What Do We Really Know about Professional Development?

Iris Weiss & Dan Heck

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Horizon
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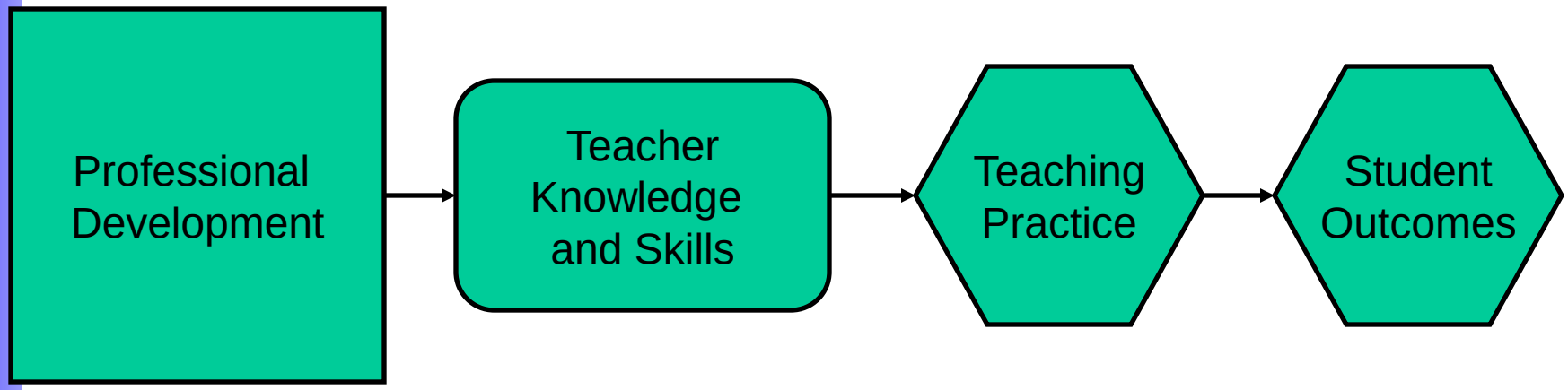
What do we want to know?

1. Is professional development important?

2. What are effective professional development strategies?

3. For which teachers are those strategies effective, and under what conditions?

Simplified Logic Model for Professional Development



Do you know how to find the length of the hypotenuse of a right triangle?

$$c^2 = a^2 + b^2$$

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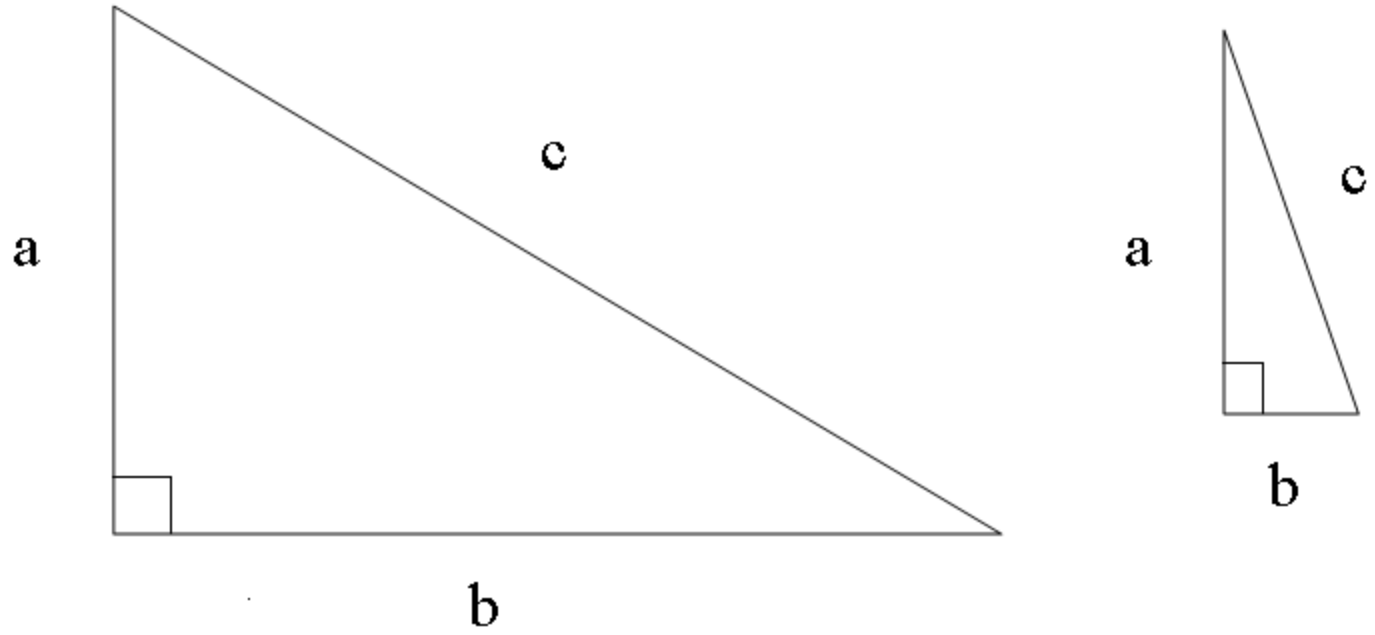

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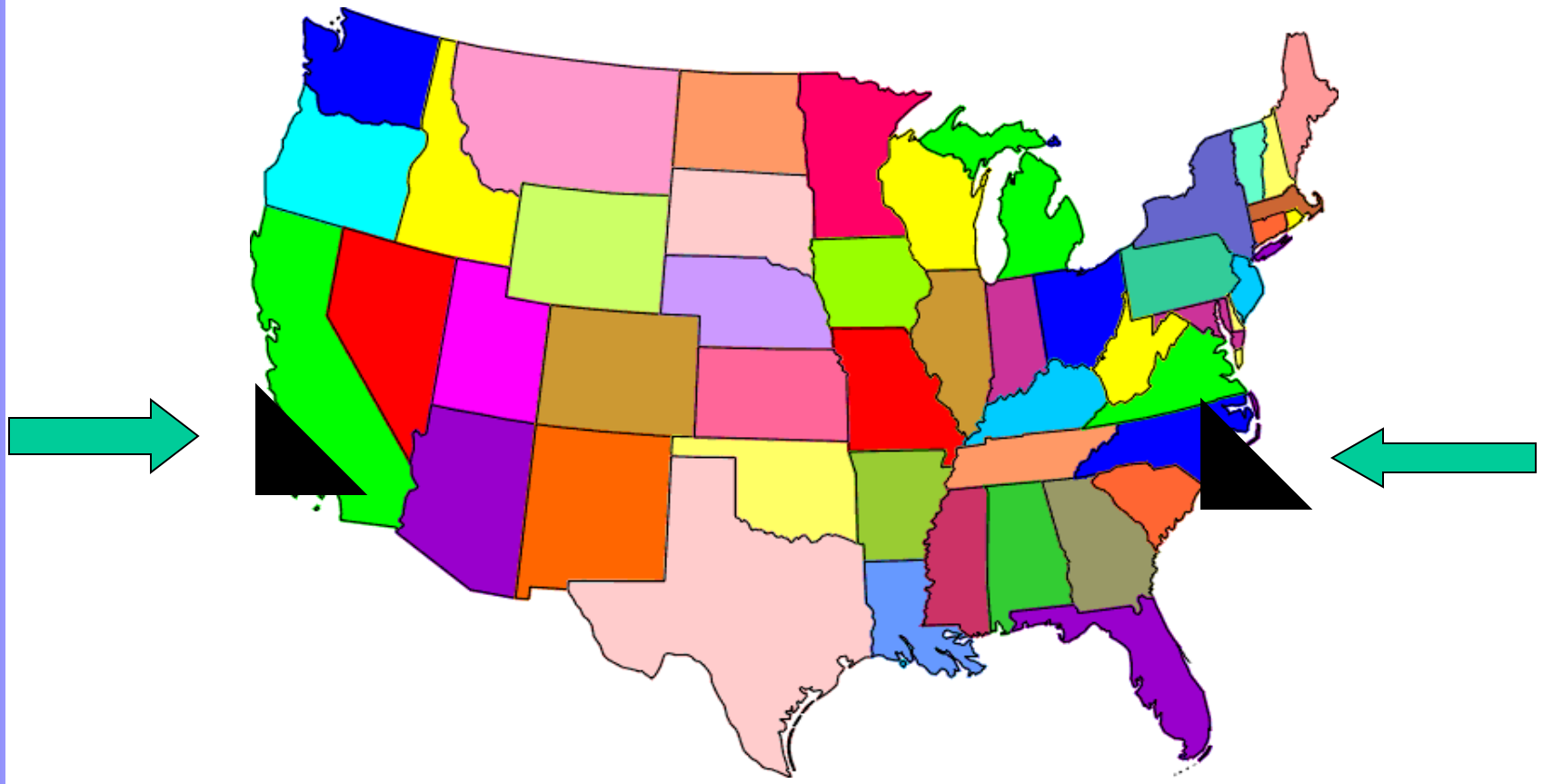

Effective PD = ?

- It is unlikely that there is any PD strategy that will work for all mathematics content, for all teachers, in all contexts.
- We don't have, and will never have, certainty about effective PD for a particular group of mathematics teachers.

Effective PD = ?

- Common Core State Standards suggest important mathematics content to address

- But there are lots of other decisions to be made that should be informed by the best available knowledge—
  - From research
  - From theory
  - From practice

Facets of Teacher Content Knowledge

- Disciplinary content knowledge
- Pedagogical content knowledge
- Ways of knowing content

What facets of content to choose in content-focused PD

- Most people seem to agree that all of these facets are important for teaching
- With unlimited time and resources, you would likely address them all
- But we don’t have unlimited time and resources, so choices have to be made

Sequencing PD Goals

One line of reasoning:

Teachers can't learn to teach what they don't know. Therefore, it is important to start with mathematics content, and only after teachers themselves have a sufficiently deep understanding of the content, move to considering classroom application.

Sequencing PD Goals

Another line of reasoning:

Teachers are by their very nature practitioners. Starting with classroom applications, e.g., trying to analyze student work, provides a purpose and context for engaging the teachers in learning mathematics content.

Sequencing PD Goals

Available research does not indicate which approach is "better" under a particular set of conditions.

MSP KMD Review of Research on PD to Deepen Teacher Content Knowledge

- Identified more than 1000 "studies" on PD to deepen teacher mathematics content-related knowledge

- Applied standards of evidence to 28 studies of mathematics PD, those that were not simply opinion or advocacy pieces *and* actually measured teacher content knowledge

What we learned

Available research points to some elements of effective PD, but provides very little guidance about how to design and implement PD for particular purposes in particular kinds of situations.

Example 1

Opportunities to learn about student mathematics curricula were positively related to…

- reports of classroom practices advocated in the California mathematics frameworks; and
- student performance.

Cohen & Hill, 2000

Example 2

- Longer duration/more contact hours; and
- Opportunity to engage in mathematical analysis, reasoning, and communication

… were positively related to teacher learning of mathematics content knowledge for teaching.

Hill & Ball, 2004

Example 3

- Focus on a specific practice/set of practices
- Coherence with other PD
- Active learning opportunities
- Collective participation of teachers
- "Reform types" of PD focused on higher order instructional/assessment practices

…were positively related to changes in teachers' instruction, assessment, and/or technology practices.

Desimone, Porter, Garet, Yoon, & Birman, 2002

An Emerging Consensus Effective PD:

- Focuses on content knowledge and how students learn content
- Involves a substantial number of hours
- Sustains focus over time
- Models effective practice, including active learning experiences
- Engages teachers in communities of learning
- Involves active participation of school leaders

Study in progress

A randomized controlled trial is testing characteristics of PD, including…

- Substantial number of contact hours over a full-year duration, including summer institutes, academic year seminars and in-school coaching
- Focus on developing teachers' content and pedagogical content knowledge
- Collective participation of teachers in a school

Preliminary findings

After one year, the study found impact on …

- Teachers' use of instructional practices to elicit student thinking

But no statistically significant impact on …

- Teacher content knowledge,
- Teachers' use of representations in instruction,
- Teachers' focus on mathematics reasoning in instruction,
- Student achievement.

Garet et al., 2010

To explain these results, one might consider whether…

- The content was appropriate for these teachers
- The instruments were sensitive to impacts that were occurring
- There was sufficient time for impacts to occur

An alternative explanation

- The current understanding of PD effectiveness is incorrect or underspecified.

One Key Missing Ingredient

- HRI evaluations of PD programs suggest a need to apply what is known about how people learn in professional development.

- *How People Learn* (NRC, 2003) and *How Students Learn: History, Mathematics, and Science in the Classroom* (NRC, 2005).

How People Learn

- Motivation
- Eliciting learners' prior knowledge
- Intellectual engagement with relevant phenomena/examples
- Use of evidence to make/critique claims
- Sense-making & reflection

Another Key Missing Ingredient

- HRI evaluations of PD programs suggest a need for stronger guidance to support design and implementation.

- What does it take to make an "effective element" actually effective?
- What conditions of PD seem to matter?
  - Who are the teachers?
  - Who are the PD providers?
  - What is the context?

Practice-based Insights

- Elmore (2002) noted that the insights of experienced practitioners can serve as "sensible propositions" to guide PD as researchers work to develop a more rigorous empirical research base to test these insights

Converging Evidence

- Learning Theory: Learners need to be motivated.
- Empirical Evidence: PD that focuses on mathematics content in the context of curriculum and pedagogy is often effective.
- Practice-Based Insight: Some teachers are motivated by opportunity to learn challenging mathematics content, others by seeing a connection between the content addressed in PD and their teaching.

Converging Evidence

- Learning Theory: PD has to take into account what teachers already know and what they consider important.
- Empirical Evidence: PD that focuses on a purpose anchored in student learning of specific content in a specific setting is often effective.
- Practice-Based Insight: Design activities that are both accessible and challenging to teachers with a range of mathematics content understanding.

Converging Evidence

- Learning Theory: Learners need support in sense-making.
- Empirical Evidence: PD that includes opportunity to engage in mathematical analysis, reasoning, and communication is often effective.
- Practice-Based Insight: PD providers need to make sure that teachers make connections between what they experience and the mathematics ideas they are intended to learn.

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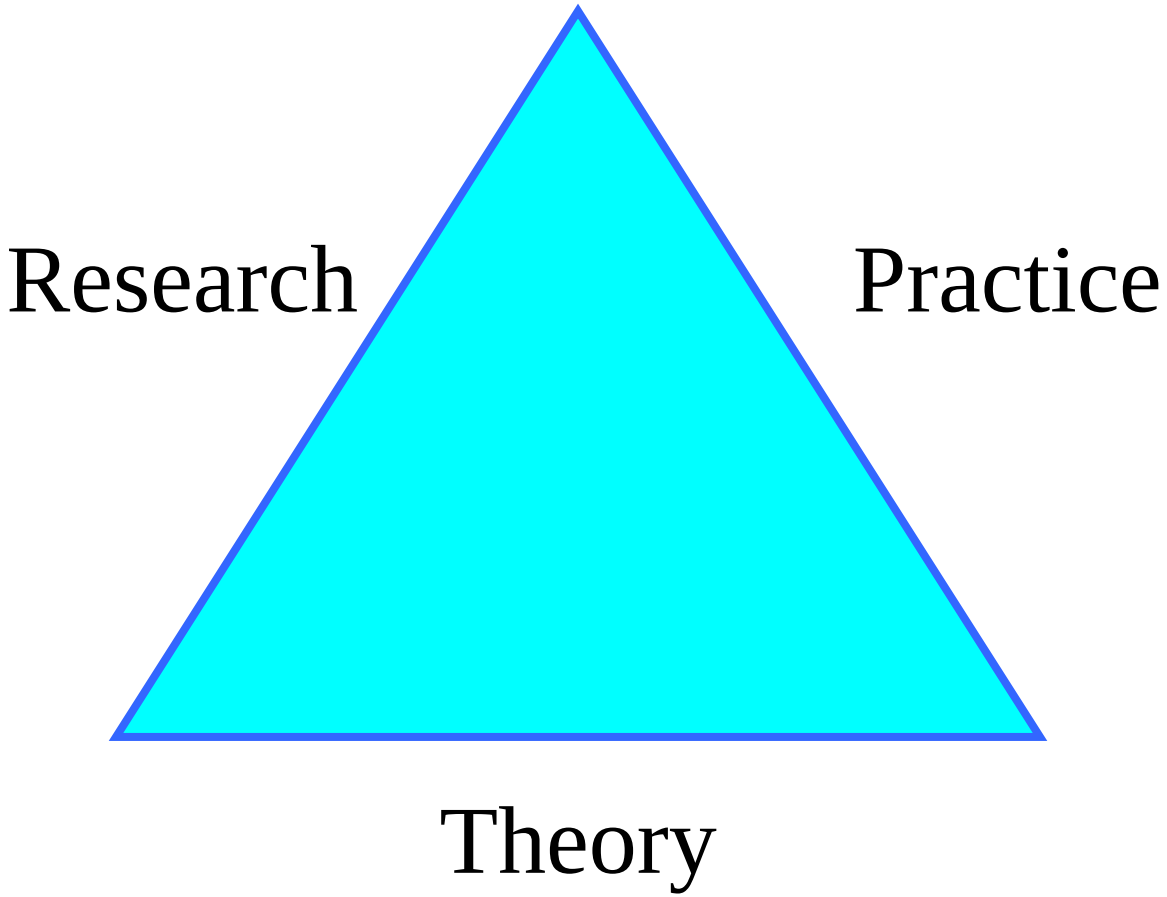

As you learn about other programs and consider applications to your context

- How can learning theory inform your design?
- How can the research base inform your design?
- How can practice-based insights inform your design?

As you implement and learn from your own programs

Add to the knowledge base:

- Provide detailed descriptions of your interventions
  - Common Core Standards addressed
  - Participants/contexts
  - How your design incorporated learning theory, prior research, practice-based insights
- Share empirical results/lessons learned

For More Information

MSP Knowledge Management and Dissemination

http://www.mspkmd.net

Core Evaluation of the LSC Program

http://www.pdmathsci.net

Teacher Education Materials Database

http://www.te-mat.org