If I were a district mathematics supervisor, I would…

Presentation at the NCSM Annual meeting

March 20, 2007

Iris R. Weiss,
Horizon Research, Inc.

Horizon RESEARCH, INC.

Think about your district:

- Are teachers, principals, parents, the superintendent, and the school board all in agreement about what mathematics should be taught, K-12?

- Are all students learning that mathematics, with no gaps in achievement by gender, race/ethnicity, and/or socioeconomic status?

If so...

Feel free to leave now.

If not…

- First priority: understand the current system.
- Michael Patton: Every system is perfectly designed to get the results it gets.

- If you understand how the system is operating to get the results it now gets, you can consider what needs to be changed to get different results.

Student Opportunity to Learn

- Depends both on what mathematics is addressed;
- And how well it is being taught.

What mathematics is being taught?

- Ideal: important, developmentally appropriate mathematics, well-articulated K-12.

Determining what mathematics is actually being taught

- Analyze instructional materials
- Administer a quick survey on which units/chapters are used
- Conduct more extensive data collection via logs or the Survey of Enacted Curriculum

Surveys of Enacted Curriculum

- Survey of Instructional Content
  - The K-8 mathematics survey covers 103 topics.
  - It asks teachers the amount of time spent on each topic.
  - Also asks how much emphasis instruction places on each of five “expectations”:
    - Memorize facts, definitions, formulas;
    - Perform procedures;
    - Demonstrate understanding of mathematics ideas;
    - Conjecture, generalize, prove; and
    - Solve non-routine problems/make connections.

Survey of Instructional Content

- To see if teachers within a grade are spending roughly the same amount of time on a particular topic, and emphasizing the same levels of expectations, you might:
  - pick a subset of topics to reduce burden; and
  - tailor the terminology to your standards at each grade level.

What mathematics is actually being taught?

- Consider what you have learned
- Are teachers at the same grade level teaching essentially the same curriculum, or is there considerable variation in time spent on particular topics, and the cognitive levels at which they are addressed?

What mathematics is actually being taught?

- Does the district have a “spiral” curriculum or are you going in circles?
- One definition of insanity: Doing the same things and expecting a different outcome.

How about mathematics instruction?

- Ideal: Classroom instruction well-designed and well-implemented so students are able to learn important mathematics.

What does instruction actually look like?

- Important to get a sense of quality of mathematics instruction.
- Teacher self-report data can give you a picture of content coverage, but not of student opportunity to learn that content.

National Picture

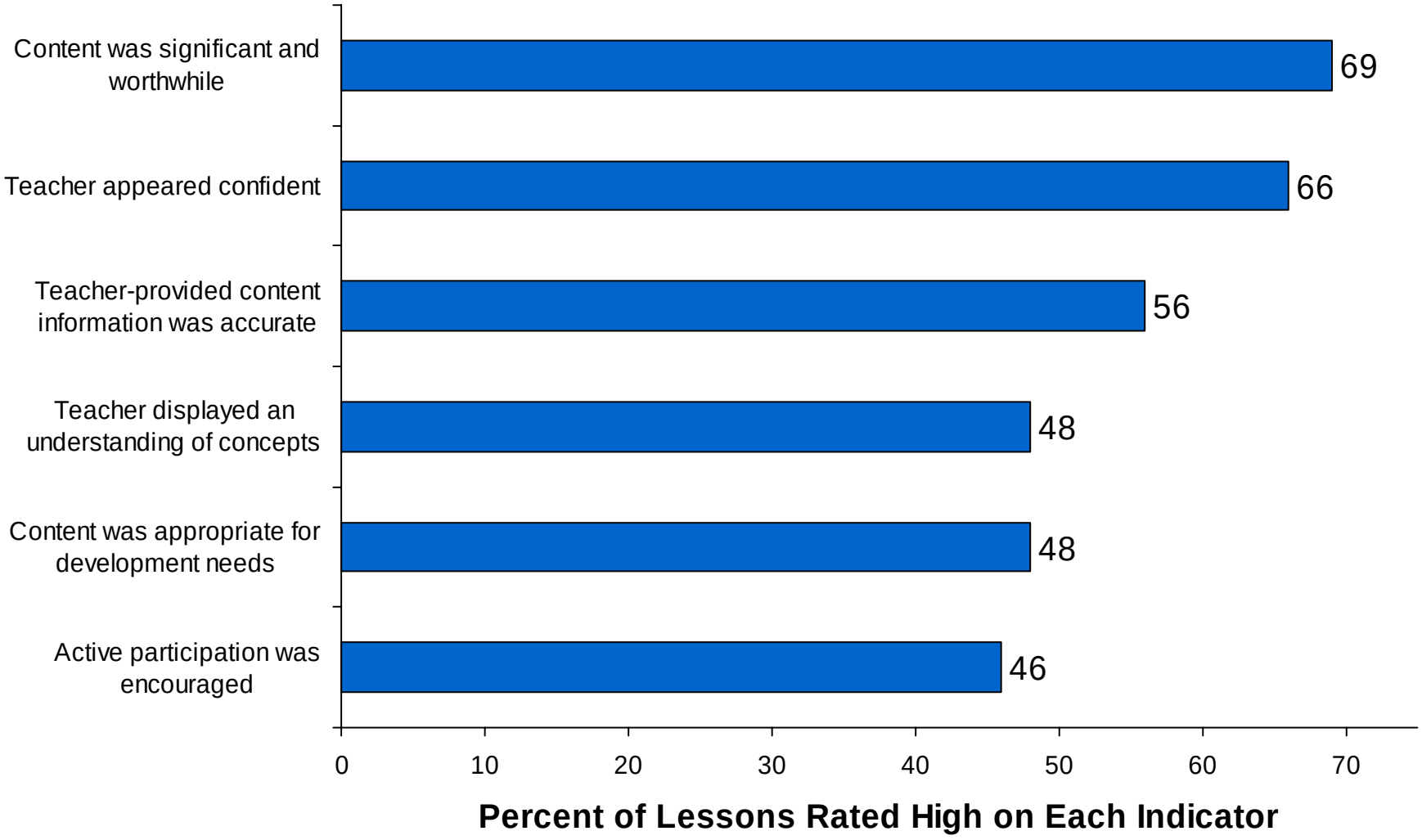
Nationally representative sample of 364 Lessons, K–12 mathematics and science

Horizon RESEARCH, INC.

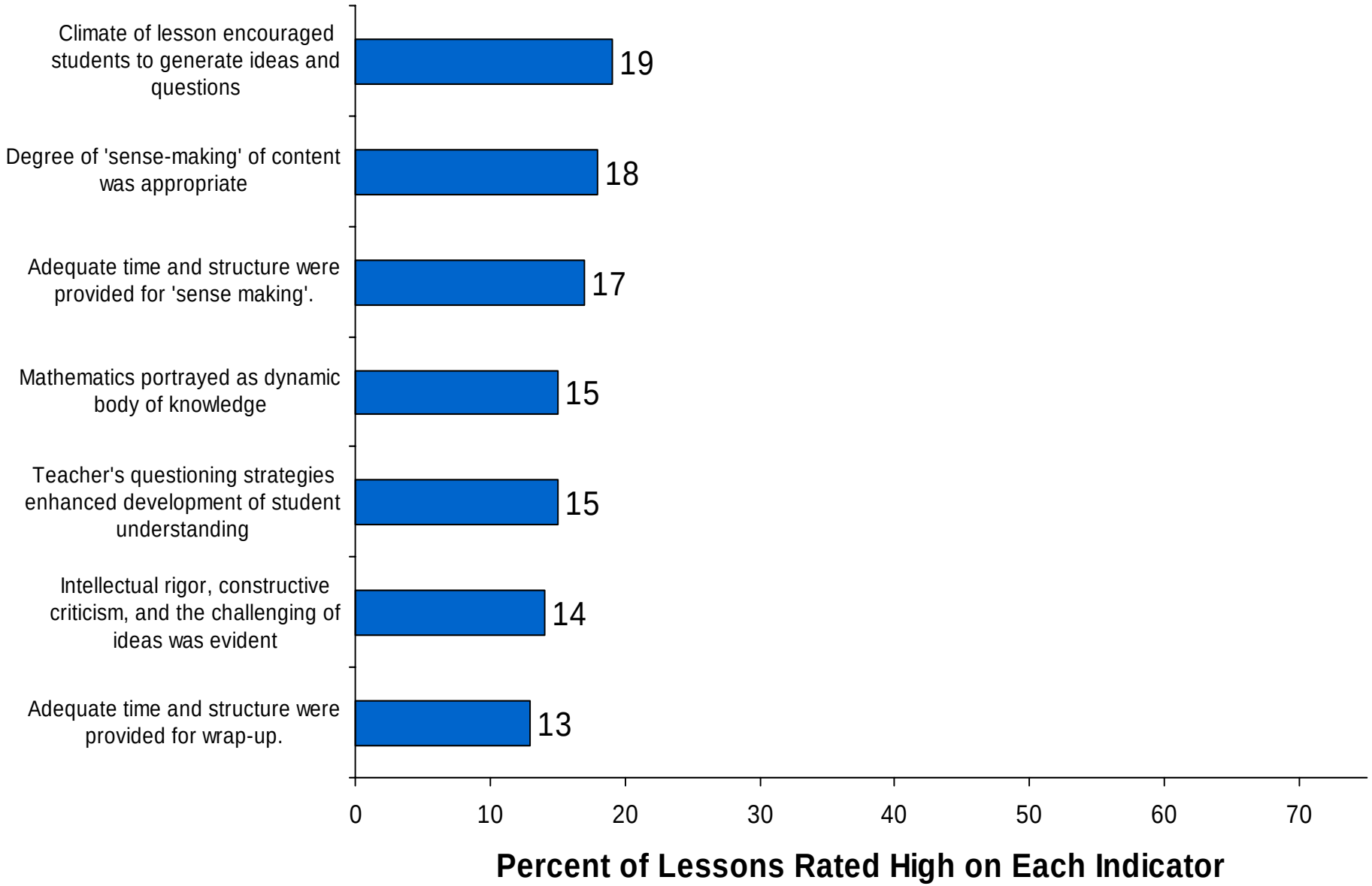
Student Opportunity to Learn Seemed Likely When Instruction:

- Engaged students with the mathematics content;
- Created an environment conducive to learning;
- Ensured access for all students;
- Used questioning to monitor and promote understanding; and
- Helped students make sense of the mathematics content.

Relative Strengths
K-12 Mathematics Lessons



Major Weaknesses
K-12 Mathematics Lessons



Mathematics instruction in your district

- May be very different from the national picture, especially if you have been working on improvement for a while;
- Or you may have a different “frame” for what constitutes quality instruction;
- So it is worth getting your own sense of instruction in the district.

In any case, what needs to be done depends

- Both on the current status

AND

- Why things are the way they are

For example:

- If state/district standards or assessments are sending mixed messages,
- It would be important to help teachers consider how to resolve the conflicts.

- If instructional materials are not well-aligned with state/district standards,

- In addition to helping teachers understand how to use current materials to address standards, you might get a group together to revise the instructional materials selection criteria before the next adoption.

- If teachers ignore high quality materials because they consider them inappropriate for their students,

- You might show them examples where those materials were used successfully with similar students.

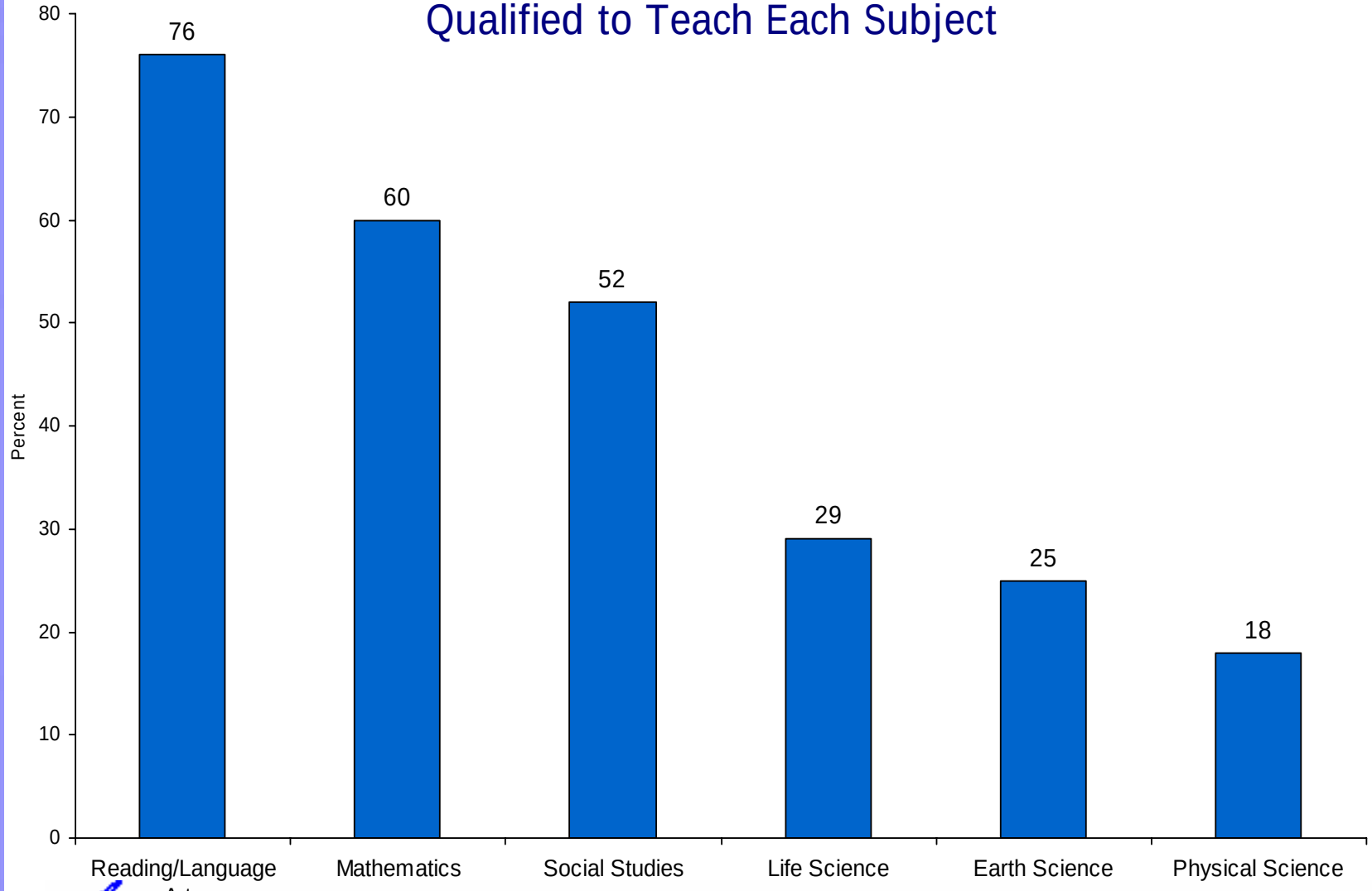
- If teachers have insufficient mathematics content knowledge/ pedagogical content knowledge to teach the curriculum well,

- You might provide professional development to help them increase their knowledge.

Is lack of teacher knowledge a problem?

- Yes
  - based on teacher self report as well as other measures.

2000 National Survey of Science and Mathematics Education
Elementary Teachers Considering Themselves Very Well Qualified to Teach Each Subject



Horizon RESEARCH, INC.

- While 92 percent of middle school mathematics teachers in 2000 indicated they were very well qualified to teach computation, only 51 percent considered themselves very well qualified to teach probability, and only 20 percent to teach statistics.

Is lack of teacher knowledge the primary problem?

- Not in my view.
- If it were, then providing incentives for university mathematicians to teach in the inner cities would make sense.
- Raise your hand if you think that would be a good solution.

What is a district leader to do?

- Recognize that teacher knowledge is part, but only part, of the problem.
- Consider PD an important part, but only part, of a system for continuous improvement.

Handbook for Enhancing Strategic Leadership in the Math and Science Partnerships

Horizon Research, Inc.

Education Development Center

Horizon
RESEARCH, INC.

Strategic Leadership: Key Components of Reform Work

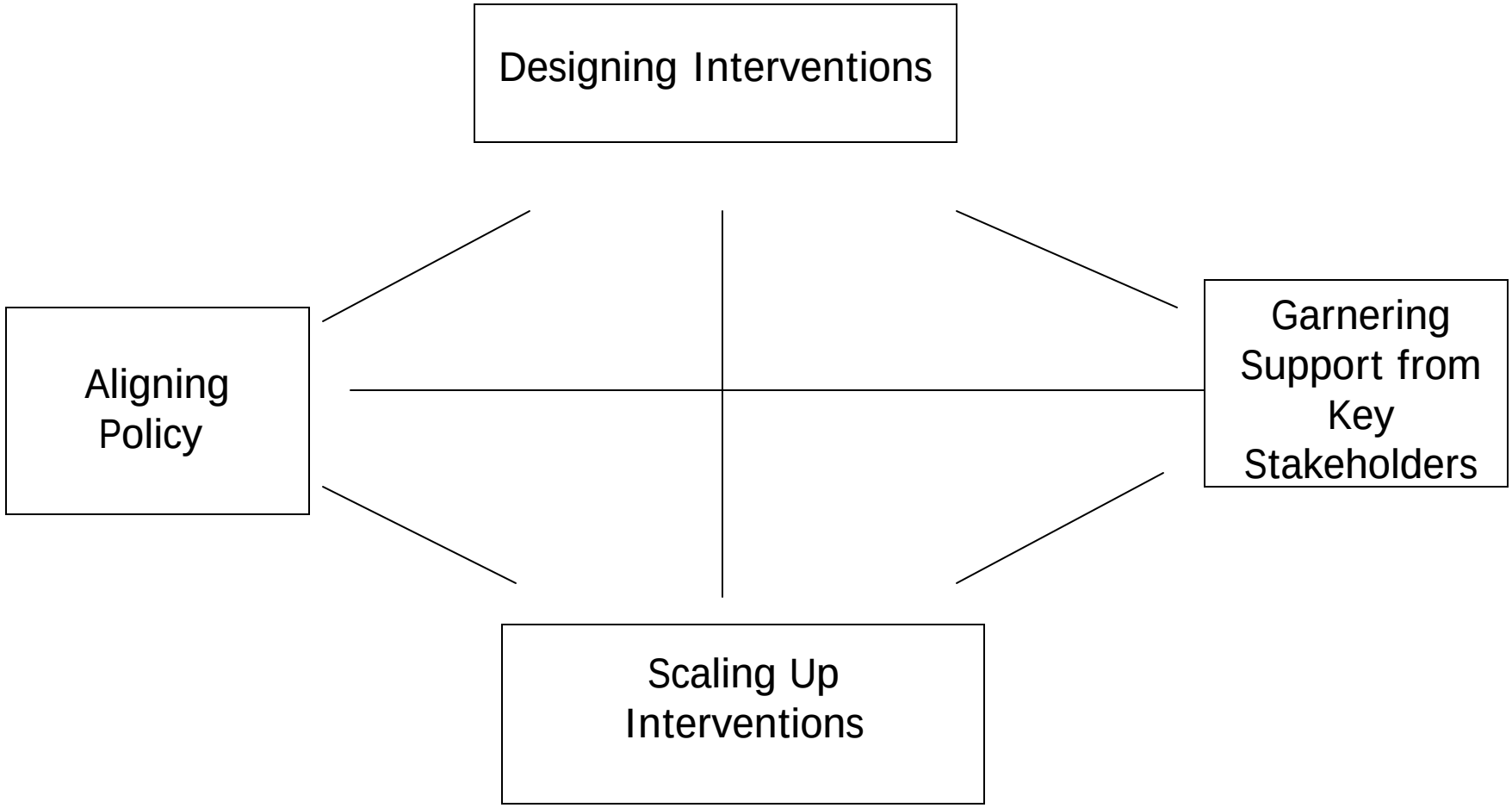
1. Designing and implementing interventions
2. Garnering support from key stakeholders
3. Aligning policies
4. Scaling up interventions

Strategic Leadership: Key Components of Reform Work

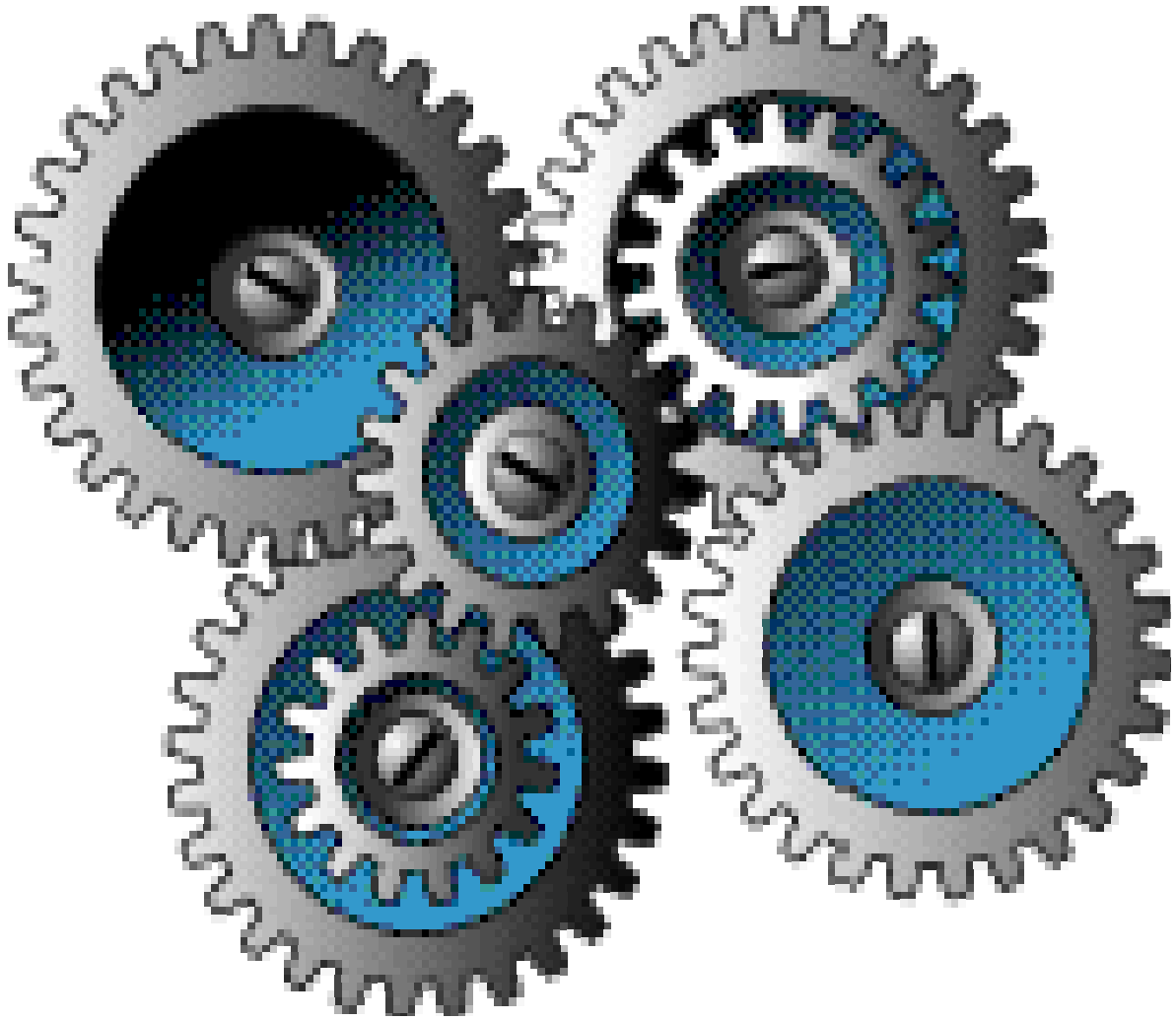
- Each component is necessary, but no one of them is sufficient for strategic leadership.

- Each component interacts with the others, and should not be considered in isolation.

Strategic Leadership: Key Components of Reform Work



Horizon
RESEARCH, INC.



Horizon

RESEARCH, INC.

Strategic Leadership: Key Components of Reform Work

1. Designing and implementing interventions
2. Garnering support from key stakeholders
3. Aligning policies
4. Scaling up interventions

Horizon RESEARCH, INC.

Designing and Implementing Interventions

- Understand the priority needs in your context
- Select effective, promising interventions
- Pilot the interventions to provide "existence proofs" in your context

Selecting “promising and effective interventions”

- Based on the admittedly sketchy empirical evidence
- And on the wealth of wisdom of practice

If I were in charge of a district's PD, I would...

- Consider it an on-going program, not a series of discrete events;
- Pick content to be addressed based on both actual and perceived needs;
- Address both the mathematics content and applications of that content;

If I were in charge of a district's PD, I would...

- Include both "immersion," e.g., a week in the summer, and on-going conversations around content and practice;

If I were in charge of a district's PD, I would...

- Distribute available PD resources so I could have a district-wide component, a grade-level component, and a school-based component, even though it would mean doing less of each in a given time period than I might like.

If I were in charge of a district's PD, I would...

- Include discussion of classroom video to develop a language of practice and a shared vision of quality instruction, one that focuses on student learning of important mathematics;

- Include examination of student work, from other classrooms and their own.

In addition to PD, if I were in charge of a district, I would…

- Work with pre-service/lateral entry providers to ensure that prospective teachers had coursework relevant to our district's needs, including:
  - mathematics content aligned with our standards
  - Knowledge/skills in working with diverse learners

- Ensure that student teachers are placed in the “right” classrooms
- Support new teachers with mentoring and reasonable teaching assignments

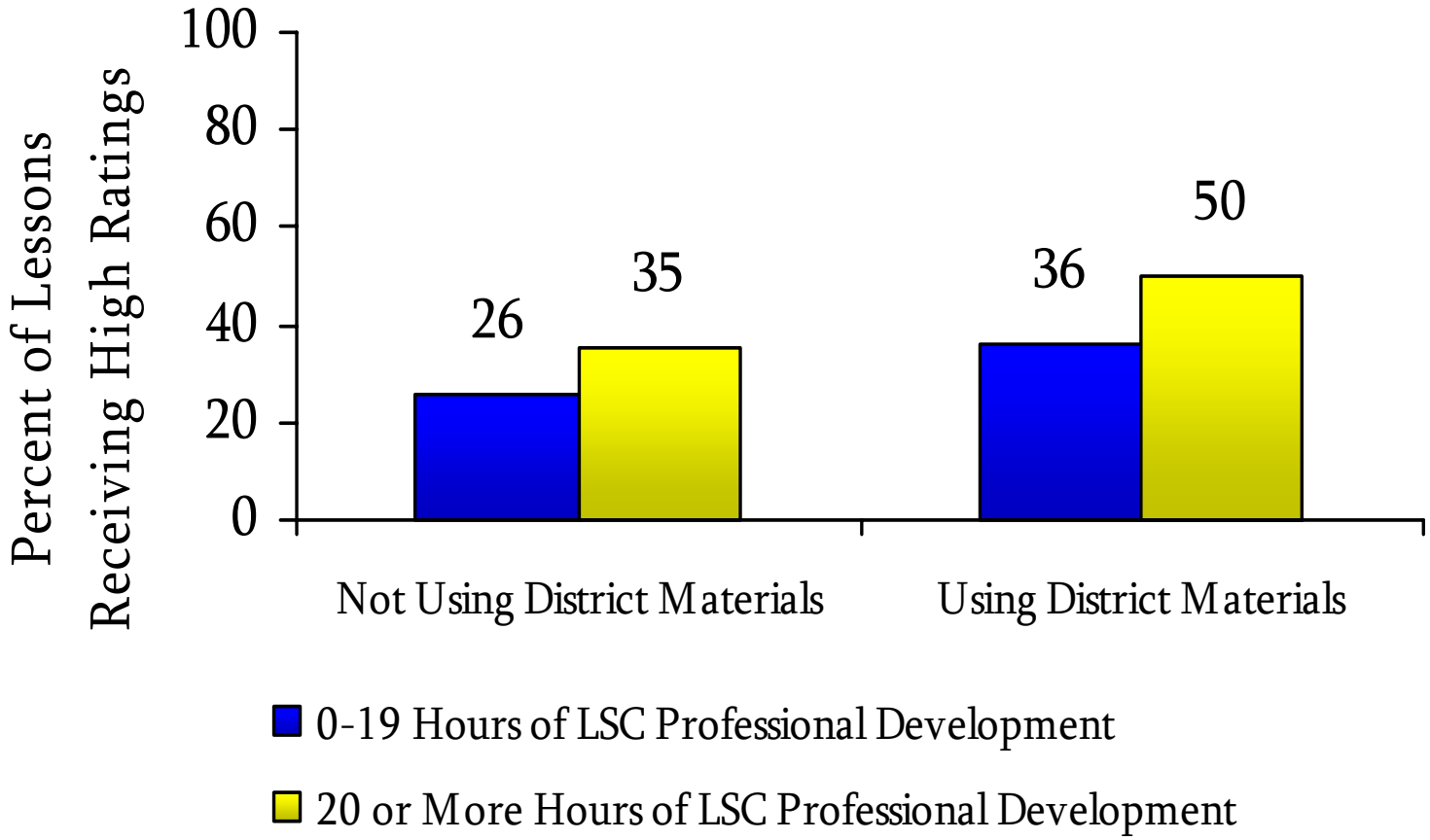
- provide print or web-based resources for teachers that:
  - "Unpack" district standards by grade/ course;
  - Address K-12 articulation, letting teachers know what understandings students should get in their class, and what will be addressed in later grades/courses.

- Help teachers understand how the activities in their instructional materials are intended to help students learn important mathematics content;
- Suggest questions/tasks that would help teachers assess student understanding;
- Provide guidance for instructional decisions based on what students do and do not understand.

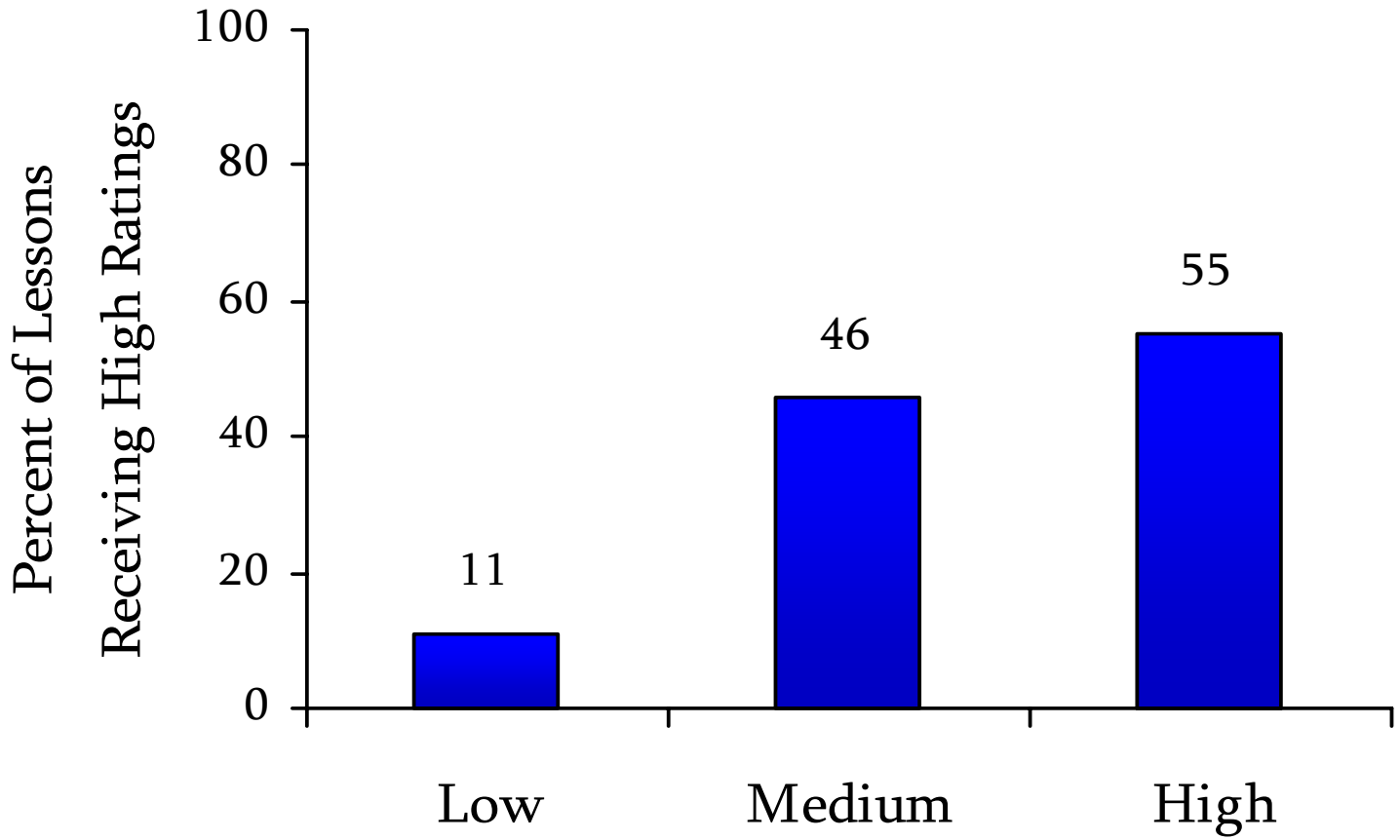
What I would NOT do

- Encourage teachers to develop their own instructional activities.
- Encourage teachers to adapt tasks in their instructional materials (unless I could provide the very extensive PD that is needed for them to do it well.)

Lesson Quality is Associated with both PD and Use of District-Designated Materials



Lesson Quality is Associated with Adherence to District-Designated Materials



The bottom line:

- Tailoring to the particular context is a romantic notion that isn't supported by the (admittedly sketchy) empirical evidence.

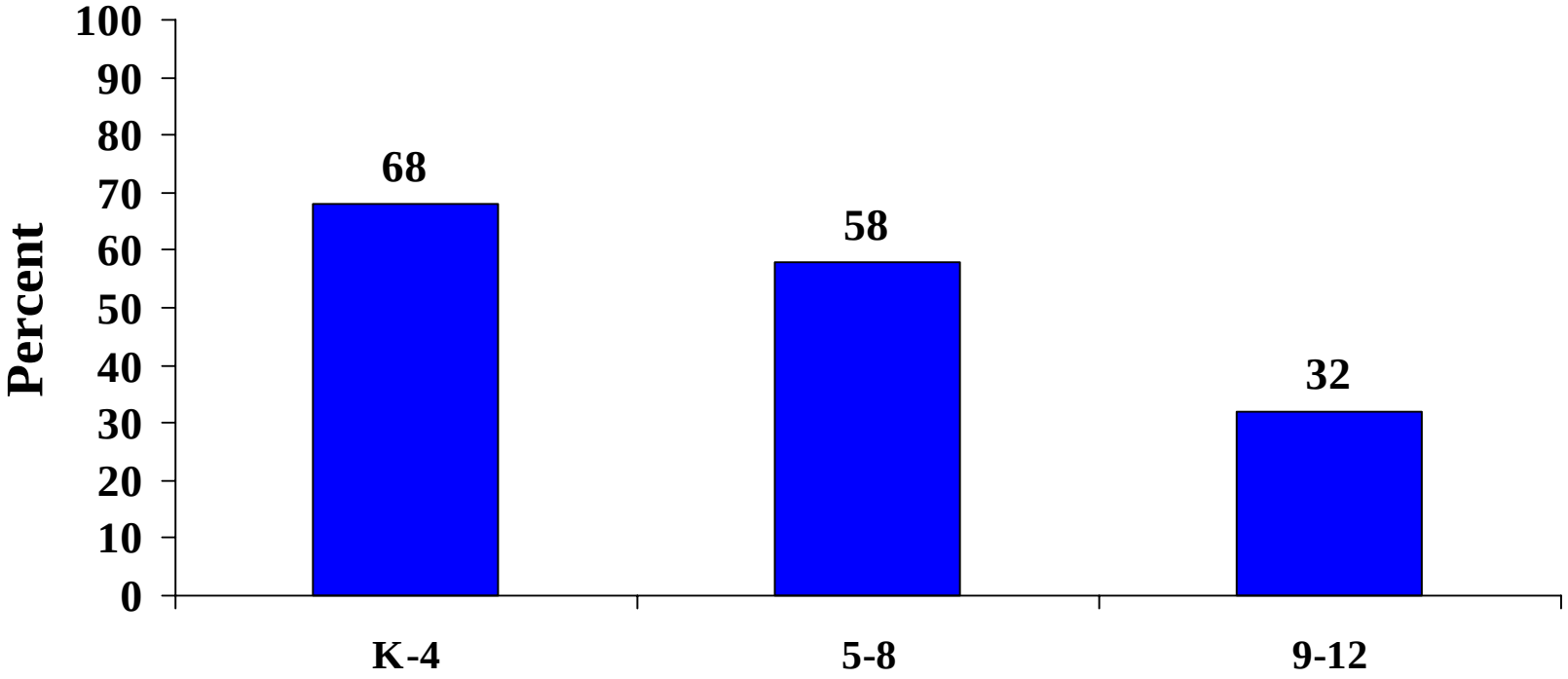
How much PD per teacher?

- 100 hours PD is often cited as necessary, although it is not clear over what period of time, nor what evidence that recommendation is based upon.

How much PD per teacher?

- Some teachers participate extensively; many others either lack opportunities or are not taking advantage of the available opportunities.

Teachers of Mathematics With <16 hrs of Professional Development in Mathematics/Mathematics Education in Last 3 Years



Report of the 2000 National Survey of Science and Mathematics Education (Weiss et al., 2001).

- Need to provide incentives to go beyond the “institute junkies” to achieve critical mass of teachers involved in PD

- Need to design PD programs that can be sustained with the capacity and resources that are likely to be available

Strategic Leadership: Key Components of Reform Work

1. Designing and implementing interventions
2. Garnering support from key stakeholders
3. Aligning policies
4. Scaling up interventions

Horizon RESEARCH, INC.

Garnering Support from Key Stakeholders

- Determine who are the key stakeholders
- Build support for the reform vision as well as the direct interventions
- Leverage the support of influential stakeholders

Principal Support is Very Important

Program Leader:

We realized that if principals are not behind you, if they're not supporting you, then you're not going to get a lot of the teachers out. If principals are not behind it, there's little opportunity for change.

Bottom Line

Engage principals early and often.

Promising strategy

- Become involved in interviews with prospective principals, sending a message that the district really cares about mathematics education and helping to recruit those who share your vision of quality mathematics instruction.

Promising strategy

- Establish an alliance with one or two university mathematicians who support your vision of mathematics education and can be called upon to talk to the powers that be when the need arises.

Strategic Leadership: Key Components of Reform Work

1. Designing and implementing interventions
2. Garnering support from key stakeholders
3. Aligning policies
4. Scaling up interventions

Horizon RESEARCH, INC.

Aligning Policies

- Identify the most influential policies and have a plan for dealing with them
- Leverage aligned policies to move forward
- Seek and create opportunities to align policies

Potentially Important Policies

- Curriculum
- In-service education
- Teacher evaluation
- Teacher recruitment/orientation
- Student assessments
- STUDENT ASSESSMENTS

Fortunately

- You don’t need to start from scratch.
- There are several existing methods for analyzing the alignment of standards and assessments.

Processes for Alignment Analysis

- Norm Webb: www.wcer.wisc.edu
- Surveys of Enacted Curriculum (can also be used to analyze instruction and curriculum materials): www.wcer.wisc.edu or www.ccsso.org
- Achieve: www.achieve.org
- Council for Basic Education: www.c-b-e.org

Strategic Leadership: Key Components of Reform Work

1. Designing and implementing interventions
2. Garnering support from key stakeholders
3. Aligning policies
4. Scaling up interventions

Horizon RESEARCH, INC.

Scaling Up Interventions

- Develop human resources for scaling up
- Develop infrastructure for scaling up
- Create a system for maintaining quality in scaling up

Developing Human Resources

- Districts are challenged with having a large enough cadre of well-qualified leaders who can provide professional development or otherwise support their teachers.

Developing Human Resources

- If I were a district mathematics supervisor, I would have teachers in each school elect a teacher to serve as a liaison between the district and the school.

Developing Human Resources

- If the district could afford it, I would have a cadre of teacher leaders to work with other teachers on an on-going basis.

Developing Human Resources

- Piloting a PD intervention provides an opportunity to develop the capacity of teacher leaders and other PD providers

- But like teachers, teacher leaders need on-going opportunities and support for professional growth.

Developing Human Resources

- District supervisors need to trade-off the amount of time it takes to prepare and support professional development providers vs. scaling up as quickly as possible.

Based on previous experience, district supervisors need to:

- Expect teacher reluctance to take on these roles;
- Expect that there will not be as many teacher leaders as you need;
- Expect attrition due to burn-out and mobility,

Bottom Line

- Have a deliberate process for bringing new leaders into the fold.

Develop infrastructure for scaling up

- Preparing teacher leaders who don't have time to work with teachers doesn't get you very far.

Create a system for maintaining quality in scaling up

- Quality control is especially important when there are multiple individuals working with teachers

Maintaining quality in PD

- Use well-designed professional development materials to provide scaffolding to professional development providers;

- But, resist the urge to use *every* set of new materials.

A brief “commercial”

Horizon
RESEARCH, INC.

TE-MAT

Teacher Education Materials Project

WWW.TE-MAT.ORG

An online database of reviews of materials for K-12 mathematics and science professional development providers

National Science Foundation
Grant #: ESI 9619139

What's In TE-MAT

- Materials designed to support the work of K-12 mathematics and science professional development providers

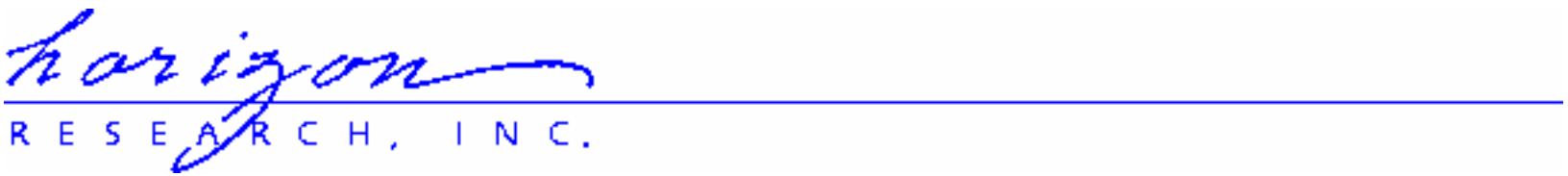
- A conceptual framework that highlights key elements critical to professional development.

The TE-MAT Database

- TE-MAT was initially funded as an NSF grant to Horizon Research.
- NSTA and AMTE will be continuing the database in the future.

Horizon RESEARCH, INC.

www.te-mat.org



In conclusion:

- Coherent system reform doesn't happen by accident.

District Leaders Need To:

- Foster the development of a shared mission district-wide, including getting principals on board;
- Work toward alignment of curriculum, instruction, and assessment with that vision.

Which includes:

- Ensuring that district policies send consistent messages to teachers about what mathematics should be taught, and how;

- Selecting/preparing/supporting teacher leaders and PD providers to help teachers understand the mathematics big ideas AND how the student activities relate to those ideas;

- Providing inexpensive “interventions” such as educative materials for teachers in addition to the more expensive, in-person assistance; and

- Providing incentives for all teachers to engage in long-term efforts to continuously improve their professional practice.

And finally

- Take advantage of opportunities to learn from other district supervisors about effective strategies for on-going improvements to the mathematics education “system” so that all of your students have an opportunity to learn important, powerful mathematics.

References

Banilower, E. R., Boyd, S. E., Pasley, J. D., & Weiss, I. R. (2006). Lessons from a decade of mathematics and science reform: A capstone report for the local systemic change through teacher enhancement initiative. Chapel Hill, NC: Horizon Research, Inc.

Blank, R. K., Porter, A., & Smithson, J. (2001). *New tools for analyzing teaching, curriculum and standards in mathematics and science: Results from survey of enacted curriculum project, final report*. Washington, DC: Council of Chief State School Officers.

Weiss, I. R., Banilower, E. R., McMahon, K. C., & Smith, P. S. (2001). Report of the 2000 national survey of science and mathematics education. Chapel Hill, NC: Horizon Research, Inc.

Weiss, I. R., Miller, B. A., Heck, D. J., & Cress, K. (2004). Handbook for enhancing strategic leadership in the math and science partnerships. Chapel Hill, NC: Horizon Research, Inc.

Weiss, I. R., Pasley, J. D., Smith, P. S., Banilower, E. R., & Heck, D. J. (2003). *Looking inside the classroom: A study of K–12 mathematics and science education in the United States.* Chapel Hill, NC: Horizon Research, Inc.