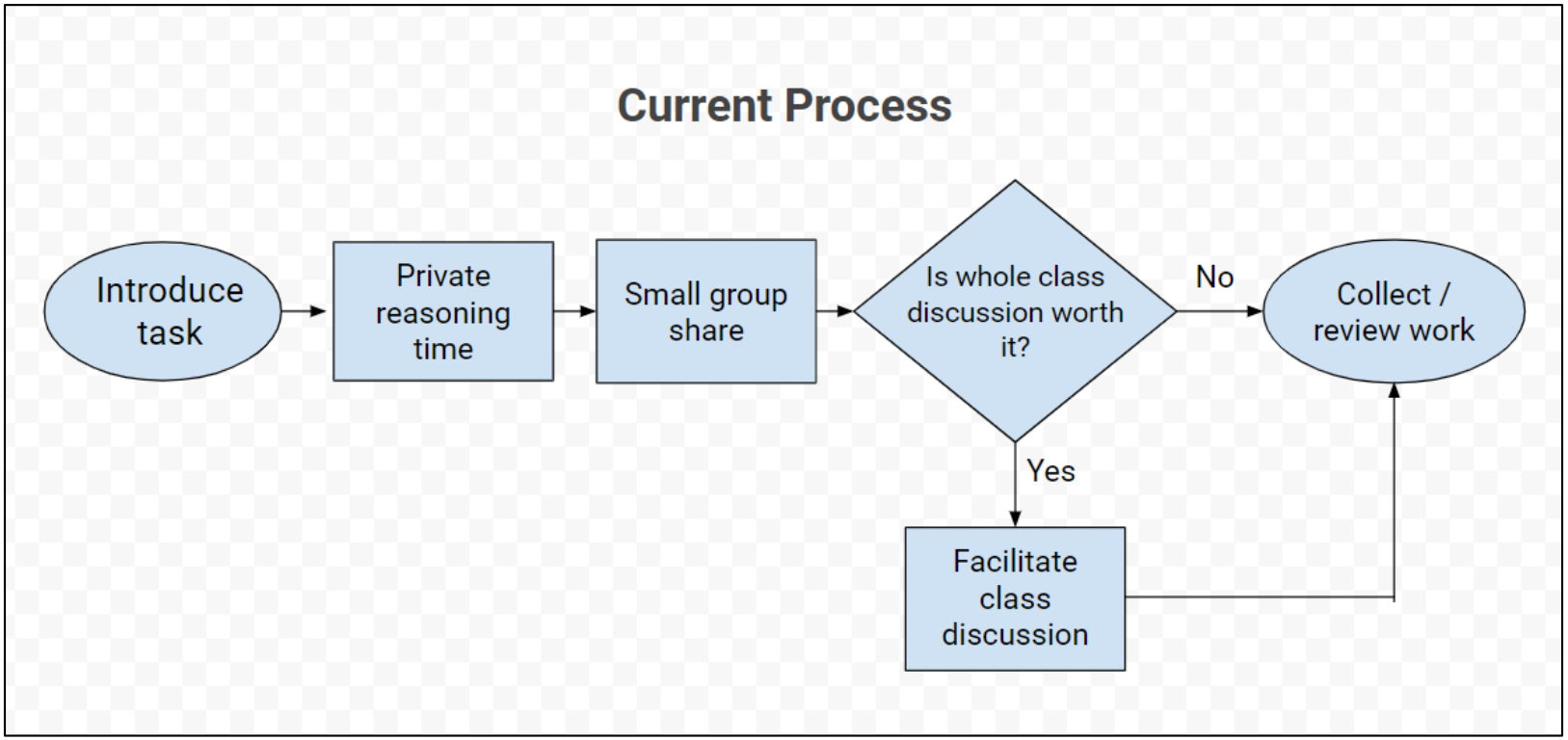
Process map



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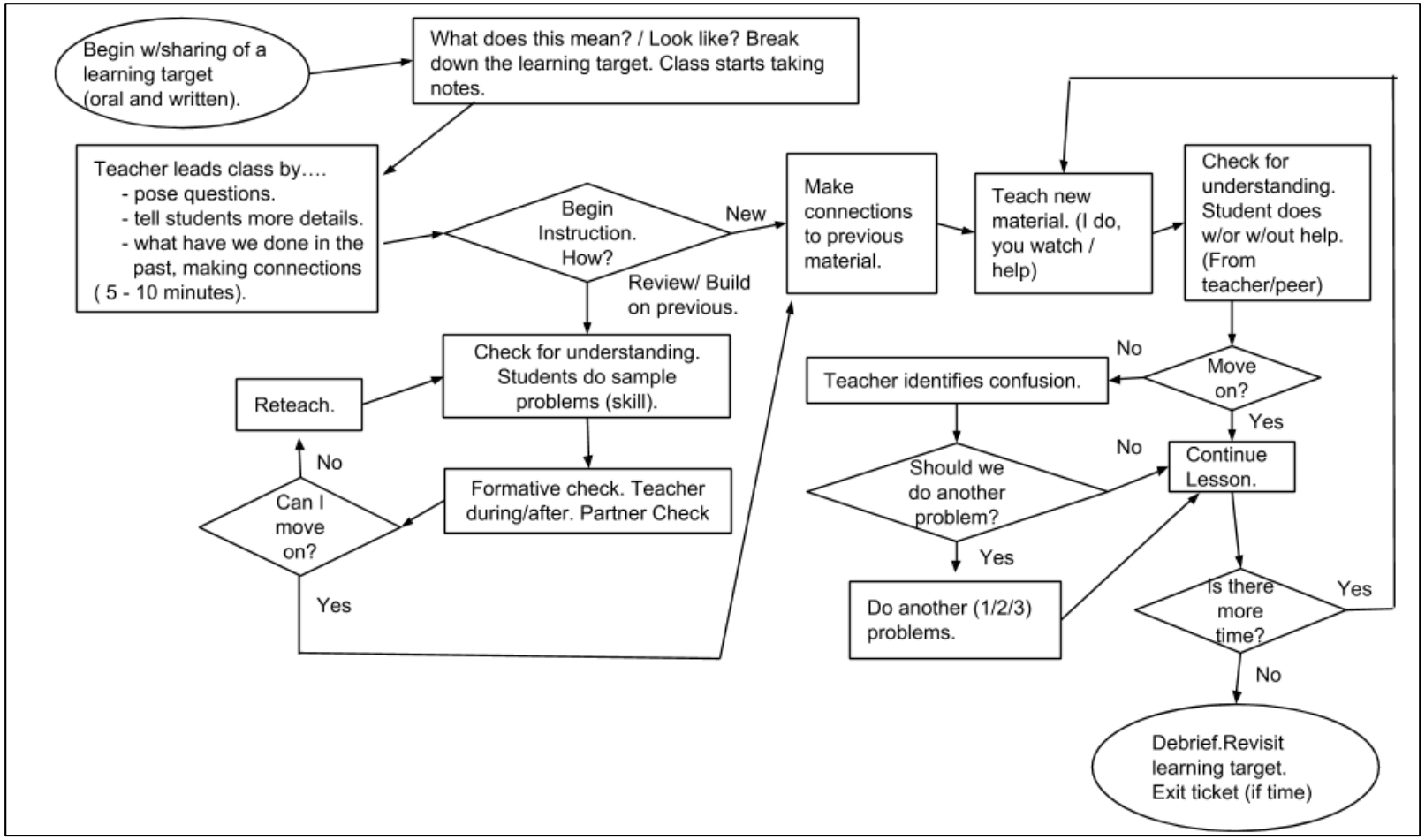
Process map



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What does this work look like in action?

2. Teachers come up with a **change idea** that they think will improve that routine – that is, **deepen student engagement**.

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Change idea embedded in routine

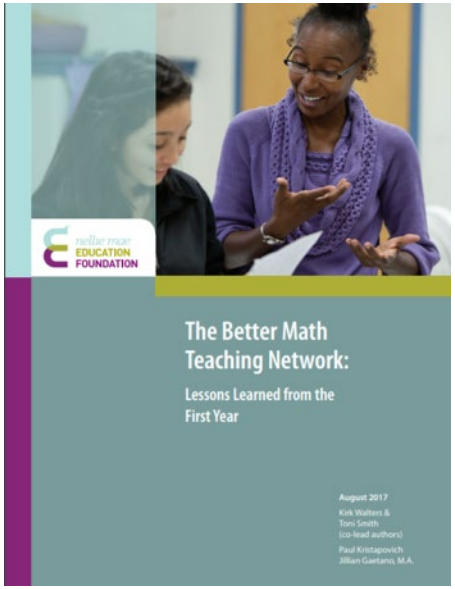
1. Administer task to students to engage in independently
    a. Task questions are organized using this graphic organizer, scaffolding into three parts: strategizing, math knowledge, and explaining/ justifying. This time, students are provided with a graphic organizer for the explanation/ justification section.
2. Use the simplified task rubric to give feedback (alter format of rubric)
    a. Rubric is broken into three parts to mirror question format in task: strategizing, math knowledge, explaining/ justifying
3. Return graded tasks to students with graded rubric attached
4. Share samples of exemplar student work for discussions in groups

Summary of Change Ideas (2016–17)

Table 1. Instructional Routines Refined Through PDSA Testing, 2016-17 BMTN Teachers*

Routine	Primary Driver			Secondary Driver	
	Connect	Justify	Solve	Intro	Reinforce
Student discourse protocol to elicit mathematical connections	✓			✓	
Open-ended problems to connect new to prior knowledge	✓			✓	
Exit tickets that assess connections to be addressed next day	✓				✓
Exit tickets to support developing connections	✓			✓	✓
Exit tickets to develop connections to prior knowledge	✓			✓	
Written examples to help students improve problem solving			✓		✓
Structured routine to help students solve challenging problems			✓	✓	✓
Written protocol to promote student reflection on homework			✓		✓
Protocol to help students self-monitor during problem solving			✓		✓
Problem-solving routine to support written justification		✓			
Formative assessment routine to promote justification		✓			✓
Claim-evidence-reasoning protocol to deepen justification		✓			✓
Teacher questions and student prompts to promote justification		✓		✓	✓
Open-ended tasks with discussion routine to support justification		✓		✓	
Student errors and stuck points to promote justification		✓		✓	✓
Formative assessment strategy to deepen justification		✓		✓	✓
Adapting a student discussion protocol to deepen justification		✓			✓

Taken from this **report**:



https://www.nmefoundation.org/getattachment/Resources/Assessment/The-Better-Math-Teaching-Network-Lessons-Learned/AIR-BMTN-2b.pdf?lang=en-US&ext=.pdf

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What does this work look like in action?

3. Teachers carry out **PDSA testing** on the routine to see if it led to an improvement.

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PDSA testing guided by 3 questions

1. Will I implement the routine **as planned**?
2. Will my **students engage** in the routine?
3. Will they engage with **depth**?

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PDSA testing form

Title	Using a partner share protocol to elicit deep justifications.					**Date:**	November - December 2017
Name	Heather Vonada	**DEA** Justify	☐ Connect X Justify ☐ Solve	**Unit/Lesson Timing**	☐ Introduction to New Material X Practice/Reinforcement of Previously Introduced Material		
Description of the Problem *The problem should focus on a particular DEA*	Students are lacking depth in their justifications in math class. Often there is no attempt to explain their reasoning or it is limited and lacking logic or clarity.						
Brief Description of Change Idea	We will use a partner share protocol to elicit justifications of conjectures.						

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Plan

Key questions

Prediction

Data

1. PLAN

Details: Outline the change idea and its implementation in the class.

Trial 1: At least once a week times in a 3 week period in my algebra classroom I will use a partner share protocol to elicit justifications.
Partner Share protocol: The goal is to add logic and clarity to justifications.

1. Students will take four minutes of private reasoning time to make a conjecture or claim in writing.
2. Students will trade papers and be given 4 minutes to write down questions they have about their partner's reasoning, or they will also be offered up sentence frames in case they don't have questions.
3. Students will get their paper back and be given 4 minutes to edit their original conjecture to elaborate on their justification to make it more clear and logical, based on their partner's feedback.

Data Collection plan:

- I with keep a log of every time I have students do the protocol and the dates.
- I will collect the justifications sheets with the claim, partner feedback and revisions.
- I will make note of if there was growth from the original justification.

Trial 2: Same as trial 1
Trial 3: Same as trial 1

Questions: What do you want to learn? *Be sure to include a question examining the depth of student engagement.*	**Predictions:** What do you think will happen?	**Data:** Describe the measure you will use to collect the data to answer the question. *Be sure to attach each measure to this form.*
Will I be able to implement this reliably?	I predict I will be able to do this once a week.	**Trial 1 Measure:** I will keep a log of dates that the protocol was implemented. **Trial 2 Measure:** I will keep a log of dates that the protocol was implemented. **Trial 3 Measure**: I will keep a log of dates that the protocol was implemented.
Will students engage with the DEA?	I predict 30% of students will engage with the DEA	**Trial 1 Measure**: Collected justifications sheet with partner feedback and edited conjecture based on that feedback. (see attached) If a student completes the form in its entirety it will count towards engaging in the DEA. **Trial 2 Measure**:Collected justifications sheet with partner feedback and edited conjecture based on that feedback. (see attached) If a student completes the form in its entirety it will count towards engaging in the DEA. **Trial 3 Measure**:Collected justifications sheet with partner feedback and edited conjecture based on that feedback. (see attached) If a student completes the form in its entirety it will count towards engaging in the DEA.
Will students engage with depth and quality in their questions and comments	I predict 15% of students will engage with depth and quality in their questions and comments on their partner's response.	**Trial 1 Measure**:Questions /comments are related to the content and question mathematical process or underlying mathematical concepts. **Trial 2 Measure**:Questions /comments are related to the content and question mathematical process or underlying mathematical concepts.

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Do

Description of what actually happened

2. DO. Briefly describe what happened during the test, surprises, difficulty getting data, obstacles, successes, etc.
Include information on the content, tasks, etc. for each trial.

Trial 1: Here was the task. For this trial, I followed my protocol for the most part. I never had sentence starters for the partner. I was surprised that most of the feedback was not in the form of a question but more of comments. I was a bit disappointed in the feedback that students gave each other. It was very obvious to me that if a student didn't receive good feedback, they didn't improve their justification. I think maybe they thought if their partner said it was good then it actually was and that they didn't need to fix anything. The actual problem that I chose for them to justify was pretty bland and only had one way to justify and it was using substitution, I think this was part of the problem. But because this was the first time students were asked to do something formal, they were all pretty engaged.
Student work

Trial 2:Here was the task. For this trial, I again followed the protocol. The problem I chose this time had several different ways to justify like drawing a graph, explaining in words, or substituting numbers. I was hoping that since there were options of ways to justify that they would choose more than one way to do it but most of them didn't. Again I noticed how important the partners feedback was as the original student didn't engage with the rest of the activity unless they got really specific feedback. Student Work

Here is the data collection for both trials.

Trial 3:Didn't do trial 3

Linked to relevant documents

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Study

Examining results in light of predictions

3. STUDY		
Questions: What do you want to learn? *Copy from Plan, Step 1.*	**Predictions** Make a prediction for each question. Not optional. *Copy from Plan, Step 1.*	**What were the results?** Comment on your predictions in the rows below. Were the correct? Record any data summaries as well.
Will I be able to implement this reliably?	Trial 1 Prediction: One a week Trial 2 Prediction: One a week Trial 3 Prediction: One a week	**Trial 1 Data:** November 29th **Trial 2 Data:** December 6th **Trial 3 Data:** Never did a third trial
Will students engage with the DEA?	Trial 1 Prediction: 30% Trial 2 Prediction: Trial 3 Prediction:	**Trial 1 Data:** 95% of the students engaged, 89% of the partners engaged **Trial 2 Data:** 79% of the students engaged, 90% of the partners engaged **Trial 3 Data:** Never did a third trial
Will students engage with depth and quality in their questions and comments on their partner's response?	Trial 1 prediction: 15% Trial 2 prediction: Trial 3 prediction	**Trial 1 Data:** 53% of students attempted to engage with depth in their first attempt, 63% of partners wrote responses that helped with a more in depth justification **Trial 2 Data:** 88% of students attempted to engage with depth in their first attempt, 74% of partners wrote responses that helped with a more in depth justification **Trial 3 Data:** Never did a third trial
Will Students grow through the use of this protocol?	Trial 1 Prediction: 70% Trial 2 Prediction: Trial 3 Prediction:	**Trial 1 Data:** 55% did grow **Trial 2 Data:** 55% did grow **Trial 3 Data:** Never did a third trial

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Study

What did you learn? *Specify learning across the trails, paying attend to variation.*
As always, I learn how important task or question selection is. The first trial the question didn't allow for multiple ways to justify where the second one did. This gave students an opportunity to engage more and use more math. I also learned that students don't really know how to write clearly or concisely exp. In math. They don't use math language and seem to regress in their writing skills! I found that most students would do the justification and would engage in the activity even though they knew it wasn't for a grade. The lack of engagement came after they got feedback. Most didn't want to change their justification or only wanted to add a little tiny bit. Also, some of them didn't understand what their partner had wrote so they didn't add more to their justification, they just left it blank or made a smiley face! Many of them giving feedback did not know how to give feedback, so that is something I know we need to work on. They seemed to think writing down, "that is what I got, good job", was really helpful feedback. I did notice that from the first trial to the second, students justifications did improve. I don't know if this is because the second task had multiple representations, but I think it is.

Reflection across trials

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Act

4. ACT. Describe modifications and/or decisions for the next cycle; what will you do next?
I am going to stick this one out! My findings were better than I thought so I am going to stay with this idea but I am going to modify a bit. 1. I am going to chose tasks that have multiple representations. 2. I am going to have it be in partners instead of individuals, so instead of one person writing the justification, I am going to have 2 students do it together and then they will get feedback from 2 students. I think this will increase engagement and might give them more to write and talk about. 3. I will increase the time more because they are working together. 4. I will set my paper up differently so I can clearly see the difference with before the feedback and the after

Should I **adopt**, **adapt**, or **abandon** my change idea?

What does this work sound like?

Small-group PDSA meetings focus on the **"study"** and **"act"** portions of the testing

Video:

https://www.youtube.com/watch?v=a1oyvXZHI68&feature=youtu.be

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Are we making progress?

- We **survey students** each year in the fall and spring about their opportunities for deep engagement.
- Survey constructs aligned to **Connect**, **Justify**, and **Solve**.

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Student survey constructs and items: Connect

Connect. *How often…*	**.80**
Do you make sense of mathematical rules, concepts, and relationships?	
Do you make connections to math concepts from other classes you've taken before or in the future?	
Do you make connections between math and real-world situations?	
Do you examine why the steps to solving a math problem or following a procedure work?	
Do you make connections to math concepts you learned previously in this class?	

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Student survey constructs and items: Justify

Justify. *How often…*	**.82**
Do you explain your answers to others in the class?	
Do you argue or defend your approach to solving math problems?	
Do you critique the mathematical reasoning of others—either written or spoken?	
Do you evaluate other students' approaches to solving math problems?	
Do you discuss possible solutions to math problems with other students?	

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Student survey constructs and items: Solve

Solve. *How often…*	**.78**
Do you keep trying different ways to solve math problems even when they are hard?	
Do you reread or go over a math problem again if you have trouble understanding it?	
Do you keep working on math problems even when you are stuck?	
Do you determine if your answers to complex math problems make sense?	
Do you solve math problems with multiple steps that take more than 20 minutes to solve?	

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After the first year, teachers valued network learning opportunities

Opportunities to collaborate with educators from other schools and districts	**98%** Extremely Beneficial
Opportunities to better understand/improve my teaching	**93%** Extremely Beneficial
Participation in network meetings and events	**90%** Extremely Beneficial
I value the opportunity to be part of the BMTN	**91%** Strongly Agree

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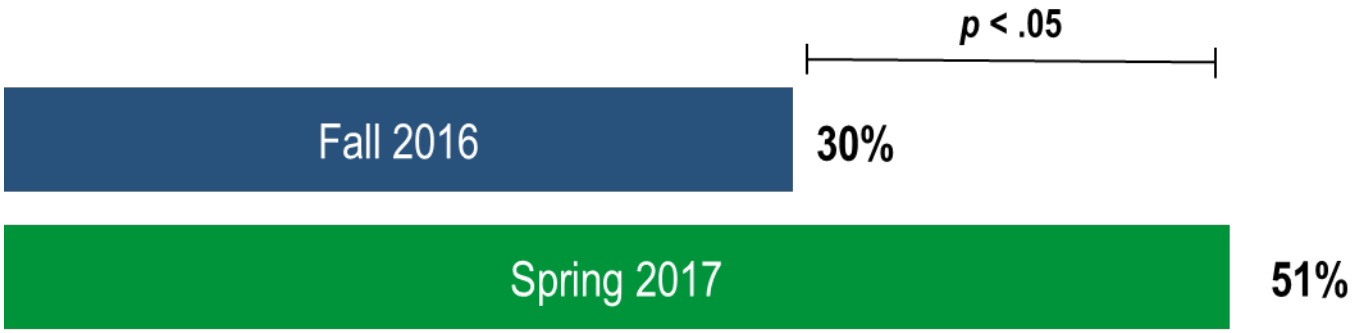
Observed growth in first year: Connect

Percentage of students who reported making connections between **math and real world** on a daily basis, fall to spring



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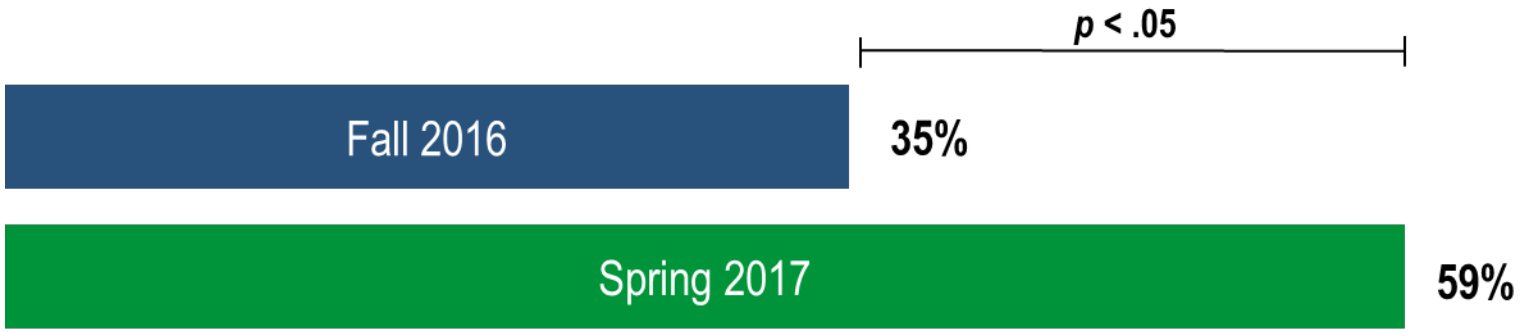
Observed growth in first year: Justify

Percentage of students who reported **arguing or defending their approach** to solving math problems on a daily basis, fall to spring



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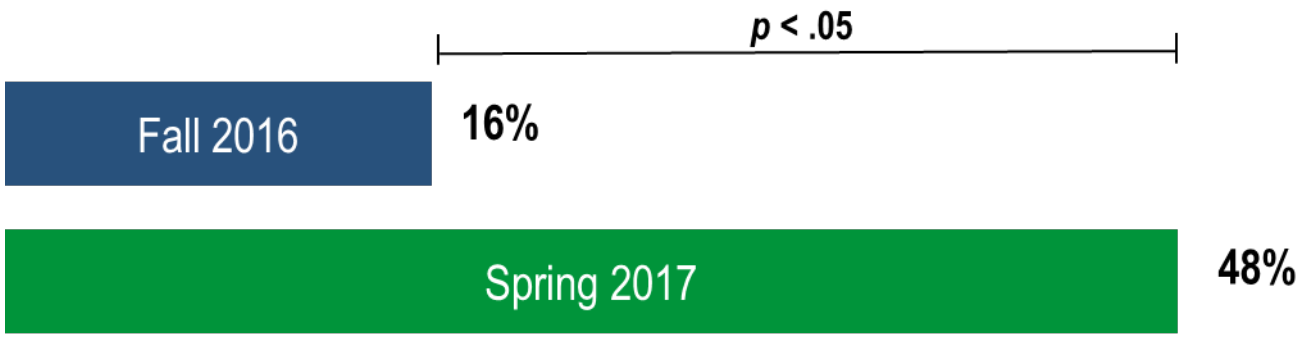
Observed growth in first year: Solve

Percentage of students who reported solving **multistep problems** that take 20+ minutes to solve on a daily basis, fall to spring



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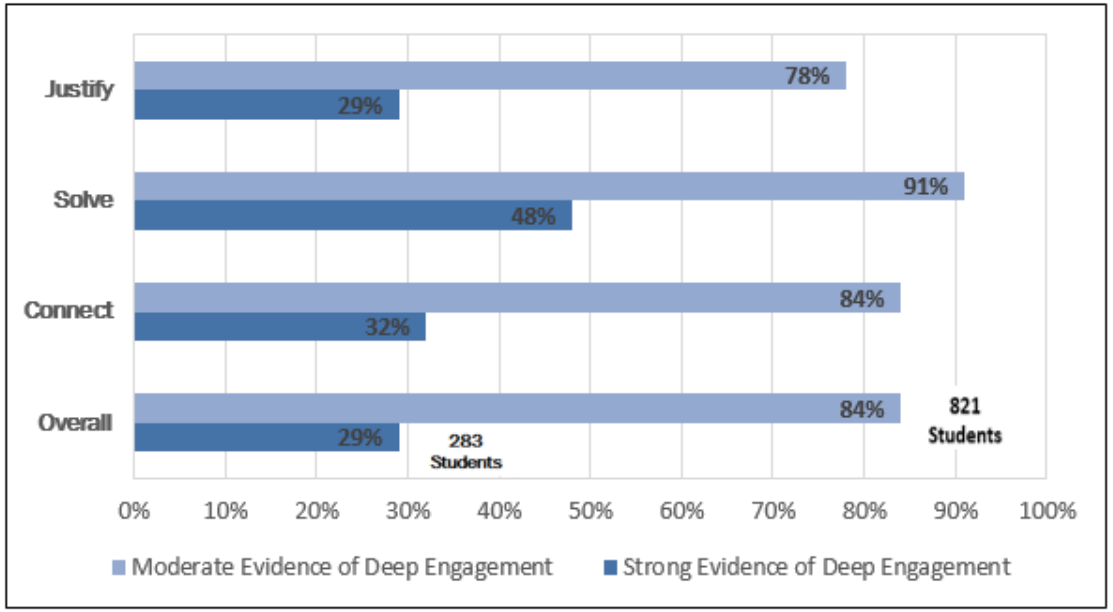
Are we making progress toward our aim?

In 2017–18, there was moderate to strong evidence that **821 students** were deeply engaged in algebra.



[1] Data taken from BMTN Student Survey, spring 2017-18; N = 977.

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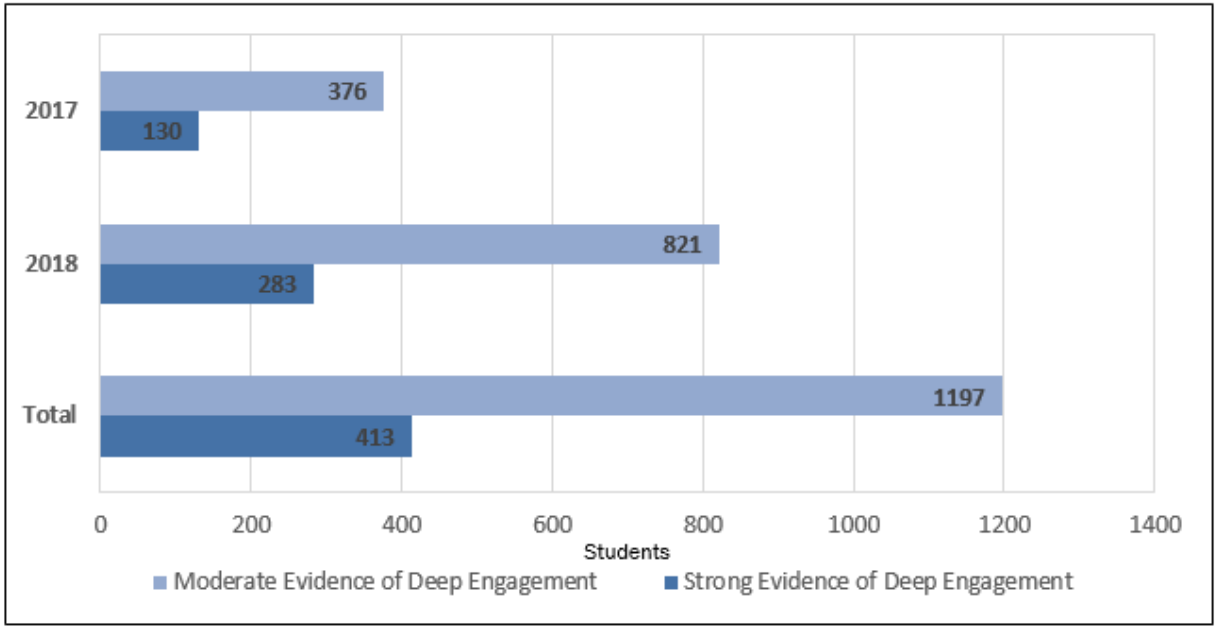
Are we making progress toward our aim?

Combined with the first year, we are getting closer to our goal of **2,019 in 2019**. We were at 1,197 students at the end of 2018.



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Reflection and planning

- What are the most **pressing challenges** you are facing in your improvement work?
- Are there things you heard about today that might **support this work**?
- How could **REL Southwest** and the U.S. Department of Education support you in moving forward?

Questions?

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Thank you!

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