



Setting the Stage for Data Collection and Evaluation

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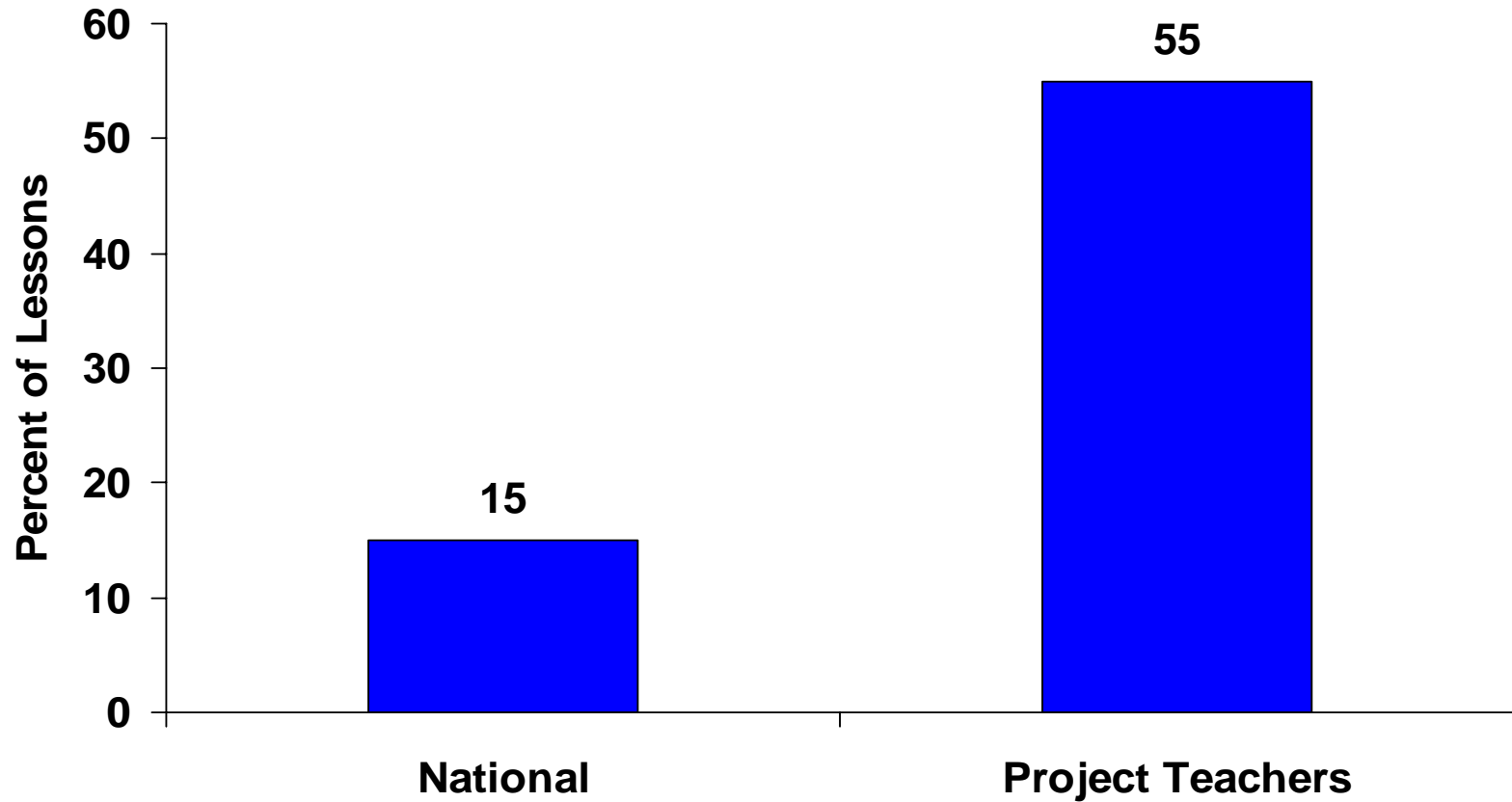
horizon
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Look at the following graph.

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Percent of K-12 Mathematics Lessons Rated Highly





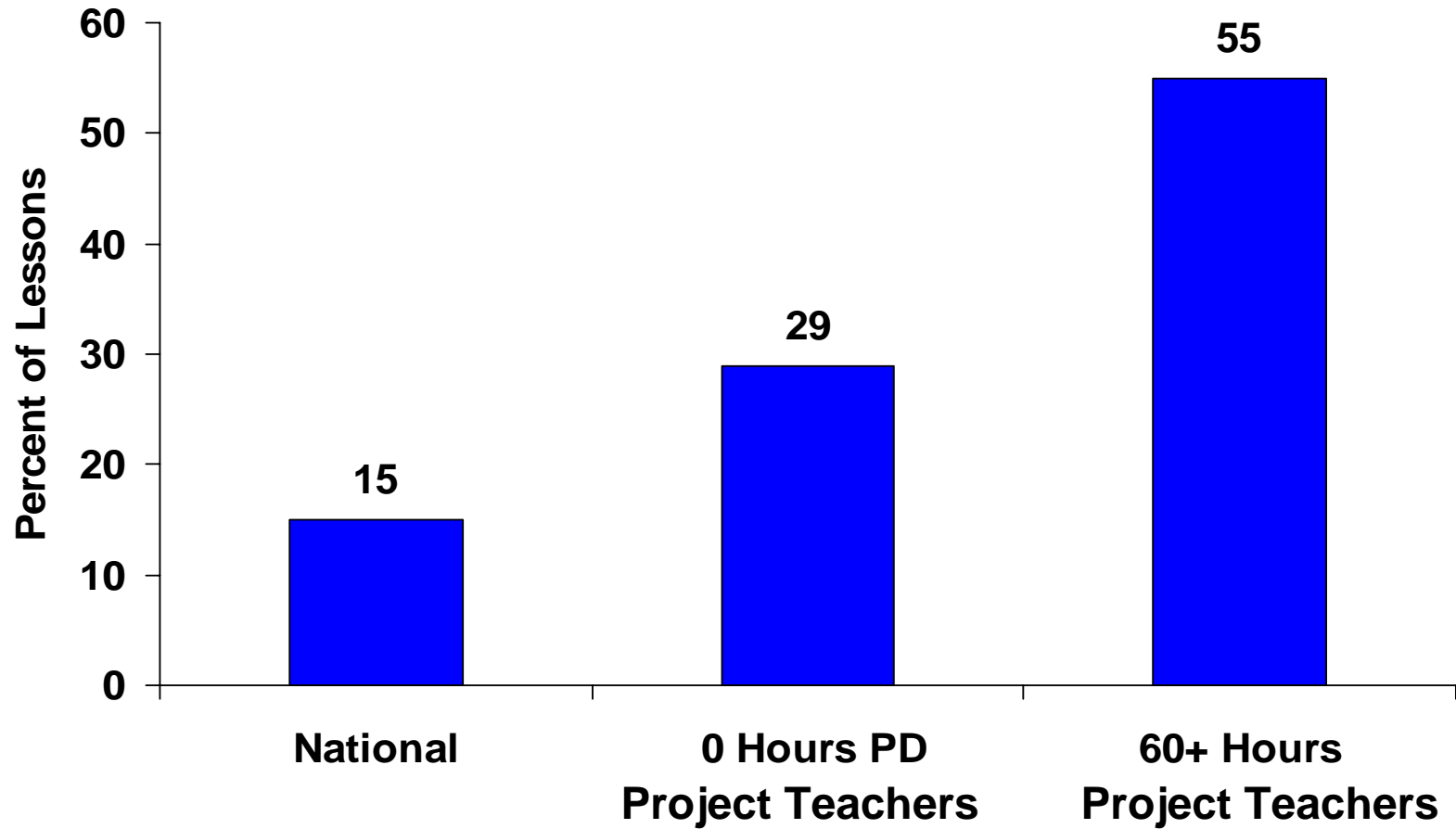
Based on this graph: How confident are you that this would be an effective program? Why?

- Think about it individually
- Talk with a neighbor

Reason for skepticism

The professional development participants may have had better mathematics instruction to begin with.

Percent of K-12 Mathematics Lessons Rated Highly



Goals

- To Share:
 - Available Instruments;
 - Strengths and Weaknesses of these Instruments; and
 - Some key findings regarding systemic reform.

Instruments

- Data can be collected by:
 - Questionnaires;
 - Interviews (individual or focus group);
 - Observations; and
 - Document review.
- Each has strengths and weaknesses.
- These slides, and links to the instruments Horizon Research, Inc. has developed, will be posted on our website.

LSC Logic Model

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

Sustained Professional Development System

- Capacity
- Structures
- Resources

Impacts on Teachers and Teaching

Impacts on Student Knowledge, Attitudes, and Skills

Impacts on Teachers

- The LSC Teacher Questionnaire has scales measuring teachers' beliefs:
 - Attitudes Toward *Standards*-Based Teaching;
 - Perceptions of Content Preparedness; and
 - Perceptions of Pedagogical Preparedness;

Impacts on Classroom Practice

- Also scales measuring:
 - Extent of Use of Traditional Teaching Practices;
 - Extent of Use of Investigative Teaching Practices; and
 - Extent of Use of Practices that Foster an Investigative Classroom Culture.

Investigative Culture Composite

Arrange seating to facilitate student discussion.

Use open-ended questions.

Require students to explain their reasoning when giving an answer.

Encourage students to communicate mathematically.

Encourage student to explore alternative methods for solutions.

Participate in discussions with the teacher to further mathematical understanding.

Work in cooperative learning groups.

Share ideas or solve problems with each other in small groups

- Also a scale measuring teachers'
 - Perceptions of Principal Support (not an impact on teachers or teaching, but an important mediator of practices).

LSC Teacher Questionnaire

- Strengths:
 - Relatively easy and inexpensive to administer to large numbers of teachers.
 - Reasonably valid and reliable measures of classroom practice.
- Weaknesses:
 - Validity of preparedness measures not established.
 - Just because teachers are doing more of something doesn't mean they are doing it well.
 - May take considerable effort to get an adequate response rate.

Questionnaire Administration Systems

- For a longitudinal analysis of teachers, need to be able to link questionnaire responses to individuals.

Follow-up with Non-Respondents

- Post-card system
 - In separate envelopes, respondents send in questionnaire and a post-card with name, etc.
 - Send non-respondents a follow-up questionnaire.
- Removable label system
 - ID is put on questionnaire along with a removable name label;
 - Participants peel off name label before returning questionnaire;
 - A neutral party checks which questionnaires were not returned and administers a follow-up questionnaire.

Without Follow-Up

- Participants create a unique ID that they will remember from one administration to the next:

CSMC Example

In an effort to track responses over time while protecting your identity, we ask that you create a unique ID number using the initials of **your mother's maiden name** (first and last name), **your mother's birthday** (2-digit month-day), and **your 2-digit birth order**. (For instance, if your mother's name is Mary Anderson; her birthday is April 10th, and you are the 2nd child in your family, you would bubble in MA 04 10 02.) Please use the boxes below to fill in the requested information, then darken the corresponding ovals.

First and last
initials for
mother's maiden name

(A)	(A)
(B)	(B)
(C)	(C)
(D)	(D)
(E)	(E)
(F)	(F)
(G)	(G)
(H)	(H)
(I)	(I)
(J)	(J)
(K)	(K)
(L)	(L)

Your mother's
birthday

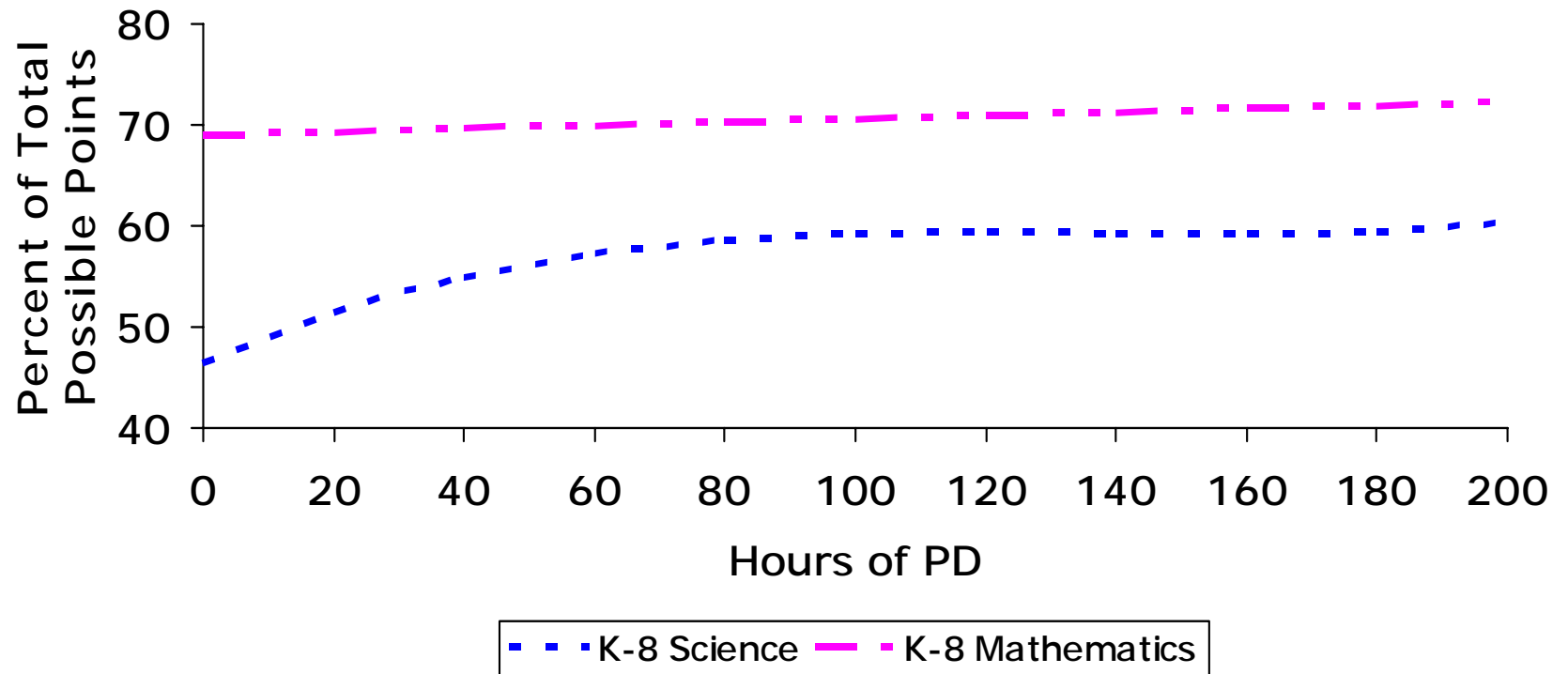
Month		Day	
(0)	(0)	(0)	(0)
(1)	(1)	(1)	(1)
	(2)	(2)	(2)
	(3)	(3)	(3)
	(4)	(4)	(4)
	(5)	(5)	(5)
	(6)	(6)	(6)
	(7)	(7)	(7)
	(8)	(8)	(8)
	(9)	(9)	(9)

Your birth
order

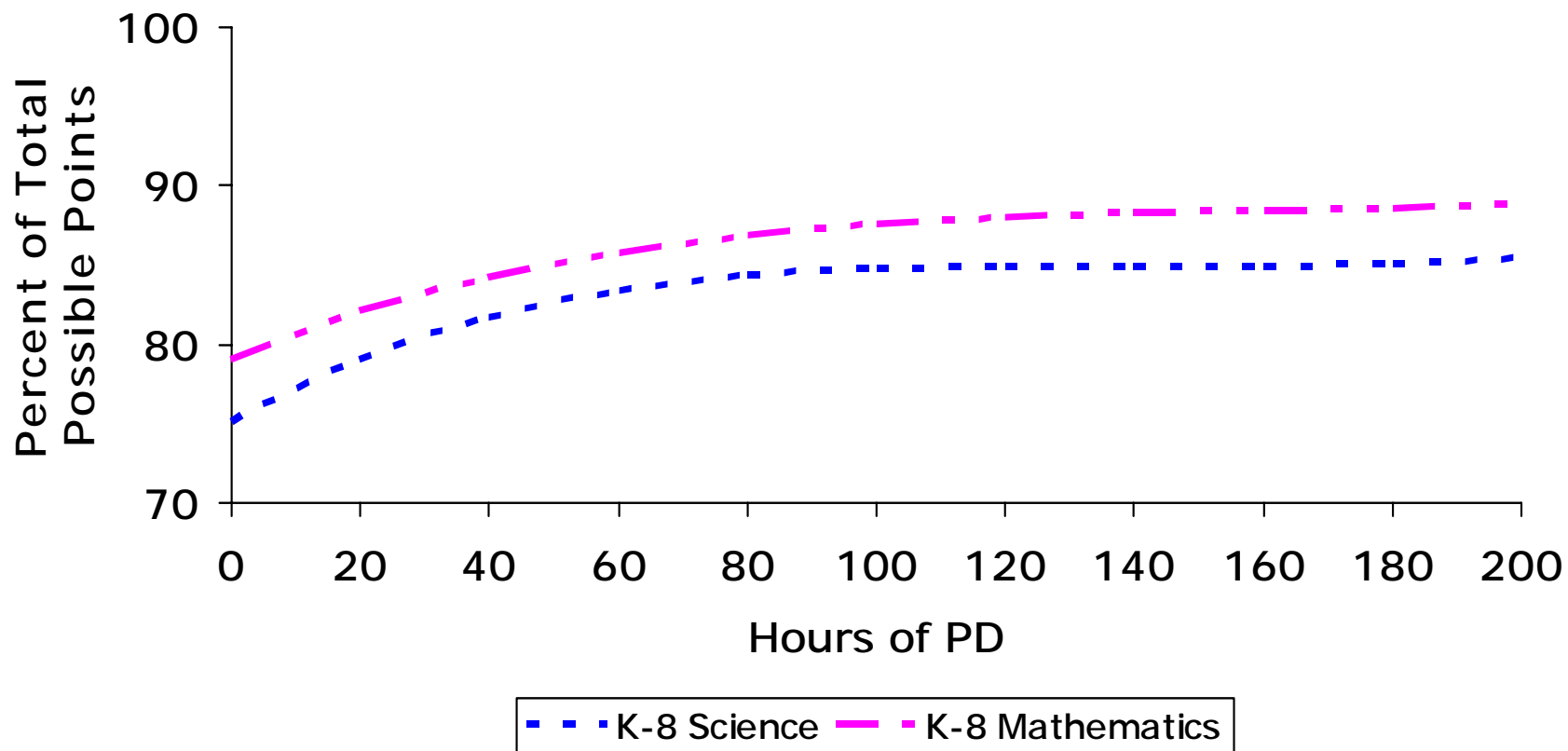
(0)	(0)
(1)	(1)
(2)	(2)
	(3)
	(4)
	(5)
	(6)
	(7)
	(8)
	(9)

LSC Findings

Teachers' Perceptions of Their Content Preparedness



Investigative Classroom Culture



Examining Change

- Questionnaires are often administered using a pre/post study design to look for change.
- In some cases, teachers' knowledge of what is being asked changes over time, e.g., might say they are well prepared in content initially because they don't have a good idea of what that content entails.
- In those cases, a retrospective pre/post study design is a good alternative (questionnaire is administered after treatment only).

Retrospective Pre

For each of the content areas below, please indicate 1) how well prepared you were in the area **prior to this course**, and 2) how well prepared you feel **now** (i.e., after the course). (Darken one circle in each section on each line.)

	Preparedness Prior to This Course				Preparedness Now			
	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared	Not adequately prepared	Somewhat prepared	Fairly well prepared	Very well prepared
a. Mathematics of counting and the natural numbers.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Historical development of numbers and the effects of historical choices on arithmetic and computation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Place value system.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Structures and concepts underlying the arithmetic operations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Fractions, ratios, and decimal numbers.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

From HRI's Virginia MSP Specialist Questionnaire

Assessments of Content Knowledge for Teaching

- Science:
 - HRI's ATLAST project is developing teacher assessments in:
 - Force and motion;
 - Plate tectonics; and
 - Flow of matter and energy in a living system.
- Mathematics:
 - Hill and Ball assessments in:
 - Number sense;
 - Operations;
 - Algebra, patterns, and functions; and
 - Middle grades mathematics.
 - Ferrini-Mundy assessments in:
 - secondary algebra.

Sample ATLAST Item

A teacher takes her middle school science class to the bowling alley for a “hands-on” experience with force and motion. The teacher asks Jill to describe the *horizontal* force(s) that are acting on the ball *after* she releases the ball and it is rolling down the alley.

Jill describes two forces: (1) the force on the ball making it move, and (2) the force of friction that makes the ball move slower and slower.

Which of the following questions should the teacher pose to Jill to better assess her understanding of the forces acting on the ball as it rolls down the alley?

- A. “What is applying the force that is making the ball move?”
- B. “Are the two forces acting on the ball balanced or unbalanced?”
- C. “How does the force of gravity fit into your description of the forces acting on the ball?”
- D. “How would you describe what affects friction?”

Sample Hill & Ball Item

Student A	Student B	Student C
$\begin{array}{r} 35 \\ \times 25 \\ \hline 125 \\ + 75 \\ \hline 875 \end{array}$	$\begin{array}{r} 35 \\ \times 25 \\ \hline 175 \\ + 700 \\ \hline 875 \end{array}$	$\begin{array}{r} 35 \\ \times 25 \\ \hline 25 \\ 150 \\ 100 \\ + 600 \\ \hline 875 \end{array}$

Which of these students is using a method that could be used to multiply any two whole numbers?

	Method would work for all whole numbers	Method would NOT work for all whole numbers	I'm not sure
a) Method A	1	2	3
b) Method B	1	2	3
c) Method C	1	2	3

From: Ball, D.L., Hill, H.C., & Bass, H. (2005). Knowing mathematics for teaching: who knows mathematics well enough to teach third grade, and how can we decide? American Educator, Fall 2005.

Assessments of Content Knowledge for Teaching

- Strengths:
 - Objective measures of teacher content knowledge and application of content knowledge.
 - Items embedded in the context of teaching; more like what teachers are expected to do.
- Weaknesses:
 - Exist (or planned) for only a small number of content areas/grade-ranges.
 - Some teachers resist being tested.

LSC Classroom Observation Protocol

- Evaluator rates lesson on a number of key indicators, e.g.,:
 - The mathematics/science content was significant and worthwhile;
 - Students were intellectually engaged with important ideas relevant to the focus of the lesson;
 - The degree of sense-making was appropriate;
 - There was a climate of respect for students' ideas, questions, and contributions;
 - Intellectual rigor, constructive criticism, and the challenging of ideas were evident.
- Evaluator provides overall lesson quality rating.

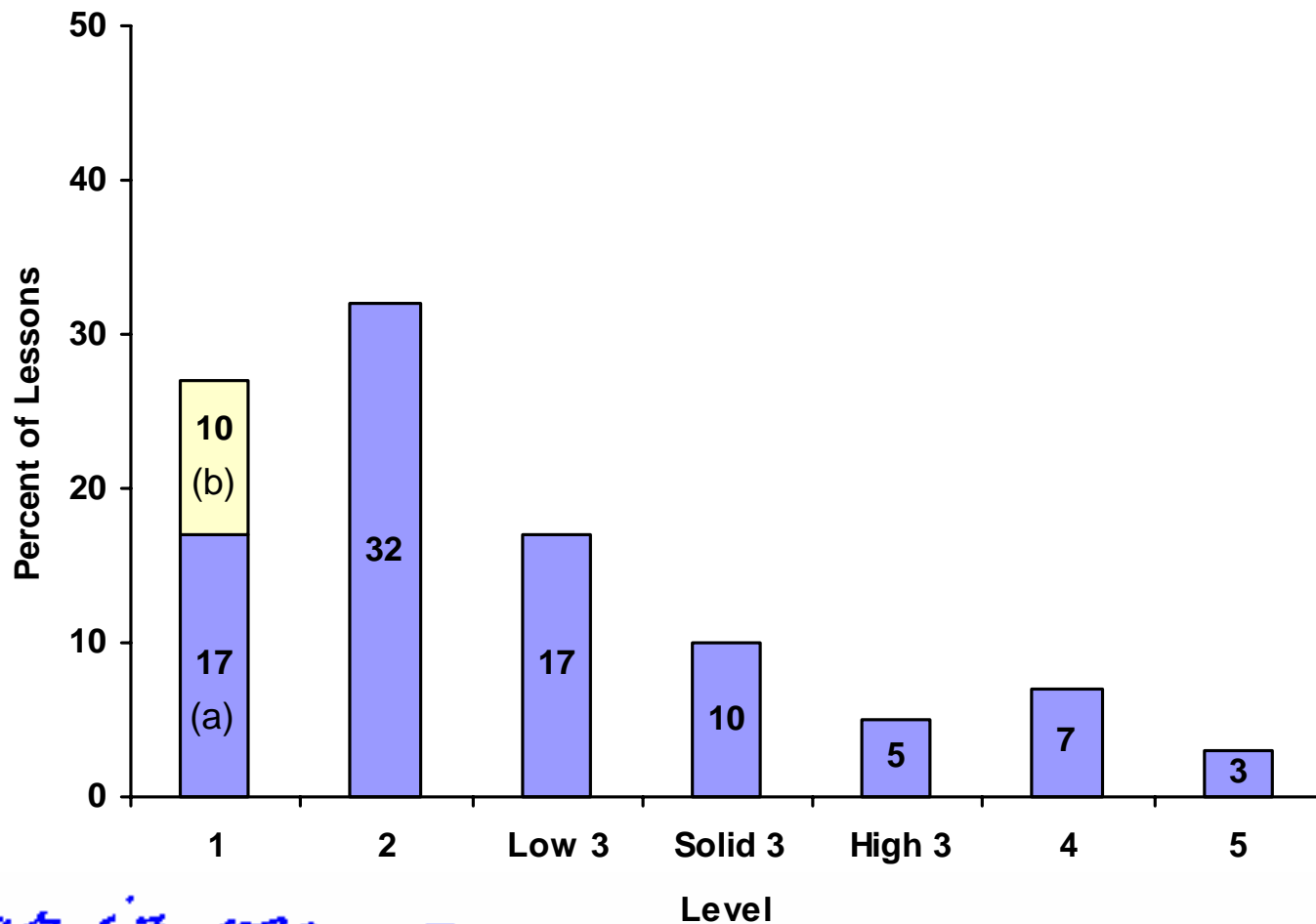
Overall Rating Scale

1. Ineffective Instruction
 - A. Passive “Learning”
 - B. Activity for Activity’s Sake
2. Elements of Effective Instruction
3. Beginning Stages of Effective Instruction
 - Low
 - Solid
 - High
4. Accomplished, Effective Instruction
5. Exemplary Instruction

LSC Classroom Observation Protocol

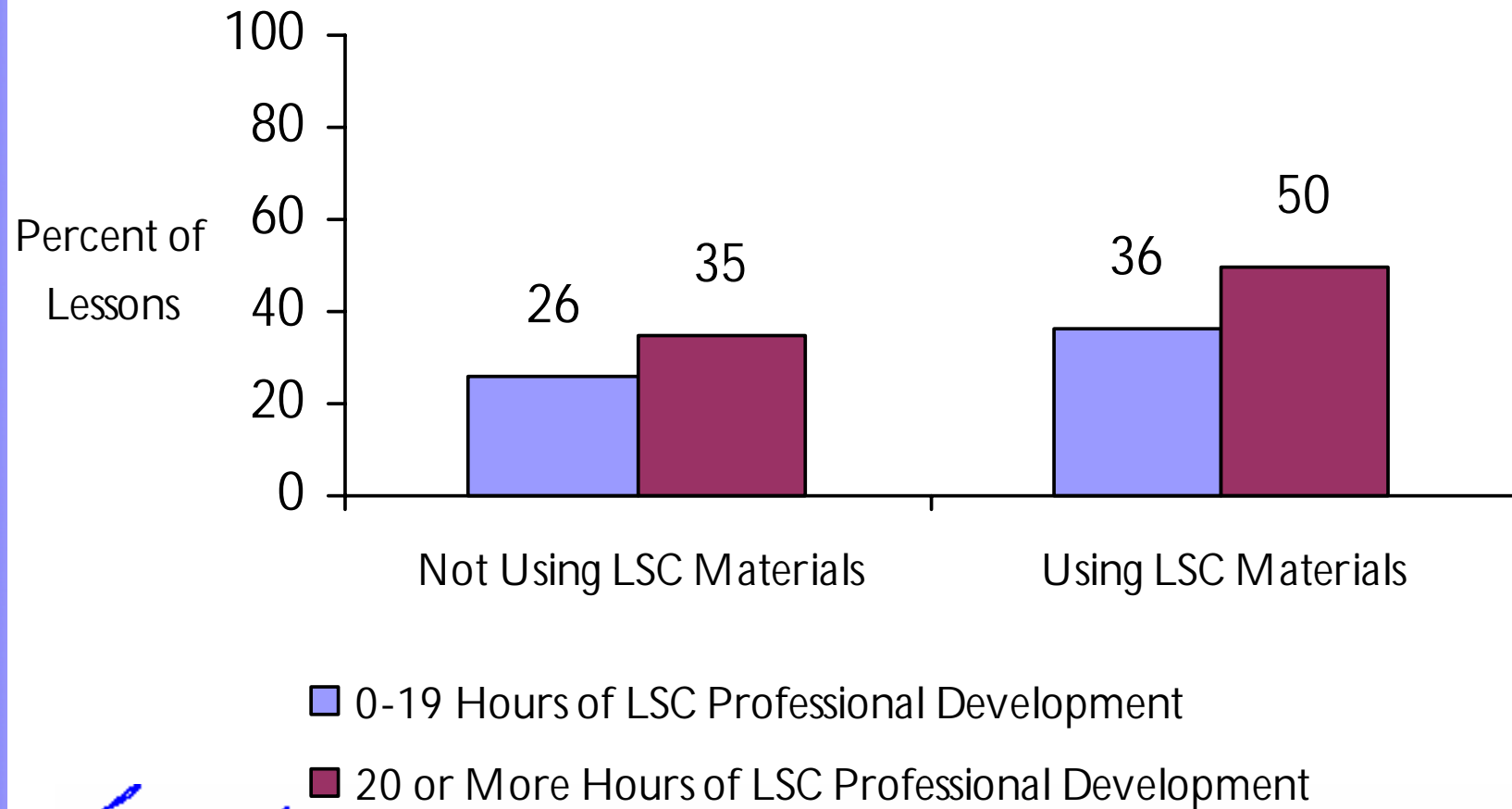
- Strengths:
 - Having an observation protocol helps ensure that all observers are attending to the same things.
 - Protocol isn't content-specific.
 - Provides "face validity" to evaluation.
 - Provides insight into the quality of instruction.

Quality of Mathematics and Science Lessons: Nationally



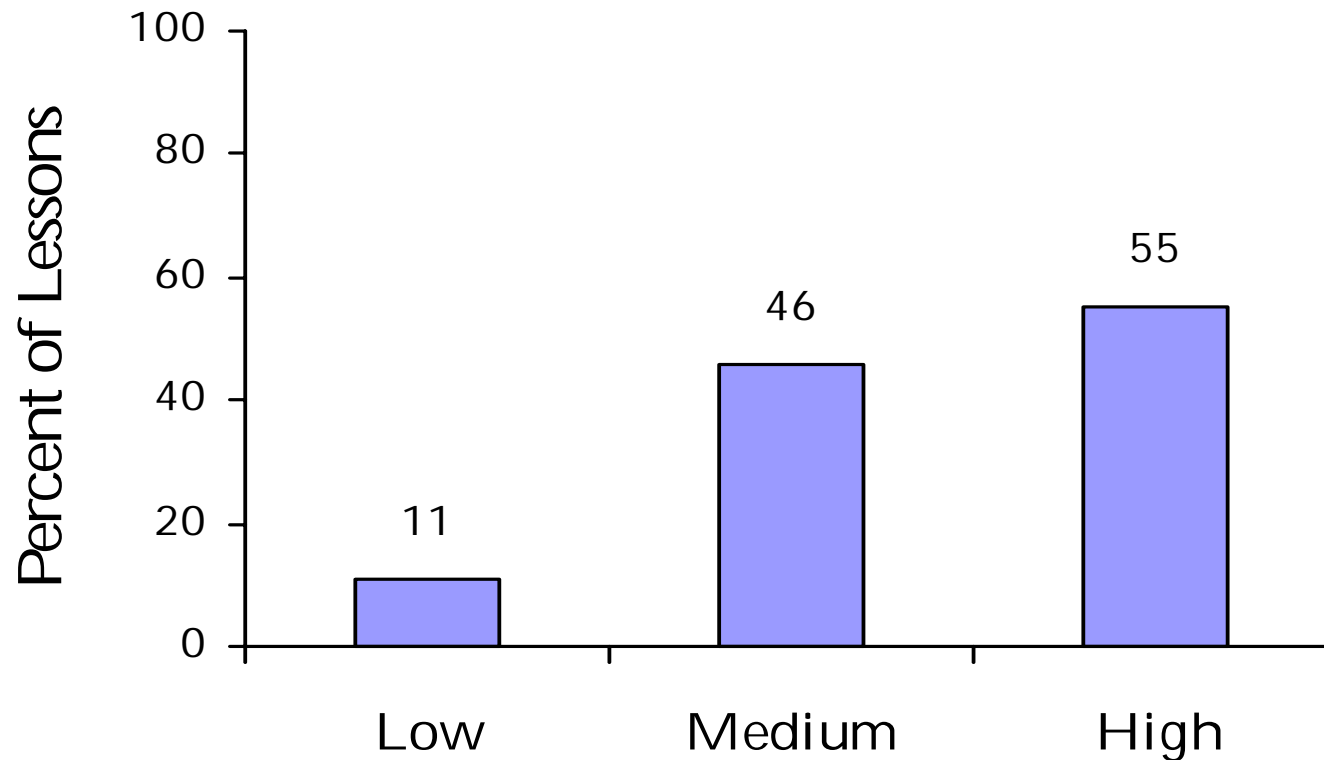
Impact on Classroom Practices

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



Impact on Classroom Practices

Highly-Rated Lessons, by Adherence to LSC-Designated Materials



LSC Classroom Observation Protocol

- Weaknesses:
 - Observers need both knowledge of the content and an understanding of teaching.
 - Need to train observers to obtain interrater reliability.
 - Much more costly than surveys.
 - Observation of a single lesson leaves many questions unanswered.
 - Protocol does not include important content-specific elements.
 - Possibility of selection bias.

Classroom Observation Protocol Revisions

- Observing a single lesson per teacher leaves many questions unanswered.
- HRI is developing a “unit protocol” intended to measure student opportunity to learn:
 - Revised classroom observation protocol (3-5 observations per unit);
 - Brief instructional logs; and
 - Pre-unit, post-observation, and post-unit interviews.

Classroom Observation Protocol Revisions

- Focus: Rate the extent to which the:
 - Content of the lesson was appropriate **and aligned with learning goals**;
 - Presentations/activities in the lesson were appropriate (accessible yet challenging) for the students;
 - Students were **intellectually engaged with important ideas relevant to the intended content**;
 - Lesson provided **opportunities for sense-making of the intended content**;
 - Learning environment promoted an open exchange of ideas;
 - Learning environment encouraged rigor; and
 - Overall quality of lesson.

Supportive Context

- Policy is an important, but often overlooked, aspect of sustaining reform.
- LSC Policy Ratings were developed to examine institutionalization of:
 - Professional development systems;
 - Stakeholder support; and
 - Aligned district policies (e.g., selecting instructional materials, assessment, teacher evaluation).

LSC Policy Ratings

Other District Policies and Practices for Mathematics/Science Education

(Select one number in *each* column on *each* line.)

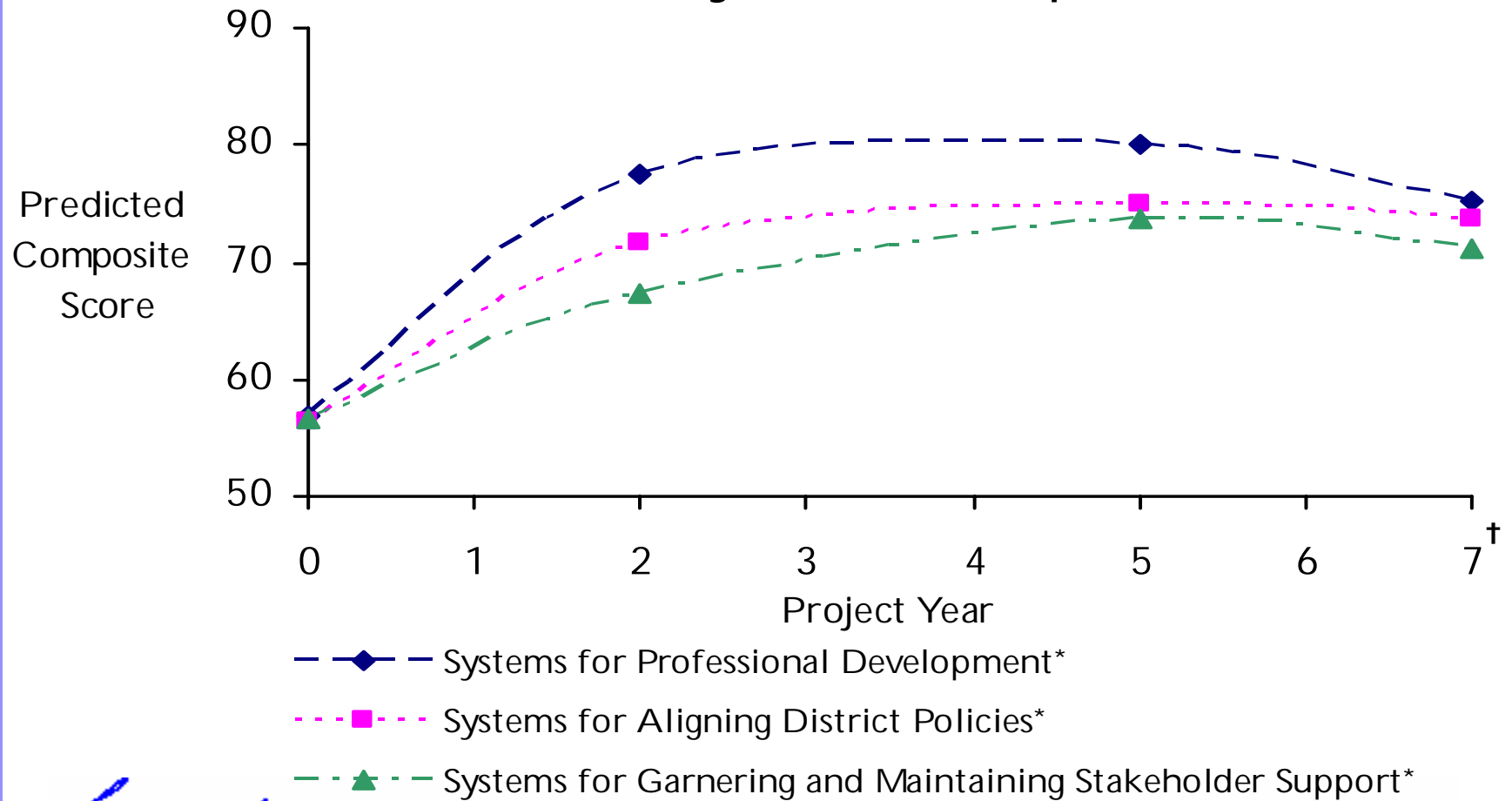
The district(s) have systems in place for aligning the following policies and practices with the mathematics/science reform vision:

1. Mathematics/science curriculum framework/scope and sequence
2. Selection of instructional materials
3. System for purchasing and managing supplies and materials
4. District-wide student assessments
5. Recruiting/hiring new teachers
6. Evaluation of teacher performance
7. Organizational structures/policies within schools (e.g., time for preparation and planning; importance placed on mathematics/science)

	Exists now (end of the LSC)					Likely to exist after the LSC				
	Not at all		To a great extent			Not at all		To a great extent		
1. Mathematics/science curriculum framework/scope and sequence	1	2	3	4	5	1	2	3	4	5
2. Selection of instructional materials	1	2	3	4	5	1	2	3	4	5
3. System for purchasing and managing supplies and materials	1	2	3	4	5	1	2	3	4	5
4. District-wide student assessments	1	2	3	4	5	1	2	3	4	5
5. Recruiting/hiring new teachers	1	2	3	4	5	1	2	3	4	5
6. Evaluation of teacher performance	1	2	3	4	5	1	2	3	4	5
7. Organizational structures/policies within schools (e.g., time for preparation and planning; importance placed on mathematics/science)	1	2	3	4	5	1	2	3	4	5

Development of Systems to Support Reform

District Systems Composites



LSC Policy Ratings

- However, validity and reliability of this instrument has not been established beyond “face validity” and internal consistency of composite scores.

Strategic Leadership Handbook

- Considerations for “going to scale” with reform, including use of evidence.
- Developed by HRI and EDC.
- Available at:
 - www.horizon-research.com/reports/2004/mspta_handbook.php

Availability of Instruments

- Now:
 - LSC policy ratings, classroom observation protocol, and teacher questionnaires.
 - Hill & Ball elementary teacher content scales (in certain areas of mathematics); requires attending training session.

Availability of Instruments

- In the works:
 - ATLAST middle grades science teacher assessments, available summer 2006.
 - Unit protocol.
 - Additional Hill and Ball elementary and middle grades mathematics teacher assessments.
 - Ferrini-Mundy middle grades mathematics teacher assessments.