



Issues in Designing Professional Development for Teachers of Mathematics

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Part I.

What does the empirical evidence tell us about effective professional development?

- A study of Eisenhower supported professional development (Garet et al., 1999) provides support for a number of features of high quality PD.

Features of High Quality PD

- Focuses on content knowledge;
- Emphasizes active learning;
- Promotes coherence;
- Provides a large amount of training sustained over time; and
- Encourages collaboration among teachers.

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- Teachers attending PD emphasizing content knowledge, active learning, and coherence reported enhanced knowledge and skills, and changes in teaching practice.

Effective PD (Cohen and Hill, 2000)

- Teachers who reported opportunities to learn about student mathematics curriculum in PD reported more of the kind of classroom practice that the CA frameworks advocated.
- Student performance was related to teacher reports of curriculum-focused PD.

- Similarly, Hill and Ball (2004) found that content-focused PD led to improvements in teacher content knowledge.

A Decade of Research on LSCs

- The Local Systemic Change Initiative (LSC), funded by NSF's Division of Elementary, Secondary, and Informal Education, built on the lessons learned in earlier NSF programs.
- Results from the LSC provide additional empirical support for content-based, instructional materials focused, PD.

Lessons from a Decade of Mathematics and Science Reform: A Capstone Report for the Local Systemic Change through Teacher Enhancement Initiative (Banilower et al., 2005).

Local Systemic Change Initiative

- NSF funded the first cohort of LSC projects in 1995.
- By 2002, there was a total of 88 projects.
- Projects represented a wide variety of contexts – rural, suburban, urban districts, with widely varying demographics.

Logic Model of LSC Professional Development

Quality PD Program



Increased Teacher Knowledge/Skills



Improved Classroom Practice



Improved Student Performance

LSC Program Logic

Supportive Context for Teaching

- Appropriate curriculum, assessment, materials management
- Time for teachers to plan, collaborate
- Support from administrators
- Support from parents and community

High Quality Instructional Materials

Professional Development for Teachers

Improved Instruction

Improved Student Knowledge, Attitudes, and Skills

Sustaining Professional Development System

- Capacity
- Structures
- Resources

LSC Professional Development

- Targeted all teachers in a jurisdiction for professional development.
- LSCs were expected to provide each teacher with a minimum 130 hours of professional development, typically over a 5-year period.

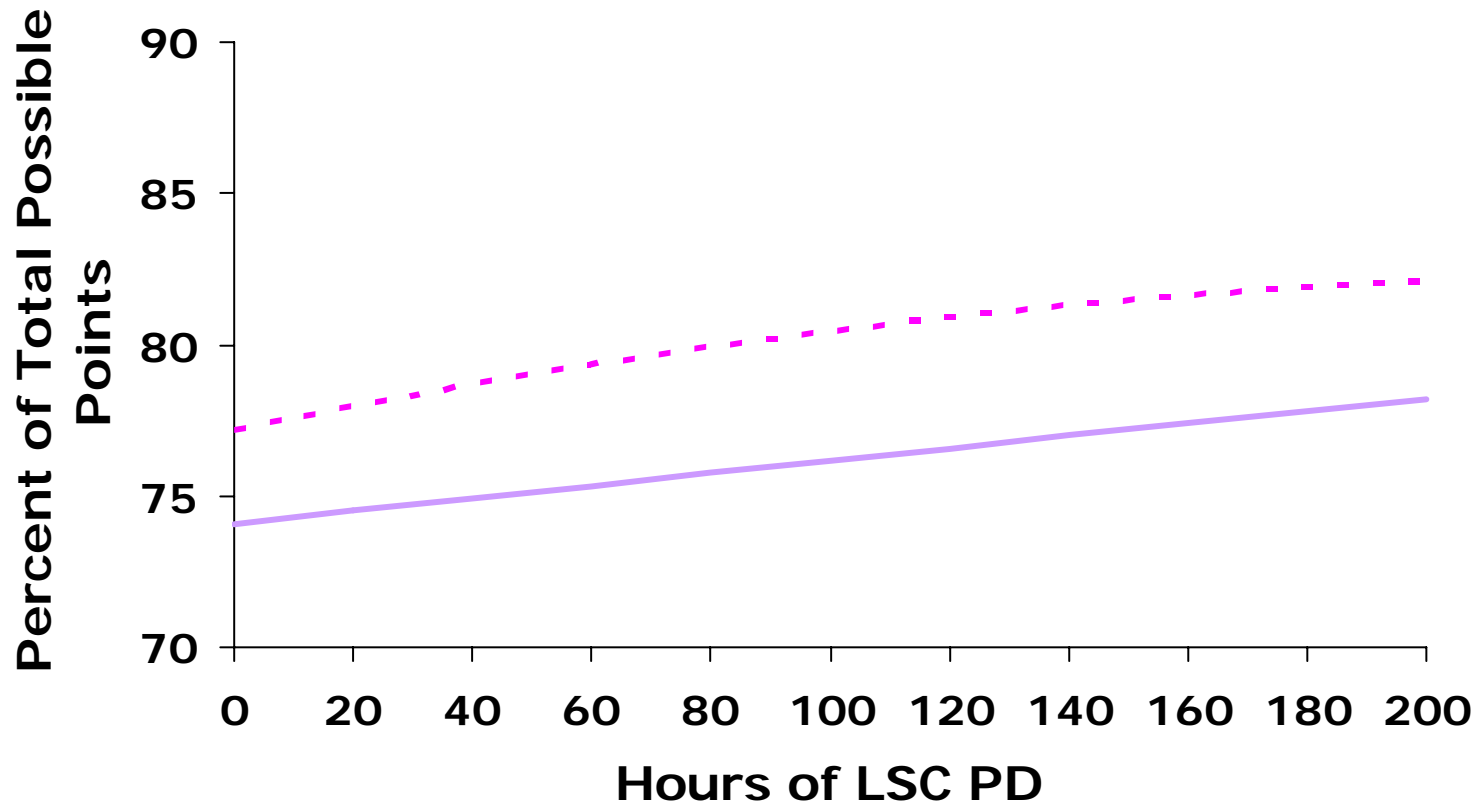
- Provided opportunities for teachers to explore and become conversant with exemplary instructional materials and the appropriate pedagogy for using these materials in their classrooms; and
- Provided support for teachers in content, pedagogy, and materials over the course of implementation.



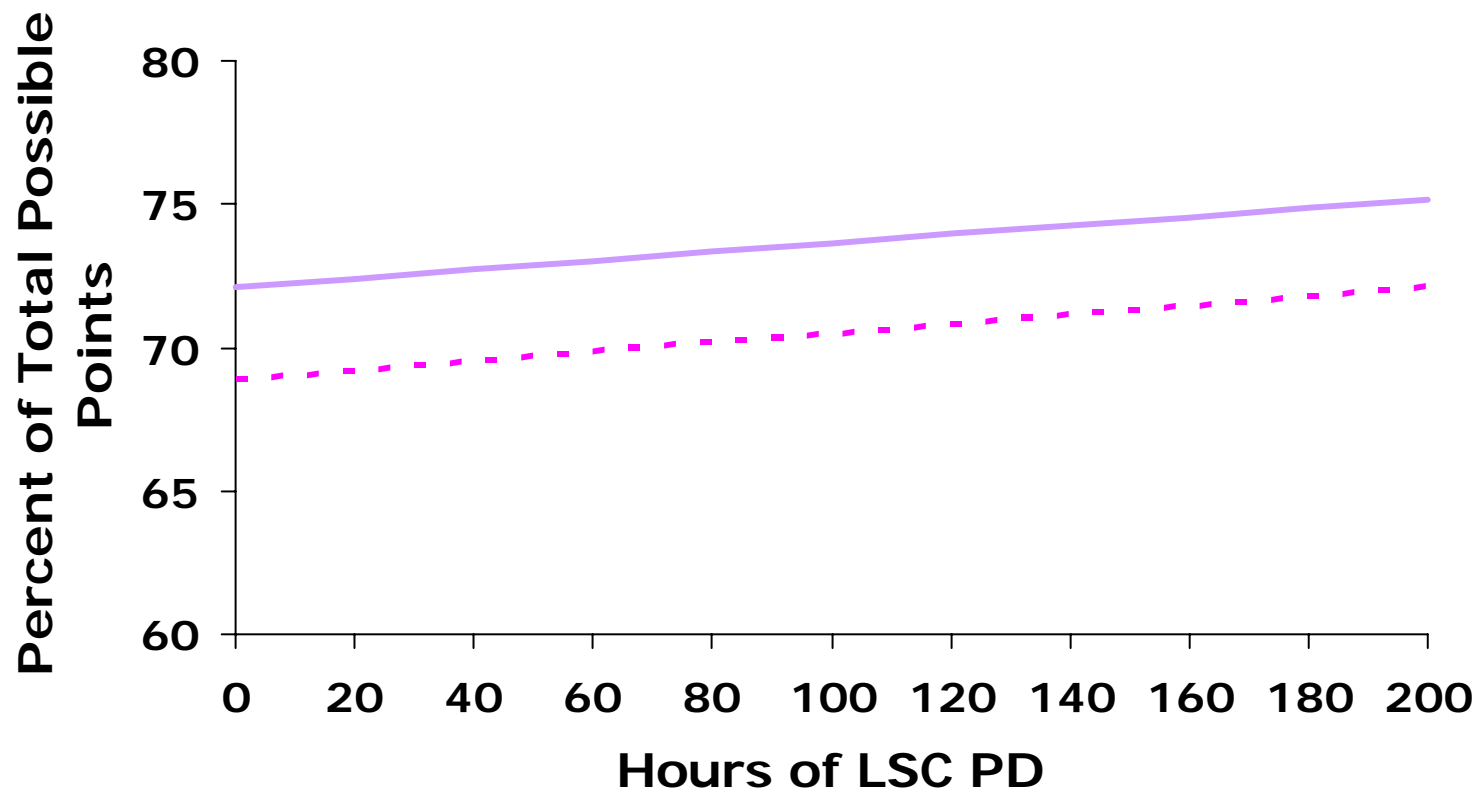
Findings:

Impact of LSC on Teachers

Perceptions of Pedagogical Preparedness, by Extent of Participation in LSC PD



Perceptions of Content Preparedness, by Extent of Participation in LSC PD



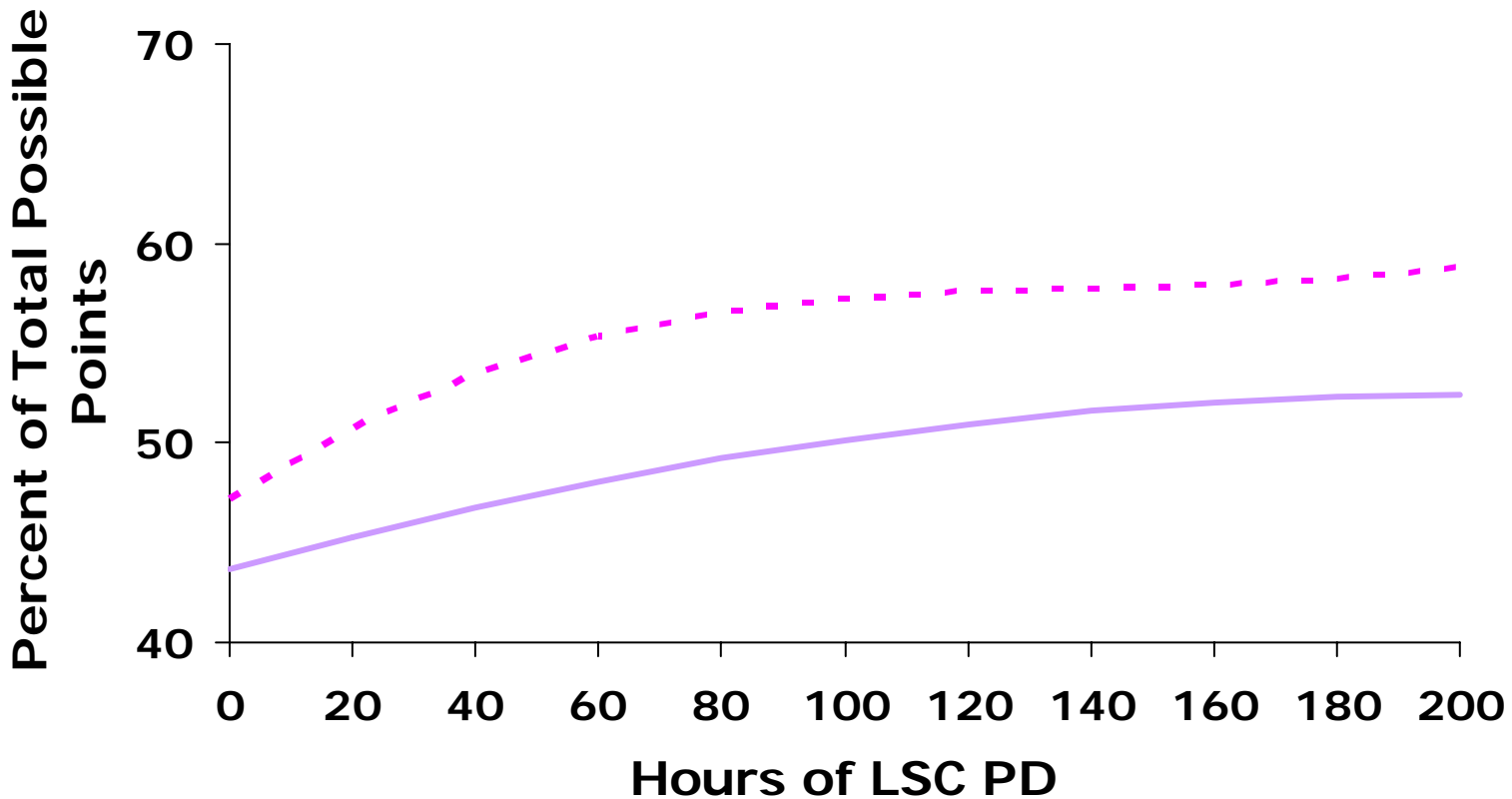
--- K-8 Mathematics — 6-12 Mathematics



Findings:

Impact of LSC PD on
Classroom Practices

Use of Investigative Teaching Practices, by Extent of Participation in LSC PD

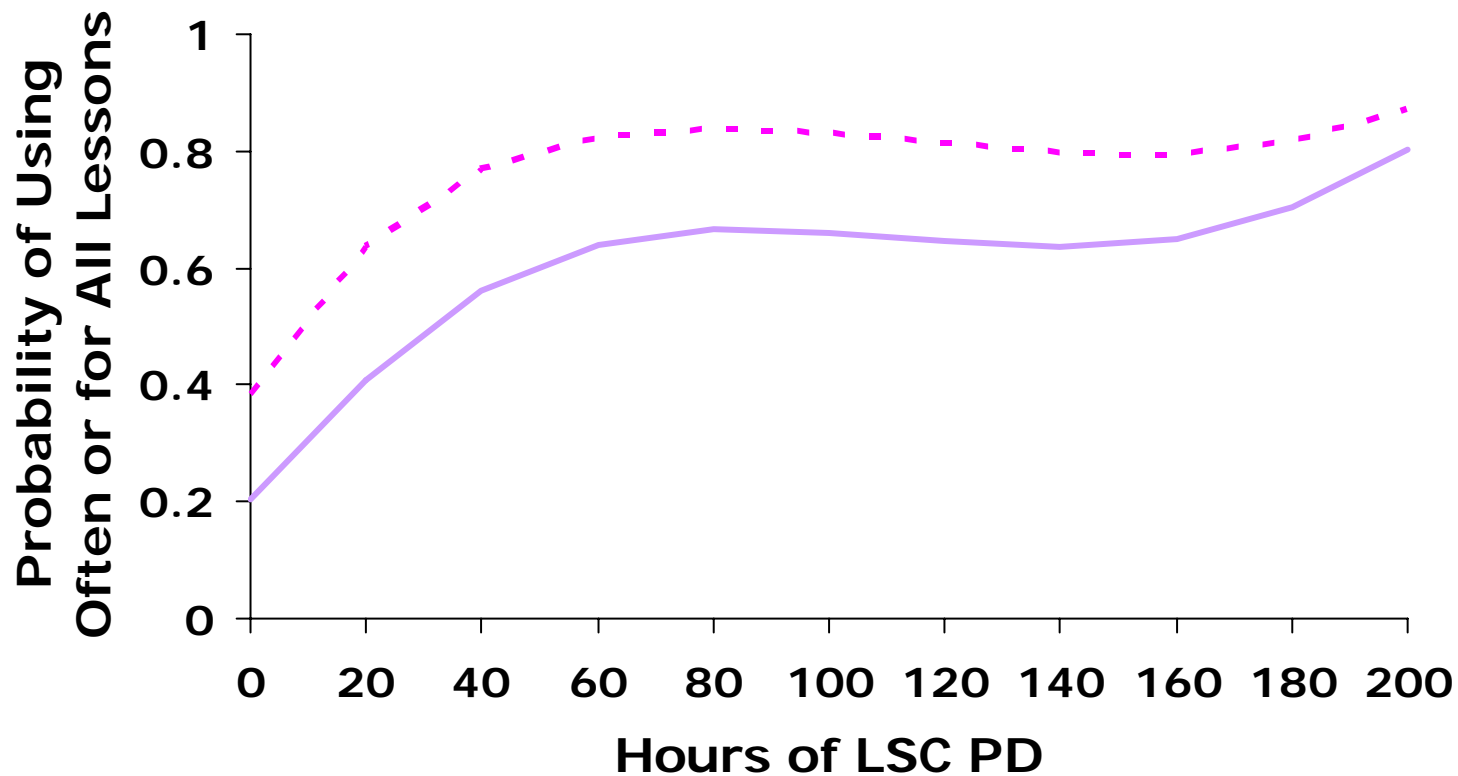


- Impacts were evident with about 30 hours of LSC PD, typically increased until about 80 hours PD, and then leveled off.

Cautions:

- More **efficient** PD could get these kinds of modest gains with fewer hours.
- More **effective** PD would continue to get gains well past 80 hours.

Use of Designated Instructional Materials, by Extent of Participation in LSC PD



--- K-8 Mathematics — 6-12 Mathematics

In addition...

- After factoring out the effect of professional development, teachers' frequency of use of the designated instructional materials continued to increase over time.

Principal Support is Very Important

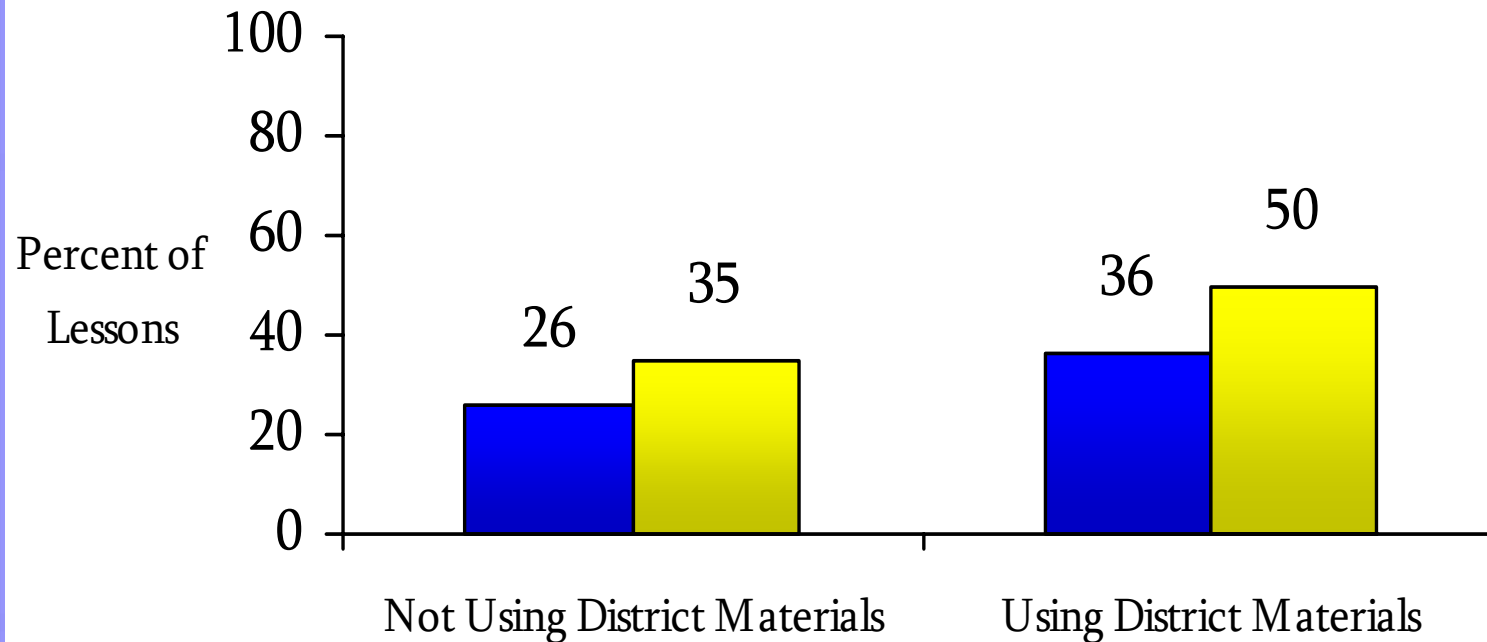
- Teachers' perceptions of principal support was a positive influence on teachers and teaching, beyond the effects of the PD.



Use of Designated Materials is Very Important

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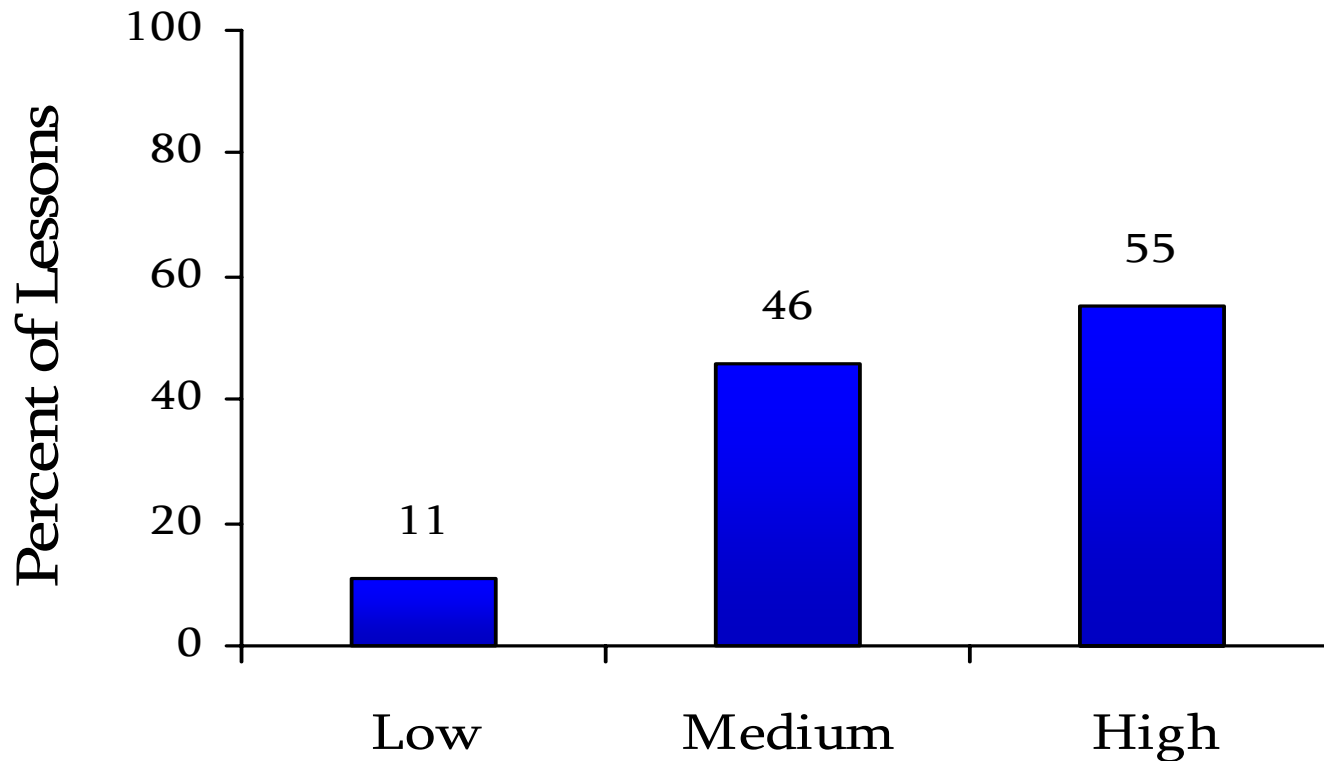
Highly-Rated Lessons, by Use of District-Designated Materials and Treatment



■ 0-19 Hours of LSC Professional Development

■ 20 or More Hours of LSC Professional Development

Highly-Rated Lessons, by Adherence to District-Designated Materials and Treatment



Why were only 50 percent of PD/designated materials lessons highly rated?

- Based on observations (PIs and evaluators), teachers often focused on the reform aspects of the materials, but the key mathematics content sometimes got lost.

To summarize:


- Mathematics teachers need content-focused PD.

- Basing PD on student instructional materials is a promising strategy.

- PD needs to keep the focus on that content, helping teachers help students learn important mathematics.

- Need to select/prepare/support PD providers to carry out content-based, curriculum focused PD.

- Having a shared mission (school-wide/district-wide/state-wide) and getting a critical mass of teachers involved, seems to change the discourse, reinforcing and expanding the impact of the PD.


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- Principals need to know what teachers are learning and how they can best support them.

- State/district policies need to send consistent messages aligned with the same vision as the PD.


Part II.

Professional Development Program Design


- Individually, read the description of the two “research-based” professional development programs.
- In your small group, discuss the strengths and weaknesses of each program. Decide which program design is stronger and why.



How many of you thought that Design A was stronger?




How many of you thought that Design B
was stronger?



How many of you thought that each design has strengths and each design has weaknesses?

Key elements from the PD Design Task

- Content-focused
- Addresses priority teacher needs
- On-going
- Help teachers apply to practice (use student instructional materials and/or student work)
- Teacher collegiality/critical mass
- Principal involvement
- Mechanisms for assessing effectiveness and making mid-course corrections



The reality is that there is not enough, nor will there ever be enough, empirical evidence to give you detailed guidance when making decisions about these tradeoffs.



Context matters.

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Professional Development Reflection Task

- The core evaluation of the Local Systemic Change initiative identified a number of attributes of an effective professional development system. Please indicate whether the professional development system in your district/state reflects each of the attributes and, if not, how difficult it would be to incorporate it.

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Professional development for mathematics teachers:	Already in place	Not in place but fairly easy to fix	Not in place but difficult to fix
1. addresses priority needs.			
2. is content focused.			
3. is on-going.			
4. is implemented by well-prepared providers (including mathematicians and teacher leaders).			
5. helps teachers apply to practice (uses student instructional materials and/or student work).			
6. develops teacher collegiality.			
7. is designed to reach a critical mass.			
8. involves principals.			
9. includes mechanisms for assessing effectiveness and making mid-course corrections.			

- Starting with the attribute the largest number of people at your table considered “difficult to fix”, brainstorm strategies for changing the professional development system to incorporate that feature.
- Move on to another “difficult to fix” attribute when you’ve solved (or given up on) the first one.

- Each table pick one “solution” to share with the group, indicating the attribute you are addressing.

Opportunity to Collaborate

- HRI is currently involved in a middle school mathematics curriculum study examining the impact of curriculum on student achievement.

- Provides an opportunity for districts to get data about their mathematics programs for free.

and

- Provides an opportunity to further the field's knowledge.



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Please include what mathematics program(s) your schools use in grades 6-8.

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