NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Research in the Math Classroom: Using it and Doing it

July 8, 2024

Introducing NCTM's updated

"Linking Research and Practice"

Position Statement

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Hosts

Melissa Boston,
Duquesne University

Mike Steele,
Ball State University

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Special Guests

Dr. Margaret “Peg” Smith,
University of Pittsburgh
Professor Emerita

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Special Guests

Dr. Lori Hart

Dr. Kayla Blankenship

Dr. Maria Porras Monroy

Orange County Public Schools &
University of Central Florida

What words or phrases come to mind when you hear the word "**researcher**" or think about **research**?

What words or phrases come to mind when you hear the word "**practitioner**" or think about **practice**?

Mentimeter: https://www.menti.com/al677hz1ukiz

Some Definitions…

- **Practitioner**: one who engages in teaching (K-12, college, teacher education or professional learning)
- **Researcher**: one who engages in collecting data or evidence (formally or informally) to answer questions about teaching and learning
- **Classroom**: K-12, college, teacher education, other professional learning setting

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How have you engaged in using and doing research in practice?

Mentimeter: https://www.menti.com/al677hz1ukiz

Using Research in Practice:

- How have you used research in your practice?
- What questions have you looked to research to answer?

Doing Research in Practice:

- What topics or questions have you researched in your classroom (K-12, college, or teacher education/professional learning), formally or informally?

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Declarations

1. Mathematics education research must be ethical and comprehensively address critical problems.
2. Research should identify high-leverage, effective, equitable mathematics practices shared in useful, actionable ways.
3. All educators build knowledge of mathematics education research and practice.

Collaboration provides integrated perspectives for addressing critical issues that lead to enhanced mathematics teaching and learning experiences for each and every student.

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Connecting Research and Practice

"What positive outcomes will the knowledge generated from research create, and how will that knowledge be used to enhance the teaching and learning of mathematics?"

"The practice of teaching mathematics informs the research knowledge base, and research outcomes contribute to the practice and professional knowledge base for teaching…."

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Blending Our Roles as Researchers and Practitioners

"professionals with primary roles as practitioners should engage in generating research, and these activities should be encouraged and supported within the teaching profession."

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R

Creators of research

- Analyzing data to develop frameworks and tools
- Sharing findings with the research community

Consumers of research

- Collecting data
- Noticing patterns
- Making and testing conjectures
- Modifying tools

- Using research-based tools
- Sharing strategies with practitioner colleagues

P

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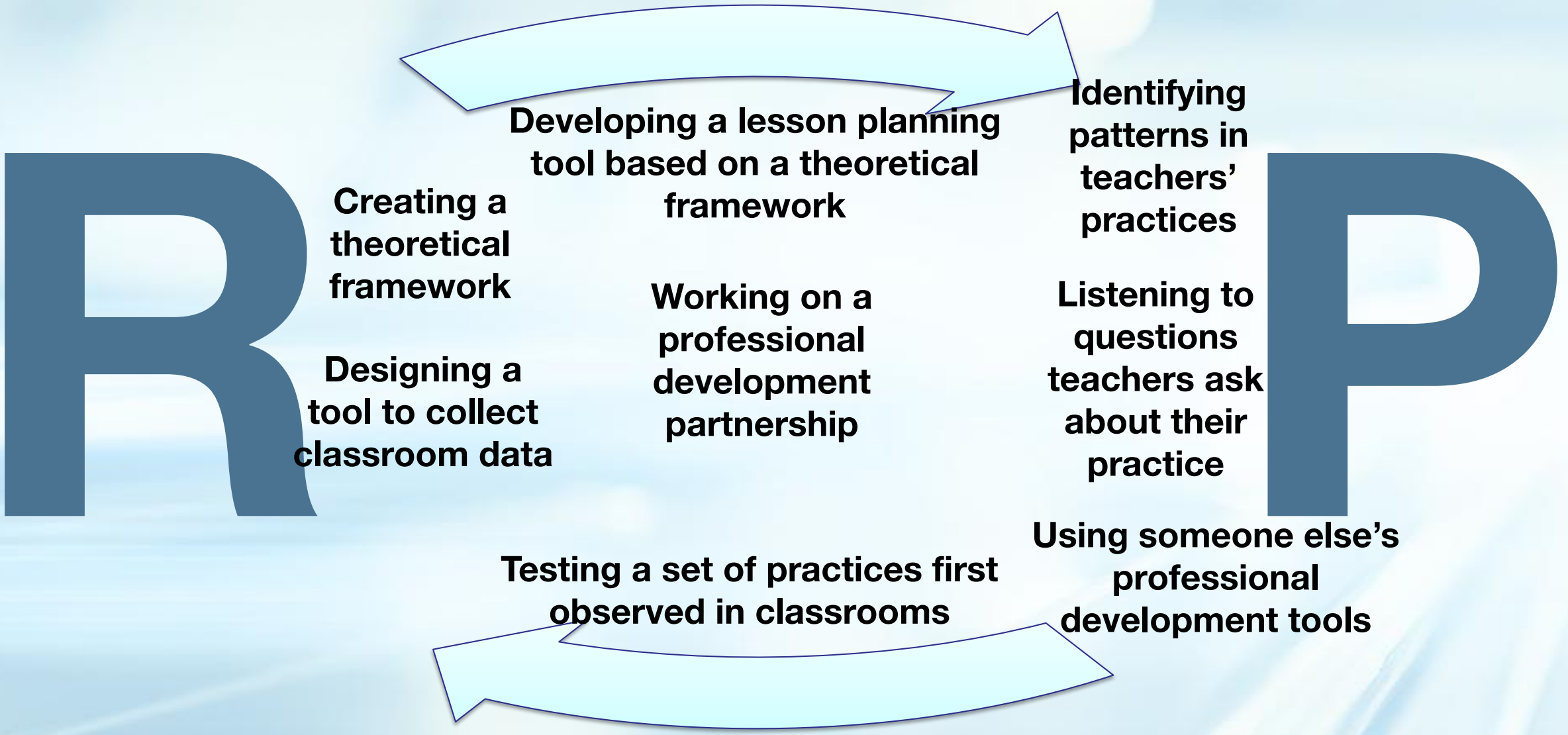
University-based mathematics educators



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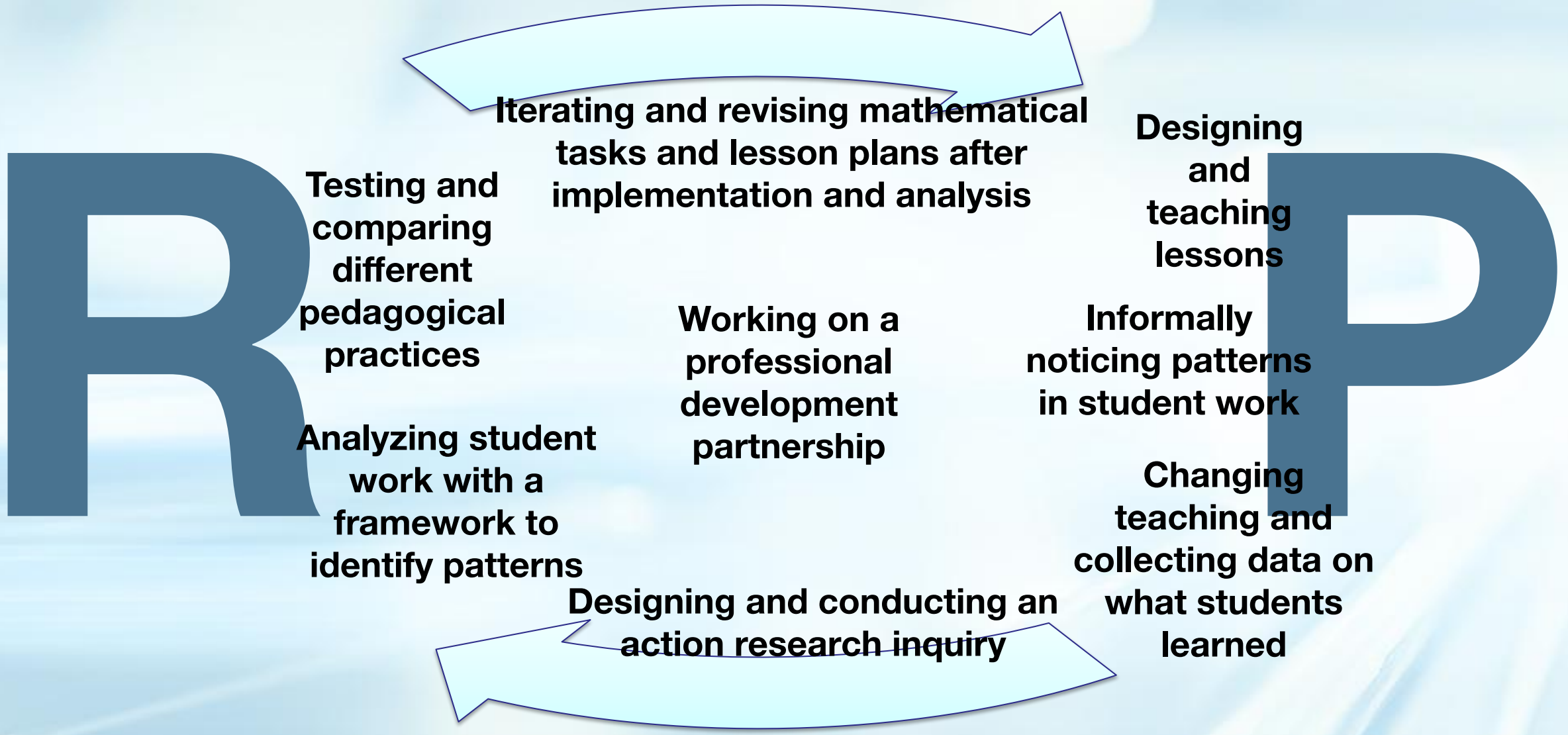
Classroom-based mathematics educators



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Dr. Lori Hart

R

P

University of Central Florida
Dissertation Title:

Exploring the Challenges of First Grade Students' Non-Exit from Mathematics Intervention: A Comparative Analysis of Mathematics Instruction and Best Practices during Intervention

Orange County Public Schools,
4th Grade Math Teacher
Title 1 Math Interventionist

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Dr. Lori Hart

R

I noticed that first grade students were not exiting from Tier 2 Intervention

P

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Dr. Lori Hart

R

I analyzed tasks and task implementation using the IQA and also analyzed teachers' beliefs about math intervention

I noticed that first grade students were not exiting from Tier 2 Intervention

P

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Dr. Lori Hart

R

I analyzed tasks and task implementation using the IQA and also analyzed teachers' beliefs about math intervention

I noticed that first grade students were not exiting from Tier 2 Intervention

P

I found implementing the Effective Teaching Practices from *Principles to Action* supports students in Tier 2 intervention

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Connecting Research and Practice

R

P

"By collaborating to identify practical implications and applications of research and to develop useful tools for practitioners or policymakers, research that foregrounds the problems of practice can help move research into practice."

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Dr. Margaret "Peg" Smith

R

P

University of Pittsburgh

Research Projects:

QUASAR, COMET, ASTEROID, ESP

Author,

Teacher Educator, and

Professional Development Provider

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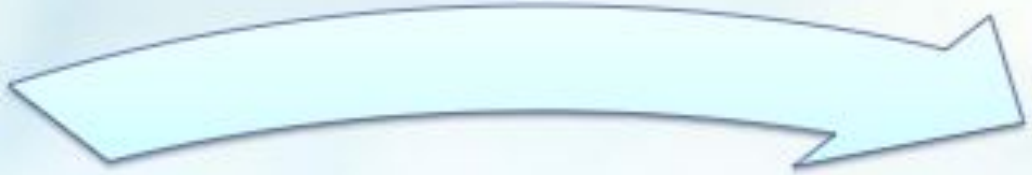
Dr. Margaret "Peg" Smith



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"That's what happened to the Tape Roll Task!"

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Research Articles:

Stein, Grover, & Henningsen (1996)

- *Different tasks require different levels and kinds of student thinking.*
- *The cognitive demands of a task can change during instruction*
- *Mathematical tasks with high-level demands are the most difficult to implement well.* [575]

Stein & Lane (1996)

- *Consistent engagement with high-level tasks leads to the greatest learning gains for students*. [233]

Henningsen & Stein (1997)

- *Classroom-based factors shape students' engagement with high-level tasks.* [484]

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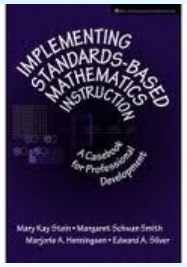
Practitioner Articles/Chapters

- *Mathematics Tasks Framework as a Tool for Reflection* (MTMS, 1998)

- *Selecting and Creating Mathematical Tasks* (MTMS, 1998)
- *Characterizing the Cognitive Demands of Tasks* (NCTM, 2004)

Book for Practitioners

Narrative cases of mathematics instruction that exemplify research-based pattern of teaching and learning through the lens of the MTF (2000).



Tools for Practice

Research Findings

FORDFOUNDATION

QUASAR 1989-2001

research

Research Articles:

Stein, Grover, & Henningsen (1996)

- *Different tasks require different levels and kinds of student thinking.*
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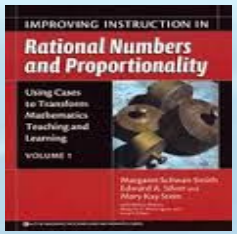
Tools for Practice

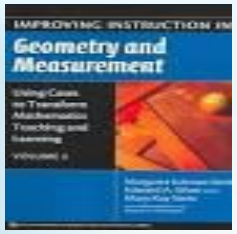
Practitioner Articles/Chapters

- Using CD tasks and students' intuitive strategies to teach measurement (NCTM, 2003), to solve missing value problems (MTMS, 2003), and to teach algebraic reasoning (NCTM, 2004)

Books for Practitioners

- Narrative cases of mathematics instruction that exemplify research-based pattern of teaching and learning through the lens of the MTF and focus on specific mathematical ideas (2005).





National Science Foundation
WHERE DISCOVERIES BEGIN
COMET
1998-2002
materials development

FORDFOUNDATION
QUASAR
1989-2001
research

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Tools for Practice

Research Findings

Research Articles:

Stein, Engle, Smith, & Hughes, 2008

- *Codified a set of practices for facilitating productive discussions of CD tasks from the study of an experienced facilitator.*

Steele, Hillen, & Smith, 2013

- *Provided evidence that teachers can learn through engagement in a course that included narrative cases and other practice-based materials.*

Stein, Engle, Smith, & Hughes, 2015

- *Provided evidence that teachers could learn a set of practices intended to support productive classroom discussions of CD tasks.*

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Practitioner Articles/Chapters

- *Using Pattern Tasks to Develop Mathematical Understandings and Set Classroom Norms* (MTMS, 2007)
- *Thinking Through A Lesson Protocol* (MTMS, 2008)
- *5 Practices for Orchestrating Productive Discussions* (MTMS, 2009)

Books for Practitioner

- *Discussion of the five practices and classroom-based examples that bring the practices to life (2011, 2013, 2019, 2020, 2024).*

Tools for Practice

Research Findings

National Science Foundation
WHERE DISCOVERIES BEGIN
ASTEROID
2001-2004
research

National Science Foundation
WHERE DISCOVERIES BEGIN
COMET
1998-2002
materials development

FORDFOUNDATION
QUASAR
1989-2001
research

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- *Provided evidence that teachers could learn a set of practices intended to support productive classroom discussions of CD tasks.*

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Research Articles:

Boston & Smith, 2009

- *Teachers participating in task-centric professional development can improve their ability to select and successfully enact high-level tasks in their classrooms.*

Boston & Smith, 2011

- *Teachers ability to select and successfully enact high-level tasks can be sustained and improved over time.*

Boston, 2013

- *Teachers learning about mathematical tasks was closely linked to the ideas represented in frameworks and their experiences in the ESP workshops.*

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Practitioner Articles/Chapters

- *A strategy for engaging teachers in conversations about their practice* (NCTM, 2009).
- *Supporting teacher reflection and collaboration on the implementation of cognitively challenging mathematical tasks* (AMTE, 2009).

Book for Practitioners

- Narrative cases of mathematics instruction that exemplify research-based pattern of teaching and learning through the lens of the MTF. Description of task-based professional development (2009).

Tools for Practice

Research Findings

ESP 2003-2009 — professional development

ASTEROID 2001-2004 — research

COMET 1998-2002 — materials development

QUASAR 1989-2001 — research

Research Articles:

Boston & Smith, 2009

- *Teachers participating in task-centric professional development can improve their ability to select and successfully enact high-level tasks in their classrooms.*

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Qs for Peg

- Can you talk about how some of the ideas central in your work have originated in classrooms and from listening to teachers?
- In your work with teachers, how have you thought about positioning them as collaborators in the research? How have you seen teachers take up this role as more than practitioners?
- How do you know when a research-practice partnership is effective? What are the signs?
- What are the biggest challenges when researchers and teachers collaborate?

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Connecting Research and Practice

R

"This research should also be influenced by the needs and issues in the classroom and provide results that are readily accessible, including tools to support practitioners and policymakers at all levels. "

"To have the desired impact, results should be reported in ways that can be shared, replicated, and applied or adapted to a variety of instructional settings…"

P

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Dr. Maria Porras Monroy

R

P

University of Central Florida

Dissertation Title:

Impacts of Professional Development on Elementary Mathematics Teachers' Implementation of Cognitively Demanding Tasks

Orange County Public Schools,

4th Grade Math Teacher &

Team Leader

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Dr. Maria Porras Monroy

I wondered how to engage students in thinking and reasoning. I noticed other teachers had the same issue.

R

P

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Dr. Maria Porras Monroy

R

I used ideas from the IQA to design professional development and then analyzed teachers' classroom practice.

I wondered how to engage students in thinking and reasoning. I noticed other teachers had the same concerns.

P

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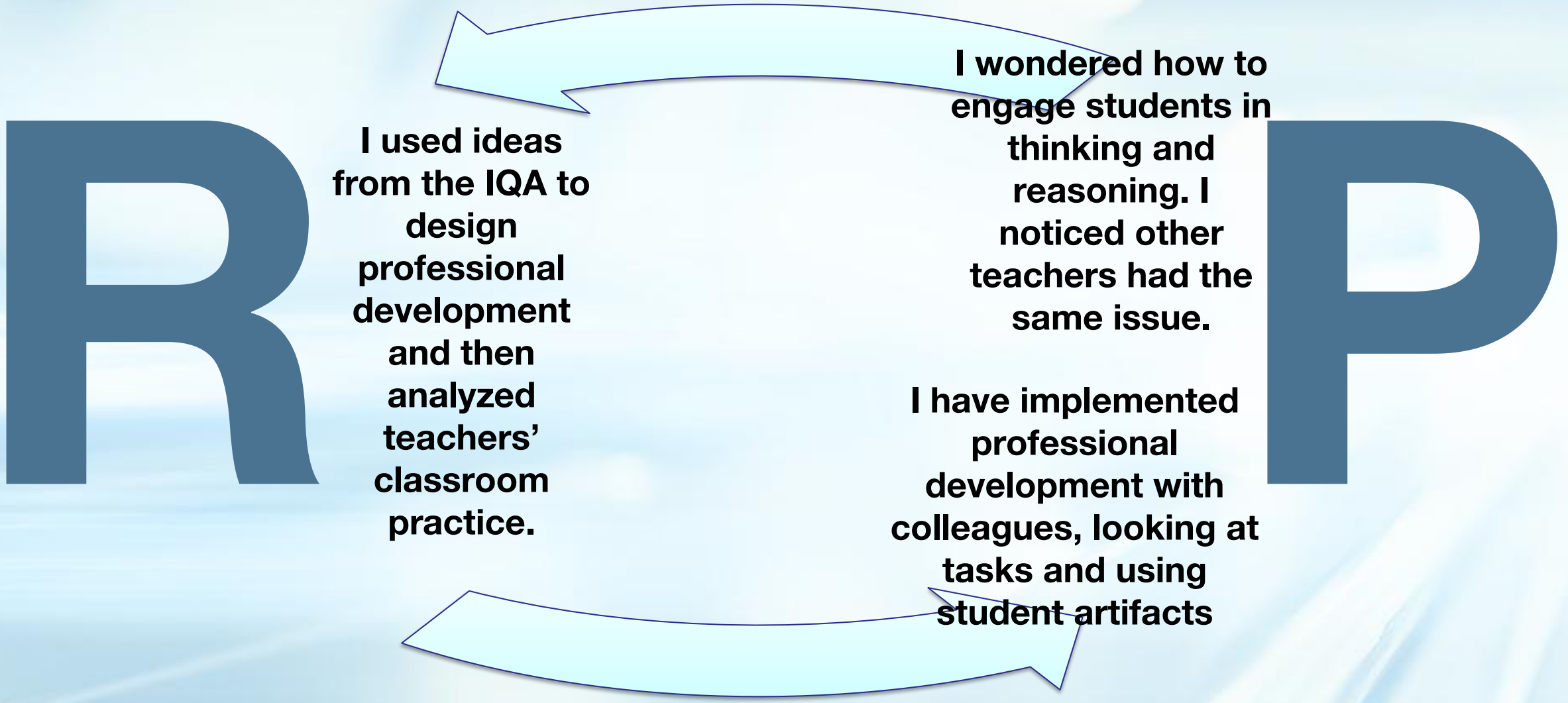
Dr. Maria Porras Monroy



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Dr. Kayla Blankenship

University of Central Florida:

Dissertation Title:

Promoting positive mathematics identity development in elementary students through a strengths-based, equity-focused mathematics club

Orange County Public Schools,

Title 1

Math Interventionist

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Dr. Kayla Blankenship

R

I noticed students' lack of engagement in mathematics (<50%) school-wide

P

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Dr. Kayla Blankenship

R

I analyzed my own classroom, read research about math clubs, and engaged in action research while implementing a math club

I noticed students' lack of engagement in mathematics (<50%) school-wide

P

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Dr. Kayla Blankenship

R

I analyzed my own classroom, read research about math clubs, and engaged in action research around the math club

I noticed students' lack of engagement in mathematics (<50%) school-wide

The "math club" program is going to be implemented at multiple schools

P

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Questions to consider next

- How (and where) can we share research<->practice stories?
- How can classroom teacher voices be authentically represented in research?
- Whose teacher voices are being elevated in research<->practices stories?

Johnson, K. R. & Steele, M. D. (2024) Creating the Elevating Teacher Voice Special Issue. *Mathematics Teacher Educator 12*(2), 84-88.

"We invite the field to collectively consider what the costs and benefits are to maintaining the status quo in terms of (re)presenting our own voices and the voices of prospective and practicing teachers that are so central to literally all of our practices…Teacher voices are extraordinary. They are powerful. Let us go forward in ways that hold those two statements at the heart of our work."

Moral of the story

What is “actionable” from the position statement?

What has this webinar made you think about as a researcher and/or practitioner?

What has this webinar made you think about **doing** (or doing differently) as a researcher and/or practitioner?

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Resources for Connecting Research and Practice

- *Putting Essential Understanding into Practice* series (NCTM, 2019)
- *More Lessons Learned from Research, Volume 1: Useful and Usable Research Related to Core Mathematical Practices* (NCTM, 2015)
- *Research Companion to "Principles to Action"* (NCTM, 2017)
- *Catalyzing Change* series (NCTM, 2020)
- "Learning from Practice about Improving the Quality of Mathematics Teacher Research" (Smith & Heaton, 2013)

Acknowledgement

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Susan Peters, University of Louisville
Michael Steele, Ball State University

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NSF Noyce Track 3 Project

“Empowering STEM Teachers with Earned Doctorates”

Principal Investigators

Drs. Sarah Bush, Juli Dixon,

Lisa Brooks, & Brian Moore

Thank you!

Questions or comments?

Feel free to reach out to:

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Mike Steele: michael.steele@bsu.edu