Using Improvement Science to Improve Science:

Presented by the Maryland What Matters Now State Coalition

December 9, 2019
2019 Learning Forward Conference
St. Louis, Missouri
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• **Jean Snell**: the University of Maryland Center for Innovation & Improvement
• **Victoria Kinzig**: KickUp
• **Angela Bozman**: Dorchester County Public Schools
• **Laura Liccione**: Maryland State Department of Education
Purpose

To **understand** and **leverage** Improvement Science principles within daily work.

To **identify** opportunities for collecting and utilizing formative data for decision-making and incremental change during the year.

To **apply** protocols to strengthen the work of existing PLCs by implementing PDSA cycles.
About The Maryland What Matters Now Coalition
What Matters Now Network’s Key Elements

• Integrating professional learning with curriculum implementation
• Sharing leadership among diverse stakeholders
• Practice informing policy
• Leveraging improvement science
What Matters Now Network

Collaborative Partner: University of Maryland Center for Educational Innovation and Improvement

Collaborative Partner: University of Cincinnati Systems Improvement & Development Center

Collaborative Partner: Rhode Island Office of Innovation

Each SEA has 2-3 participating LEAs, each in turn with selected participating schools

Content Expertise & Facilitation

Improvement Science Expertise & Facilitation
The Maryland Coalition

Prince George’s County Public Schools

Dorchester County Public Schools
MD Student Aim: By the end of the 2019-20 school year, 75% of students in the four network schools will meet or exceed the state average on the 8th grade and HS MISA and student scores on the MISA will increase in each tier band (except 2s) by 10%.

WMN Network Aim: Teachers strengthen their practice and improve implementation of high quality curriculum and instructional materials.

MD Teacher Aim: 90% of science teachers in the MD state network will demonstrate increased teaching skill and capacity to deliver 3D aligned instruction.

Problem of Practice: Lack of access to and/or shared understanding of HQ curriculum and how it is applied to instructional practices is leading to challenges in the implementation of the 3-D science standards.

Access to High-Quality Resources: Build teachers’ knowledge of NGSS and increase access to NGSS-aligned HQCIM

HQ Professional Learning: Engage teachers and administrators in high-quality professional learning that addresses the quality and use of curriculum and instructional materials.

Stakeholder Engagement and Commitment: Involve staff, leadership, families, and students in strengthening professional learning systems focused implementing NGSS-aligned HQCIM.

Primary Drivers:
1. Access to High-Quality Resources
2. HQ Professional Learning
3. Stakeholder Engagement and Commitment

Secondary Drivers:
1. Definition of curriculum
2. Definition of what makes curriculum “high quality”
3. Identification of curriculum gaps
4. Identification of curriculum strengths
5. Distribution and availability of curriculum and instructional materials

Zoom In: Maryland Drivers Diagram

1. Mechanisms and systems to gather actionable feedback
2. Mechanisms and systems to address feedback
3. Stakeholder communication systems, practices, and materials
4. Practices and systems to honor teacher expertise
How KickUp supports

“Black-box” evaluation example

Inputs

Teachers participate in 25 hours of reading workshops

Outcome

Student achievement scores on state ELA assessment increases

“Glass-box” evaluation example

Inputs

Teachers participate in 25 hours of reading workshops

Box:

- Classroom visits
- Progress checks
- Coaching
- Leadership training
- PD events

Outcome

Student achievement scores on state ELA assessment increases

kickup empowers you to study activities within the box

Improvement Science
• Name a “reform initiative” introduced in your school/district to much fanfare but it no longer exists.

• Why did the reform fail to “stick”? 
Last Decade: Evidence-Based Practice Movement

An academic has an idea

S/he designs and fine tunes an intervention

An RCT field trial (5 years later)

Evidence it can work

Reviewed and goes on an “approved list”

Districts required to only use from approved list

Educators “implement with fidelity”

Practice improves!
Improvement science is explicitly designed to accelerate learning-by-doing. It’s a more user-centered and problem-centered approach to improving teaching and learning.

- Carnegie Foundation for the Advancement of Teaching
Core principles of improvement

Be problem-focused and user-centered
Organize as networks
Learn through disciplined inquiry
Embrace measurement
Attend to variability
See the system
Improvement Science Roadmap

- Understand the Problem and the system that produces it
- Collectively identify a meaningful improvement aim
- Generate Ideas for Change
- Test and build evidence
- Spread and Scale

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The Improvement Science Toolkit

- Problem of Practice
- RCA: What really causes
- How much? By When?
- Drivers: Primary and Secondary
- ToA: If... Then... And...
- PDSA: Testing and Revising
Plan–Do–Study–Act (PDSA) Cycles
An Engine for Learning: the PDSA Cycle

PLAN
• What’s your change?
• What’s your prediction?
• Plan to conduct test.

DO
• Execute test
• Collect data, document observations

STUDY
• Compare results to prediction
• What did you learn?

ACT
• Next steps: Adapt, adopt, abandon

Source: The Carnegie Foundation for the Advancement of Teaching
What specifically are we trying to accomplish?  

What change(s) might we introduce?  

Why do we think those changes may be an improvement?  

How will we know if a change is an improvement?

**AIM STATEMENT**

**THEORY OF PRACTICE IMPROVEMENT/DRIVER DIAGRAM**

**MEASUREMENT AND DISCIPLINED INQUIRY (PDSA)**

Source: *The Carnegie Foundation for the Advancement of Teaching*
**Theory Based Learning and Improvement**

**What is measured:**
Measures are closely aligned to the actual work and specific to the processes and outcomes you hope to change.

**How and when it is measured:**
Measures are embedded in the daily workflow.
Must produce data accessible in a timely manner.

**How data are used:**
Learning requires transparency, trust, low stakes, and the safety to take risks.

*Source: The Carnegie Foundation for the Advancement of Teaching*
Increase Teacher Capacity in NGSS

- Access to Resources
- HQ Professional Learning
- School Level Capacity
- Professional Learning Time
- Stakeholder Engagement and Commitment

Source: The Carnegie Foundation for the Advancement of Teaching
Traditional Approach to Implementing Change

Ideas for change

Failures that we don't understand

Quality with reliability at scale

Implementation of changes

Source: The Carnegie Foundation for the Advancement of Teaching
Improvement Science Approach to Implementing Change

Ideas for change

Very small scale test

Follow-up tests

Wide-scale tests of change

Implementation of changes

Quality with reliability at scale

DATA

Source: The Carnegie Foundation for the Advancement of Teaching
PDSA Simulation
To improve all participating teachers’ knowledge of NGSS implementation and ability to identify NGSS-aligned instructional resources within their school/school system
To use a common **self assessment process** for teachers to **examine and reflect** on their implementation of NGSS-aligned lessons, and to **share observations** with colleagues in structured professional learning team meetings.
# PDSA Cycle: [Title]-[Cycle #]-[Date]

<table>
<thead>
<tr>
<th>Overall Aims</th>
<th>What is the overall aim from the driver diagram?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus Driver(s) for Testing</td>
<td>(Primary Driver)</td>
</tr>
<tr>
<td></td>
<td>(Secondary Driver – if applicable)</td>
</tr>
<tr>
<td>Change Idea being Tested</td>
<td>What is the specific change idea that is being tested in this PDSA cycle?</td>
</tr>
<tr>
<td>Team Members</td>
<td>Who are the members doing this testing?</td>
</tr>
</tbody>
</table>

## 1. Plan – Plan Your Test and Predict What Will Happen

### 1a. Test Steps

> What is your plan for enacting this test? (What, Who, When, Where?)

### 1b. Learning Goals

> What do you hope to learn from this test?

### 1c. Measures

> How will you know whether this change is an improvement? What will you measure, and what data will you collect?

### 1d. Predictions

> What are your targets or expectations for each test measure?
Individually Review the PDSA Cycle #1 Overview

1) Identify how the MD Change Idea was enacted through the PLC series
2) Identify what measures and instruments were used to gauge whether the enacted change was leading towards improvement
Individually review the PDSA #1 data report in KickUp

1) How did the results match the predictions?
2) How did the results match the learning goals?
3) What evidence is there that progress was made towards the Aim, if any?

In your Table Groups, discuss:

- What can be learned from these results, and what questions are raised by the results?
- Based on the PDSA #1 results, what would your adapt, adopt, or abandon to strengthen PDSA #2, and why?
What Happened: The Evolution of our MD PDSAs

PDSA #1
(2 PLCs)
Select Lesson and Share reflections NGSS Alignment in PLC

PDSA #2
(3 PLCs)
Add: Exemplar Lesson + NGSS-Lesson Checklist

PDSA #3
(3-PLCs)
Add: Peer Observations

PDSA #4-6: cont. Peer Collaboration visits, more exemplars, and LASW
Think about the parts of a PDSA and this approach to scaling up changes:

- **Where** does your organization tend to spend the most time doing?
- **Which step** does your organization tend to skip and **why**?
- **What** would facilitate PDSA cycles in your organizations?

*Source: The Carnegie Foundation for the Advancement of Teaching*
Learnings & Takeaways
Pulling it Together: Our Districts’ Experiences with PDSAs

Before PDSAing

After PDSAing
Before PDSAing:
Unstructured PLCs
Lack of Evidence on:
■ HQCIMs
■ Teacher Practice
■ Lesson Planning
■ NGSS- 3D Instruction
■ Data Driven Instruction

After PDSAing:
Structured PLCs
Evidence on:
■ Better-Aligned NGSS CIMs
■ Improved Teacher Practice
■ Improved of NGSS Lesson Planning
■ Improved NGSS- 3D Instruction
■ Improved Use of Data Driven Instruction

HQCIMs = High Quality Curriculum Instructional Materials
Pulling it Together: Our Districts’ Experiences with PDSAs

Before PDSAing:

I’m going to focus on my lesson plans right now.

Oh look! A new board on Pinterest.

After PDSAing:

Hey Teacher:

I like the way you work hard in your PD to better yourself for your students.
Before PDSAing:
Unfocused
Unproductive
Off topic

After PDSAing:
Structured
Focused
Data driven

Pulling it Together: Our Districts’ Experiences with PDSAs
NGSS Lesson Checklist

As recommended by the NGSS Lesson Screener, NGSS-aligned lessons should include:

- At least 2-4 SEPs

Science and Engineering Practices (SEPs)
- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts (CCCs)
- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

*The diagram does not show all possible connections.

The diagram below shows examples of how the four Core Ideas of Next Generation Science Standards connect to Science and Engineering Practices and Crosscutting Concepts.

Science and Engineering Practices

Crosscutting Concepts

The cover page shows the lesson checklist with relevant SEPs and CCCs.

Office of Leadership Development and School Improvement
February 2019

## Planning for the Visit

Describe the learning focus area, as determined by student data. Under which dimension does the focus align?

Explain the assessments (formative and/or summative) utilized in this lesson. How do these assessments connect to the focus?

<table>
<thead>
<tr>
<th>Pre-Visit: What strategies will the teacher use to support learners in the focus area?</th>
<th>During Visit: What is the teacher saying and doing related to the focus area?</th>
<th>During Visit: What are students saying and doing related to the focus area?</th>
</tr>
</thead>
<tbody>
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### Post-Visit Guided Conversation:

**Praise:** List strategies, techniques, resources, or tools from this lesson that inspired you.

**Question:** How well did students master the desired objectives of the lesson? How do you know?

**Polish:** What aspect of your instructional practice are you going to improve?
### Types of Data Measures

<table>
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<th>Accountability Measures</th>
<th>Research Measures</th>
<th>Practical Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome-focused; typically used to identify exemplary or problematic individuals (i.e. districts, schools, teachers)</td>
<td>Academic research focused on developing theories</td>
<td>Focus on understanding the impact of improvement efforts</td>
</tr>
</tbody>
</table>

#### Examples:
- Accountability Measures: standardized testing data, drop-out rates
- Research Measures: long, redundant question sets to identify small conceptual distinctions
- Practical Measures: a 3-minute survey, given every 90 days to take the “pulse” on a targeted practice

#### Limitations:
- Accountability Measures: Timeliness, Complex systems
- Research Measures: Too long to use repeatedly, Not actionable, Not designed to assess changes or differences between users

Source: Practical Measurement white paper, Carnegie Foundation.
[PDF version]
Data falls short as information for improvement when...

- They are not easily understood by the improvers;
- They are not (clearly) connected to practices;
- They are not (clearly) connected to outcomes;
- They are not actionable;
- They are shared too long after action has occurred;
- They are shared with insufficient frequency;
- They are too resource-intensive to be collected, processed, and shared on a regular basis

Measures developed for accountability or research purposes often fall short for improvement purposes because of the above characteristics.

Source: Practical Measurement white paper, Carnegie Foundation, [PDF version](#)
Successful practical measures fit the following criteria.

Direct measurement of intermediary targets
Improvements can be mapped back to the areas where change has been introduced; timeline would reasonably show change

Specificity
Data closely linked to specific work processes

Contextualized language
Indicators written in language meaningful to audience

Can be embedded in everyday practice
Brief and can be given routinely; no survey fatigue

Practical measures can serve several functions.

Assessing Changes
Is the change we introduced resulting in improvement?

Predictive Analysis
Who is at higher risk for problematic outcomes?

Priority Setting
How should we focus our efforts?

Source: Practical Measurement white paper, Carnegie Foundation. PDF version
Closeout & Feedback
Questions?
Post-Session Evaluation

Take our 3 minute survey!

Your responses power our kickup report

Session ID: 1423

NOTE: Session ID should be in all CAPS and is case-sensitive.

kickup.co/2019LF
What is one learning from today you hope to take back with you to your own district?
(3 volunteers)

Digital Version of today’s materials:
kickup.co/wmn_learnfwd