Looking Inside the Classroom

Results of a
National Observation Study

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Most of our information on mathematics instruction nationally comes from teacher surveys:

- National Survey of Science and Mathematics Education
- NAEP
- TIMSS

While self-report data appear to be valid (when there aren't high stakes attached), teachers can't judge the *quality* of their own instruction.

Need to go “Inside the Classroom” and look.

Also need to talk with teachers to find out where the class has been, and where they are going

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Most observation studies have been conducted with small, typically purposive samples, so there are questions about generalizability.

Inside the Classroom Study

- Designed to provide nationally-representative data on the quality of mathematics and science instruction
- Subsample of middle schools in 2000 NSSME
- Elementary and high school in feeder pattern

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The observation protocol was adapted from the LSC Classroom Observation Protocol

Used trained observers – Horizon Research, Inc. staff and consultants, most of whom had done classroom observations for the LSC.

Total of 364 lessons observed, K-12 mathematics and science.

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Researchers

- Took detailed field notes describing what the teachers and students were doing throughout the lesson
- Interviewed the teachers after the lesson
- Rated the observed lesson on individual indicators, e.g., quality of teacher questioning
- Provided overall ratings of the lesson

“Capsule” Rating Scale

- Level 1: Ineffective instruction
  a. passive “learning”
  b. “activity for activity’s sake”
- Level 2: Elements of effective instruction
- Level 3: Beginning stages of effective instruction (low, solid, high)
- Level 4: Accomplished, effective instruction
- Level 5: Exemplary instruction

Descriptive Rationale

- Where the lesson fit in with the overall unit;
- The focus of the lesson;
- Instructional materials used;
- A synopsis of the structure and flow of the lesson;
- The nature and quality of lesson activities;
- The roles of the teacher and students in the intellectual work of the lesson; and
- The reasoning behind the capsule rating.

What percent of K–12 mathematics lessons would you predict were rated as high quality?

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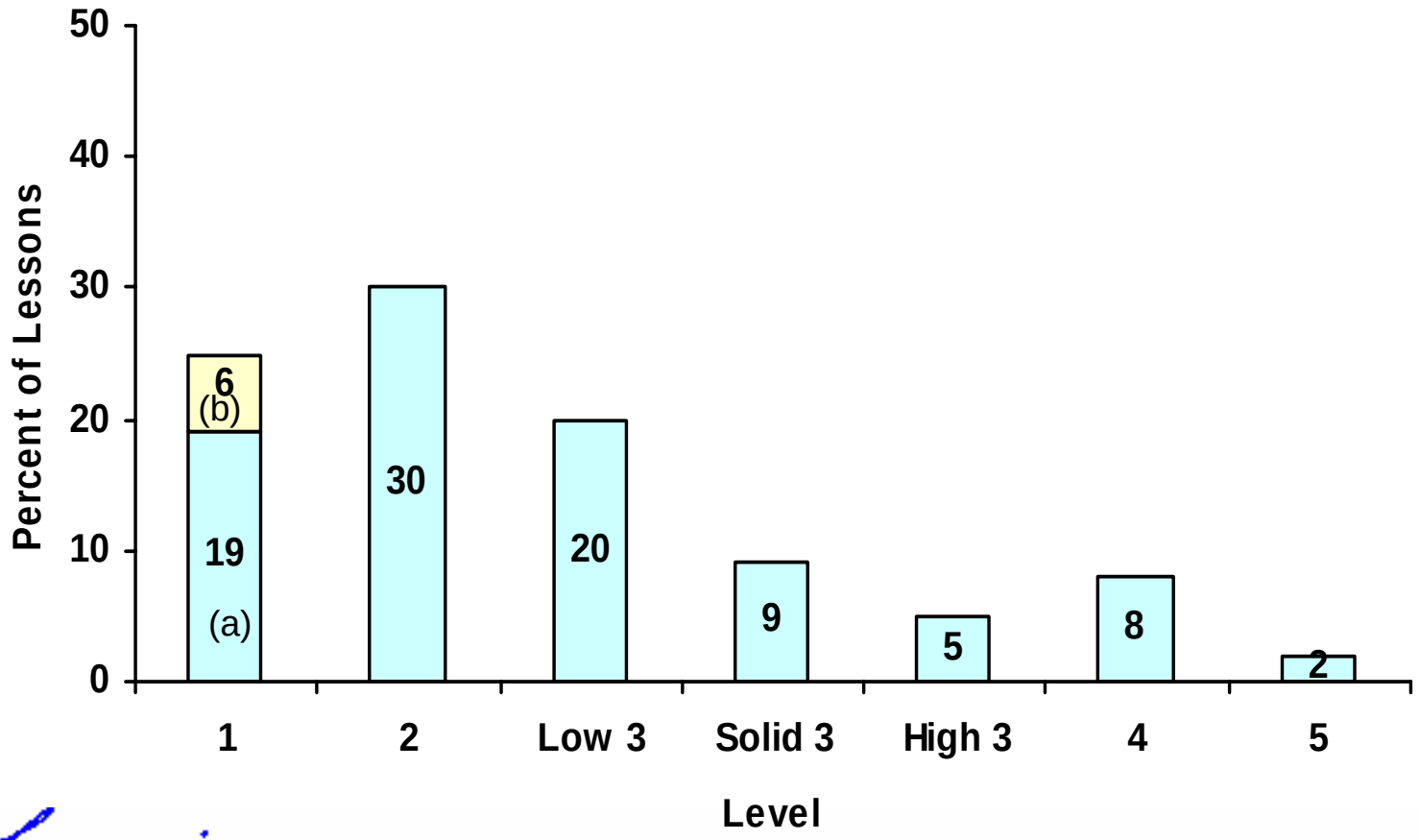
Capsule Ratings:
K-12 Mathematics Lessons



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We saw well-designed lessons that were "reform-oriented", "traditional," and a blend of the two.

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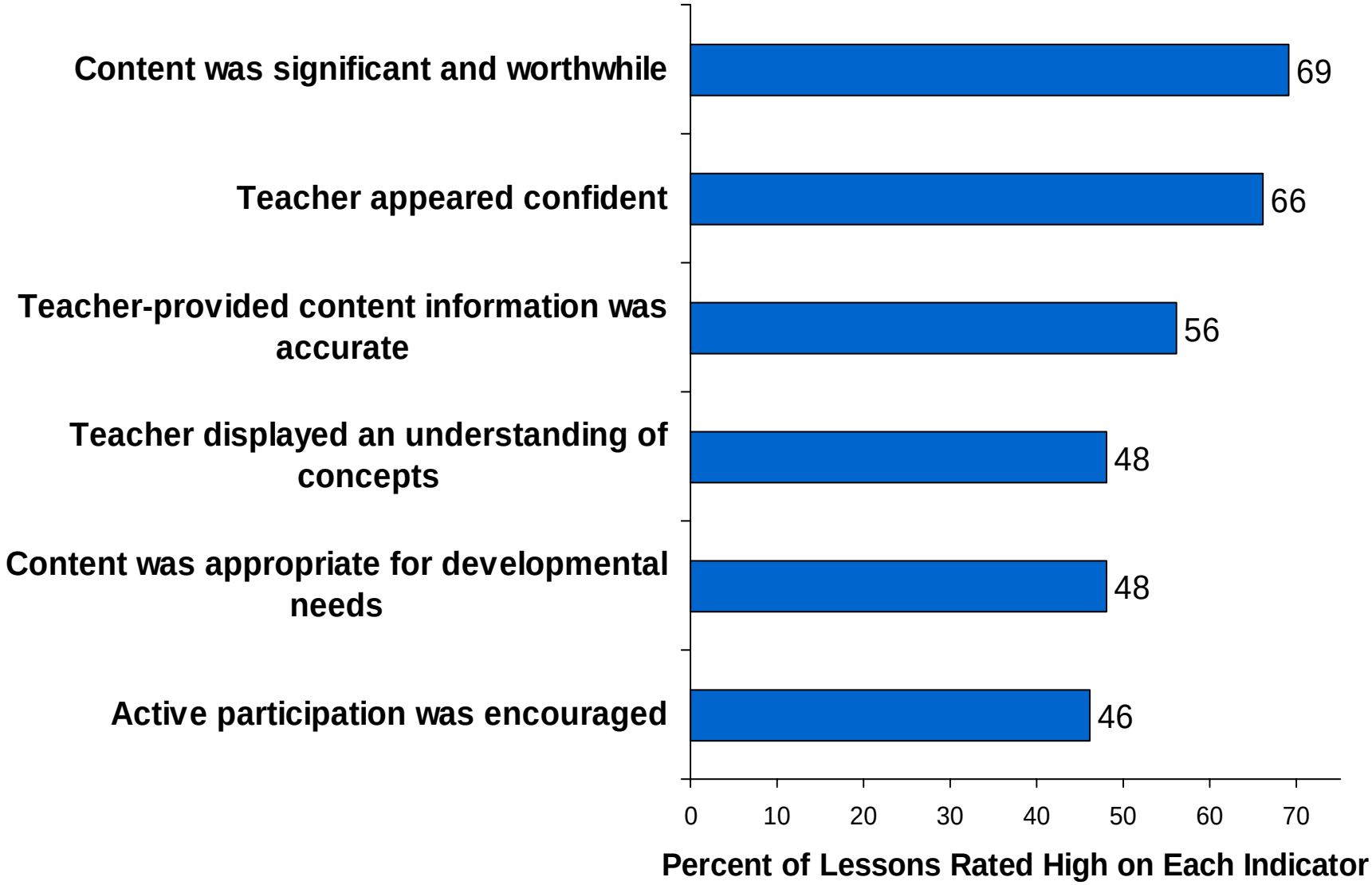
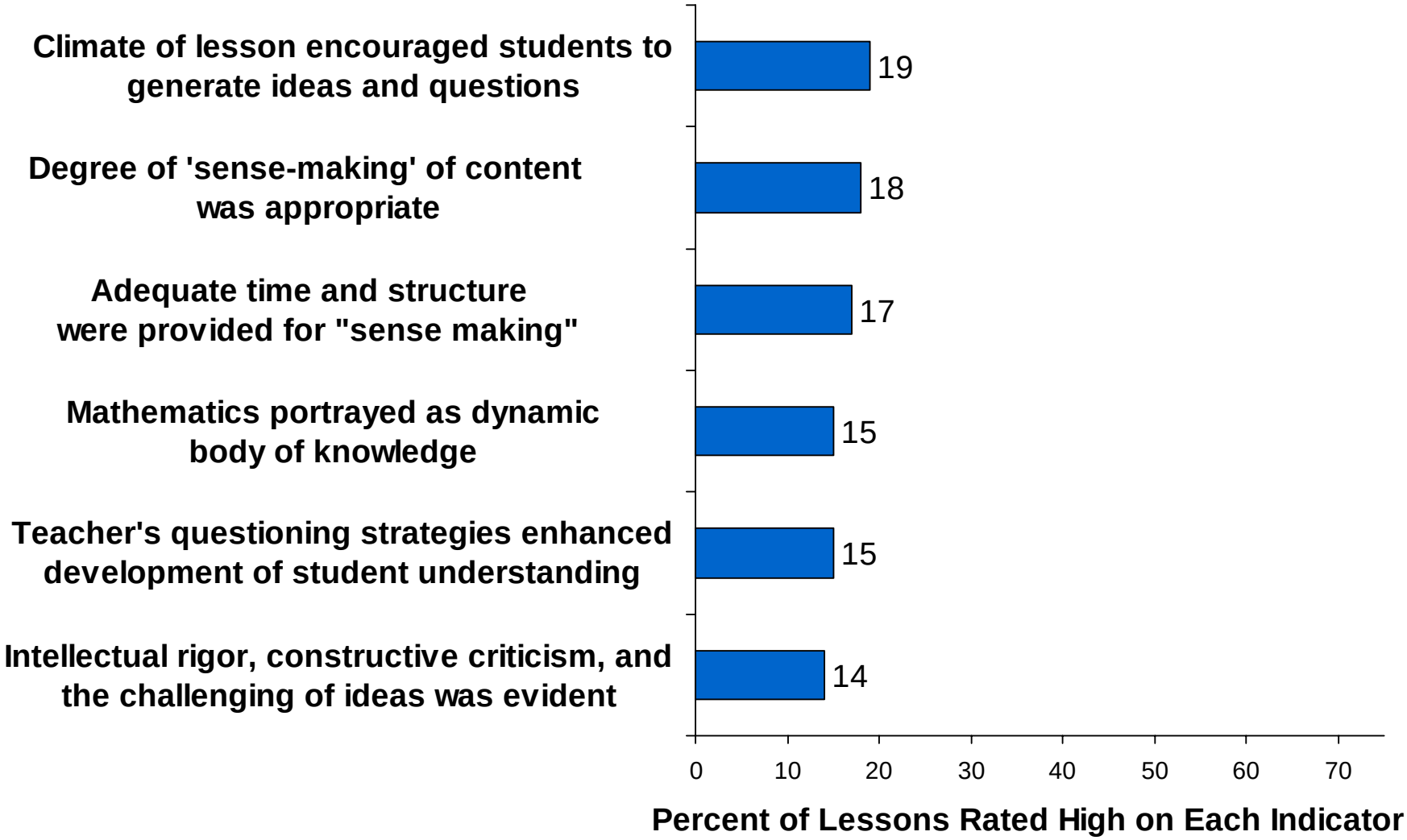
Relative Strengths of K-12 Mathematics Lessons



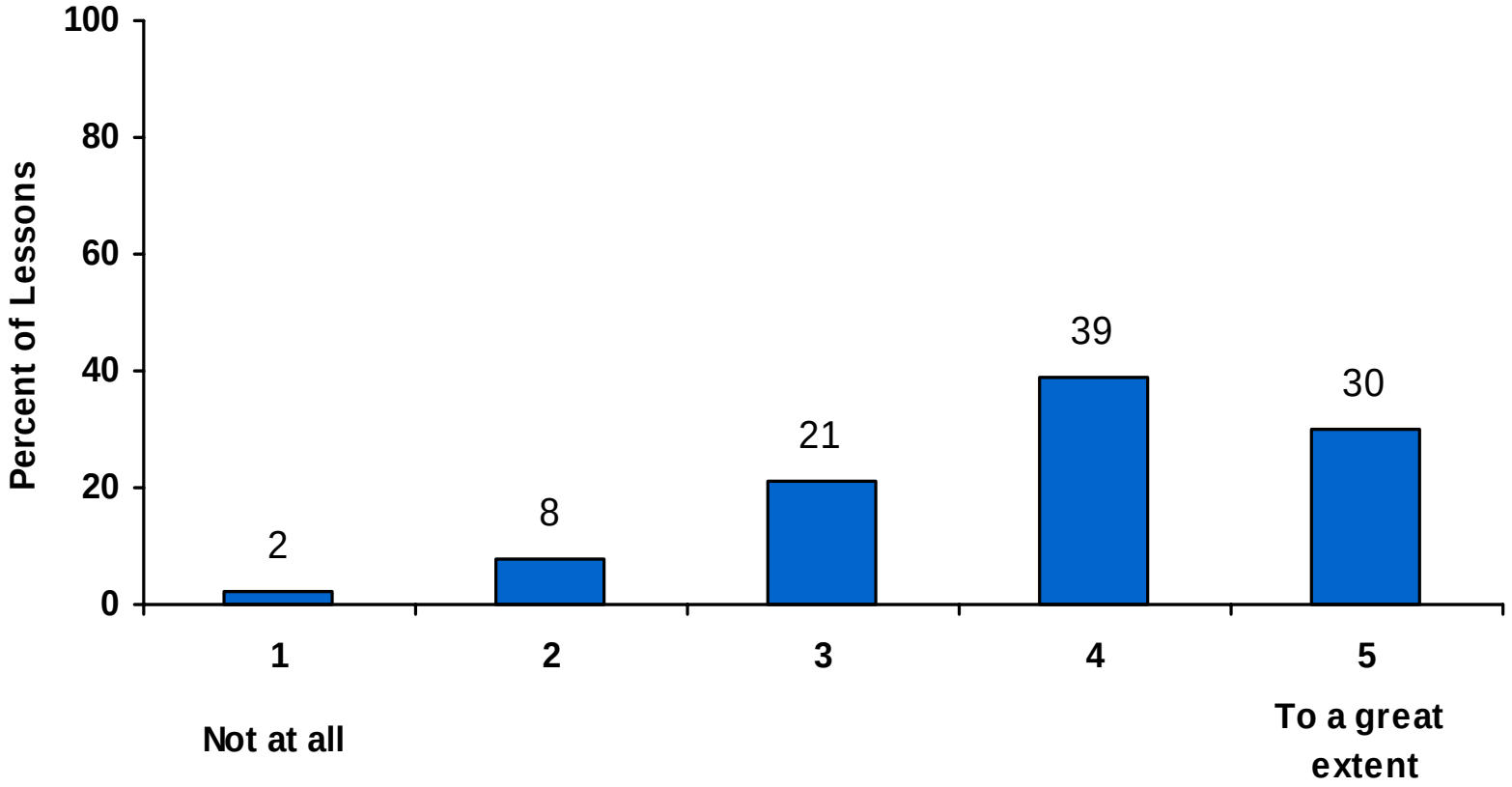
Areas Where K-12 Mathematics Lessons Are Rarely Strong



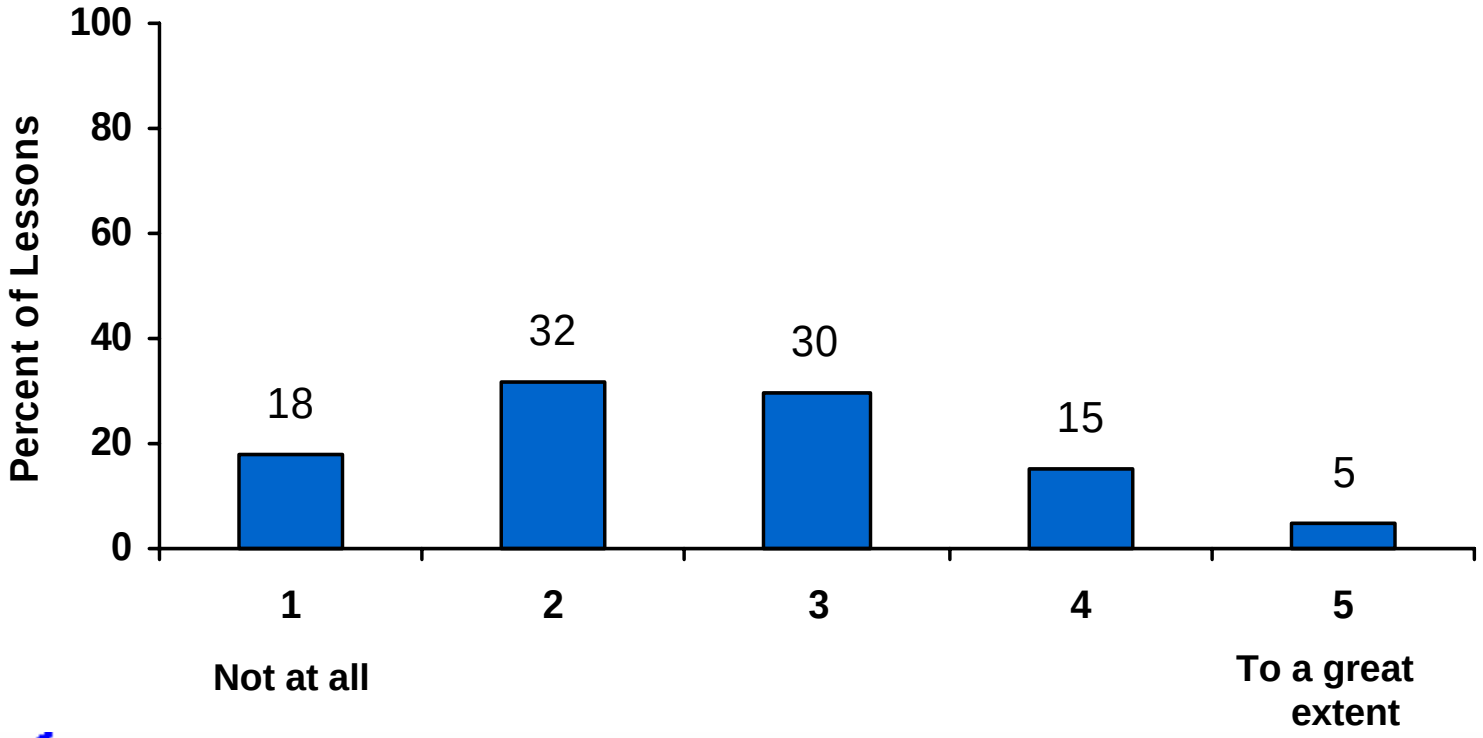
Key Elements of High Quality Mathematics Instruction

- Engage students with the mathematics content;
- Create an environment conducive to learning;
- Ensure access for all students;
- Use questioning to monitor and promote understanding; and
- Help students make sense of the mathematics content.

Mathematics Content
Is Significant and Worthwhile



Students Are Intellectually Engaged with Important Ideas Relevant to the Focus of the Lesson



Many Lessons “Just Started”

- “Turn to page 178 in your book”

  or

- “All right now, these pages should be very easy if you’ve been paying attention in class. We talked about all of this stuff.”

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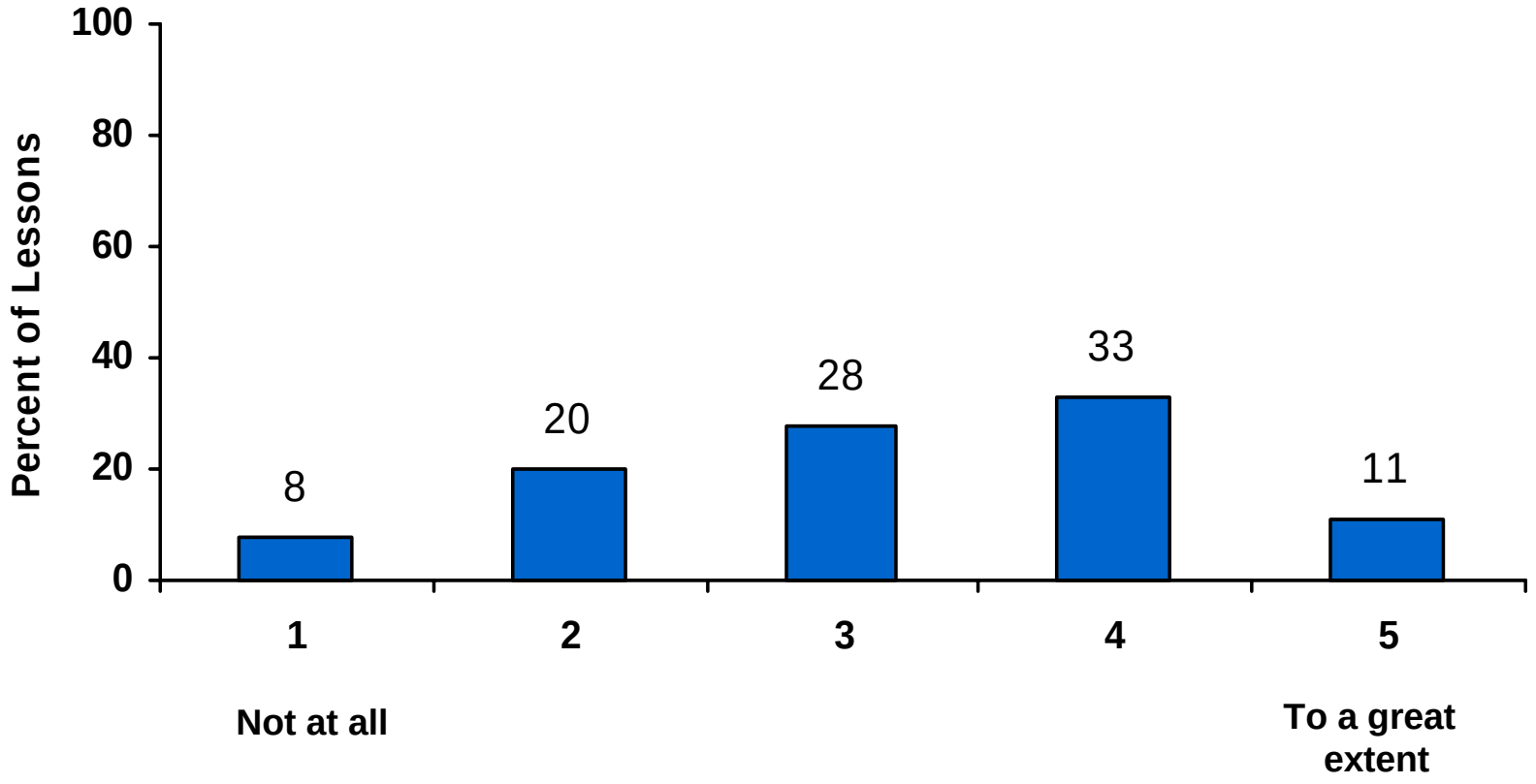
In Contrast:

In a lesson on fractions and as an introduction to percents, the teacher in a 7th grade mathematics class asked three students to come to the front of the class for a demonstration. One student measured the height and arm spread of a second student, while the third student wrote the numbers on the board. The students used these numbers to express the relationships both as a ratio and as a percent.

Climate of Respect for Students' Ideas, Questions, and Contributions



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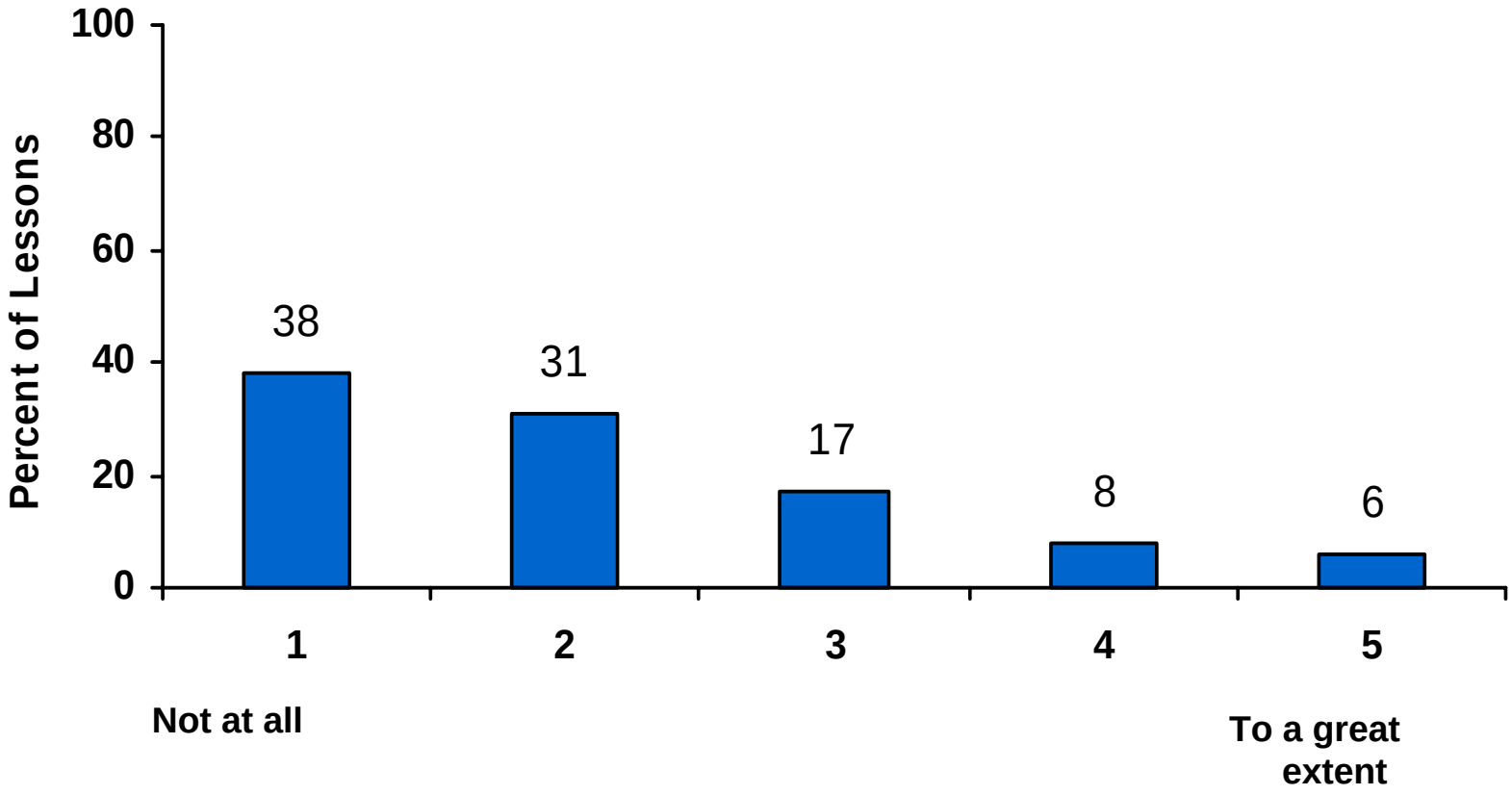
Intellectual Rigor, Constructive Criticism, and Challenging of Ideas Are Evident



Respectful and Rigorous

A student in a high school geometry class offered an answer that was slightly off-base and confusing to many others in the class. The teacher responded with, "Right idea, let's clean it up a bit." The class remained supportive as students offered suggestions for ways to clean the answer up, building on the first student's answer rather than totally dismissing it.

Respectful, but not rigorous

Other lessons could be categorized as respectful, but lacking in rigor. Observers used terms like “pleasant, but not challenging” to describe such lessons.

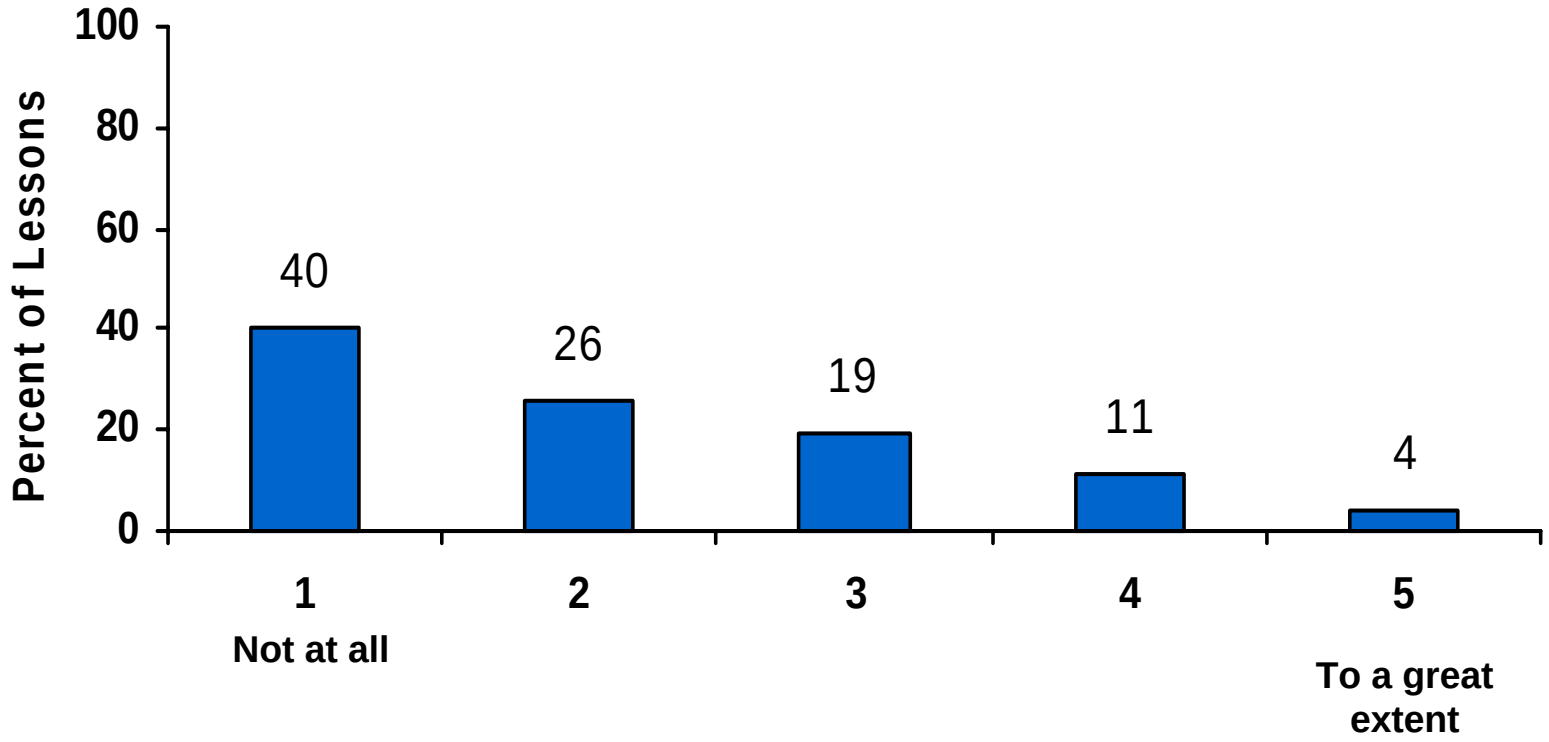
An observer described a 4th grade mathematics lesson where “the teacher was very enthusiastic; she gave lots of verbal encouragement to students as they worked…The culture suffered from a lack of focus on the intellectual content, however. The teacher appeared more intent on the students having a positive experience with mathematics than really engaging with the concepts.”

Lacking in Respect

Some lessons were judged to be lacking in respect, in some cases even hostile and demeaning to students.

"There was little concern for learning and even less respect for the students as individuals. Students were criticized and told they were wrong, but only occasionally helped by the teacher. Students who tried to contribute ideas ran a substantial risk of being told to stop: 'Please let me be the teacher.'"

Teacher's Questioning Enhanced Development of Student Understanding/Problem Solving



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The teacher asked for examples and justifications from the students as a means of assessing their understanding. When generating examples of tessellations around the room, one student proposed the border of the bulletin board that was made of circles.

Student: 'How about the border?'

Students: 'No... that won't work.' (several students talk at once and reject this contribution)

Teacher: 'Why won't it work? Can the circle ever work?'

The discussion became focused on why the circle did not create a pattern that fit the definition of a tessellation. While the student who suggested the circle had been focusing more on patterns, the disagreement helped him redirect his analysis back to the definition of tessellations presented earlier.

In Contrast,

The observer noted that the entire lesson consisted of a whirlwind of lower level, factual, and procedural questions. For 40 minutes the teacher asked students in this 5th grade class questions about:

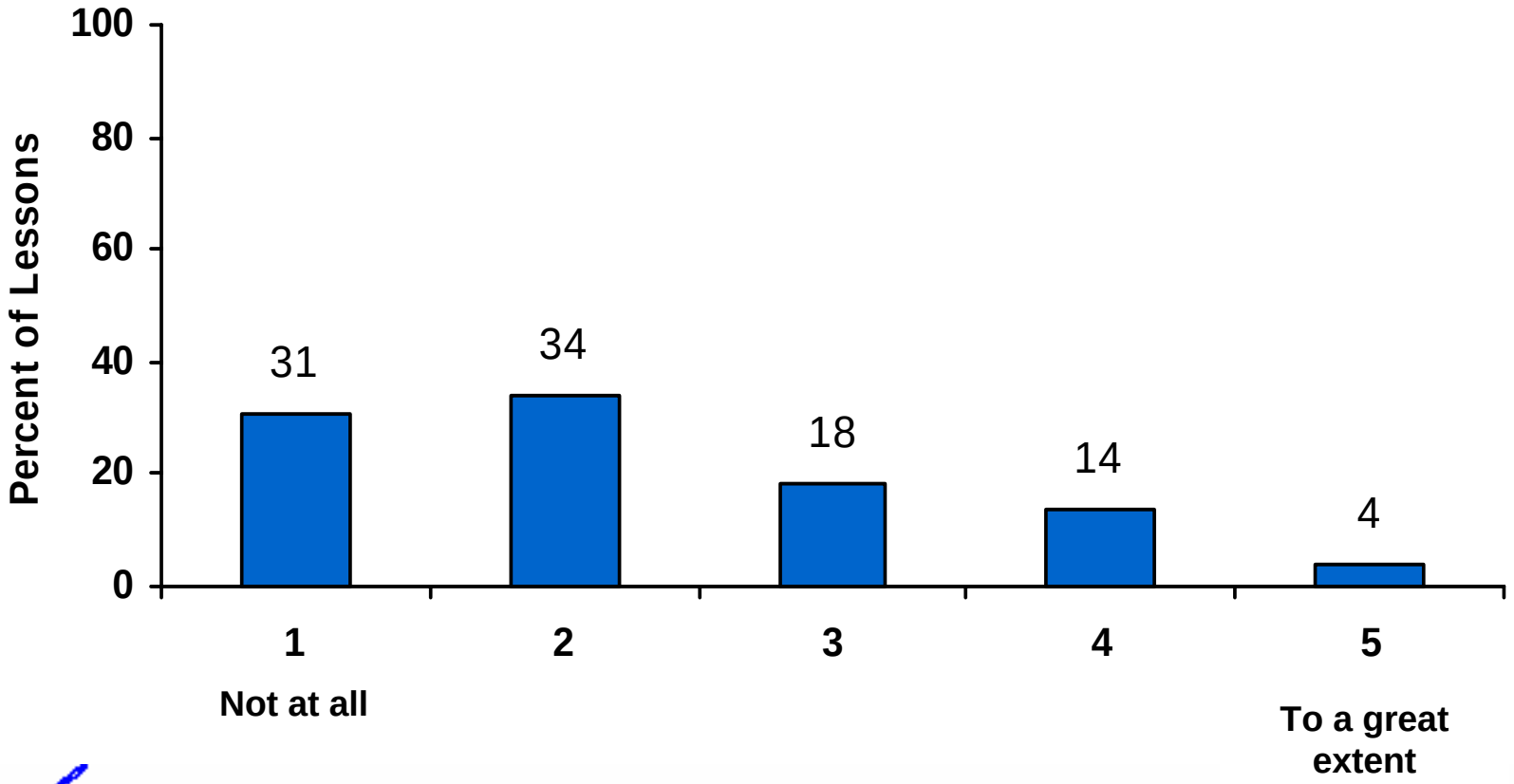
- the metric system
- the meaning of base 10
- place value
- multiplication
- division
- fractions
- decimals
- mixed numbers
- improper fractions
- fraction names for 1
- equivalent fractions
- simplifying fractions
- divisibility rules for 2, 3, 5 and 10

- writing numbers in base 5 and 3
- place value in these two bases
- changing mixed numbers to improper fractions
- defining fractions as division
- pulling up real world occupations that use fractions
- comparing fractions using cross multiplication and common denominators
- changing a fraction to a decimal then to a percent

Sometimes teachers answer their own questions:

Said the observer of a high school calculus lesson: “The teacher asked for a student’s input as to the next step toward the solution, but then disregarded the student’s suggestion (which was one correct way to proceed) and went with his own strategy, saying: ‘Yes, we can do that. But let’s….’ So the teacher solved the problem his way, even though he had asked for a student’s strategy.”

Degree of Sense-Making Is Appropriate for This Lesson



Lack of Attention to Sense-making:

An observer of a 6th grade class noted that the teacher did not seem to be trying to monitor if students understood what was going on in the lesson. "Her focus throughout the large group discussion was on getting through the sequence of questions she had prepared. The teacher did not seem tuned into whether the 'big ideas' made sense to the kids or not. She seemed pleased that she had answers to her questions and they were the answers she was looking for."

Closing Thoughts on Findings

- Choice of instructional strategy doesn't appear to be as important as some have suggested.

- The key appears to be providing students an opportunity to engage with important mathematics concepts and ensuring that they in fact make sense of these concepts.

Closing Thoughts on Methodology

1. Heisenberg's Uncertainty Principle: the process of measuring may be changing what we are attempting to measure.

2. Teaching is a complex act, heavily dependent on context, context that the "drop-in" observer may not understand very well.

3. Aggregating across observations requires collecting comparable data across observations, which in turn requires deciding ahead of time what is likely to “matter”.

4. The larger the observation study, the more observers you are likely to need, and ensuring interrater reliability gets correspondingly more difficult.

5. Any observational study needs to consider the trade-offs between depth and breadth.

Report is available at

www.horizon-research.com

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