Lessons Learned about Systemic Reform of Mathematics Education

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Presentation at the NCTM Research presession,
April 21, 2002

Data Sources

- Evaluations of numerous professional development and systemic reform projects, including several SSIs; and a current study of what has been learned about strategic thinking/sustainability of the SSIs.

Data Sources

- Cross-site evaluation of the LSCs, including having trained observers assess the quality of professional development sessions, interview teachers, and observe classrooms.

Data Sources

- National Surveys – 1977, 1985-86, 1993, 2000
- Inside the Classroom – observations and interviews of a nationally representative sample of approximately 360 mathematics and science classes, K-12
- Videos of “best practice” in classrooms and professional development

Lessons Learned about Systemic Reform

You can’t fix the whole system at once.

Lessons Learned about Systemic Reform

But…any part of the system you don't fix can undo the parts you do.

Sound Technical Strategy - Planning Phase

- Represent important areas of need within the state
- Are not being addressed well or comprehensively within the state
- Complement existing efforts in the state targeting other elements
- Can be positively affected within the resources, capacity, and design of the initiative
- Need to match resource expenditures to your goals

Sound Technical Strategy - Implementation

- Sequence of activities that build on one another
- Deliberate work on elements that provide widespread guidance and powerful influence to support more specialized or localized work undertaken simultaneously or at a later time
- Targeting additional elements of the system as opportunities emerge in the context
- Appropriate quality control mechanisms to assure that the implementation of the plan matches the standards of the plan

Lessons Learned about Systemic Reform

Systemic reform requires balancing multiple tensions.

- Short-term versus long term impact.

- Central versus local decision-making.

Key Lesson

- Systemic reform is at least as much a political enterprise as it is a technical one.

Sound Political Strategy -Planning Phase

- Involvement of important and influential individuals, groups, and organizations within the state mathematics and science education system and context
- Communications that allow the initiative to monitor the state context, disseminate information to key stakeholders, and to obtain timely input
- A plan to position the initiative as the “voice” for science and mathematics reform within the state

Sound Political Strategy - Implementation

- Providing incentives for involvement of districts, schools, teachers, and organizations
- Creating and using “existence proofs” or “proofs of concept” to establish the credibility, effectiveness, and impact of the technical strategy on a small scale as a precedent for large scale implementation
- Creating healthy redundancies to prevent obstacles facing one activity from blocking attainment of important goals
- Isolating potentially weak pieces of the initiative enough to prevent lack of progress on one activity from stifling the entire initiative

Lessons Learned about Systemic Reform

Time it takes for meaningful reform is much longer than the political cycle.

Lessons Learned about Systemic Reform

Need to plan from the beginning what will remain at the end.

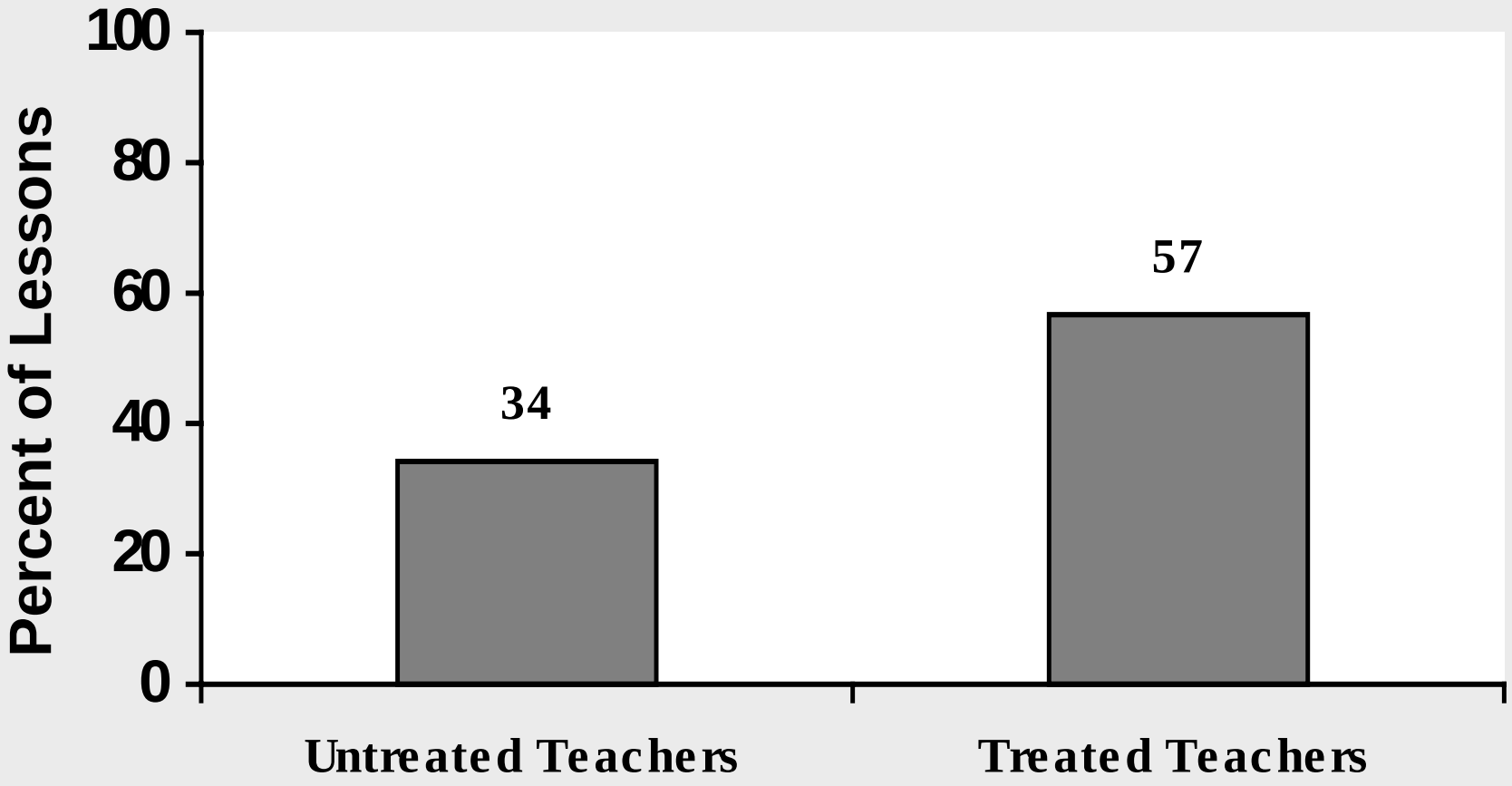
Lessons Learned about Systemic Reform

The law of entropy rules.

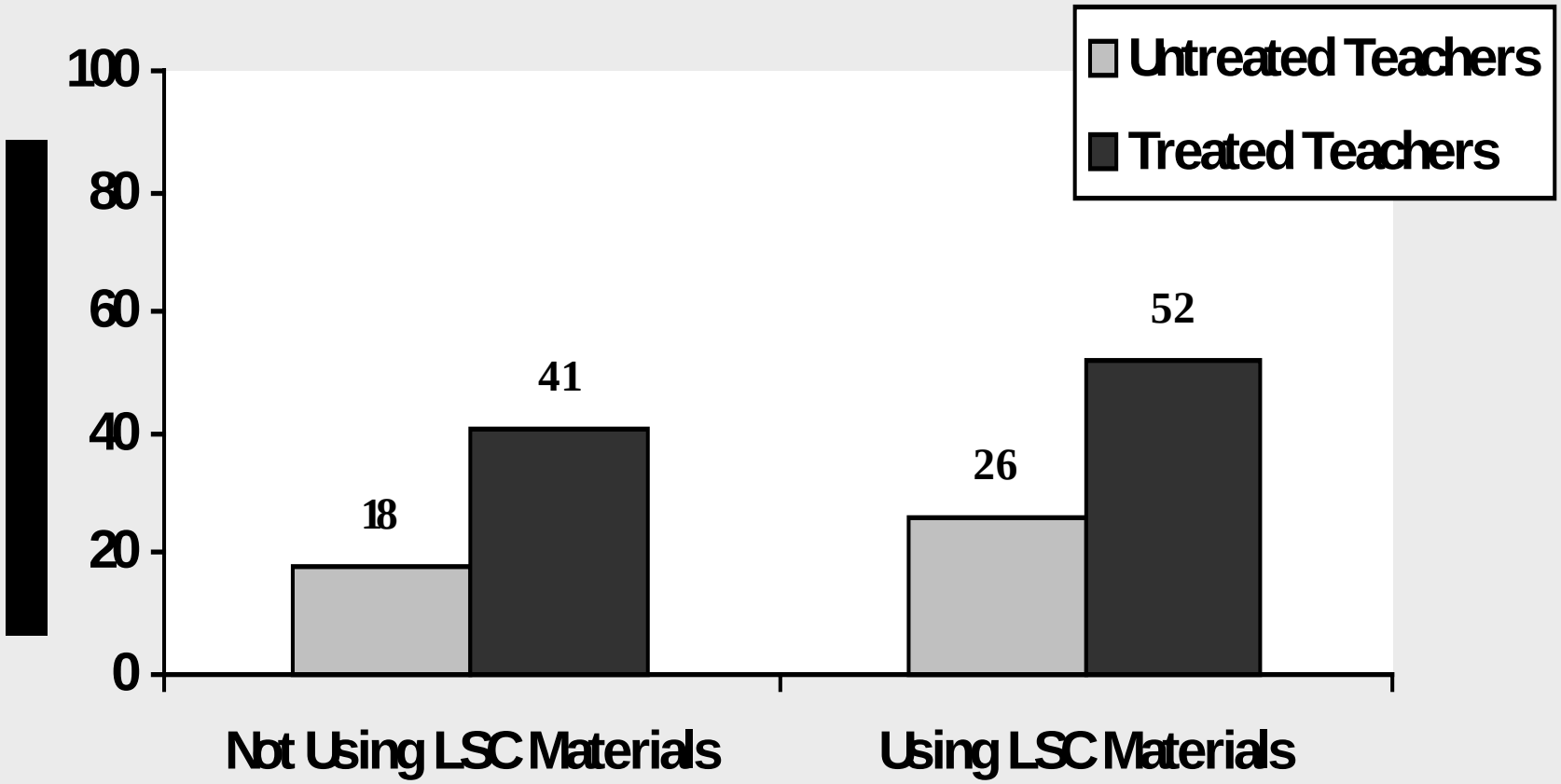
Lessons Learned about Professional Development

Professional development around high quality instructional materials seems to be an effective strategy.

Mathematics Lessons Using LSC-Designated Instructional Materials, by Treatment



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



Lessons Learned about Professional Development

Professional development around high quality instructional materials seems to be an effective strategy… especially with support from peers.

When LSC teachers were asked about the “most helpful” aspect of the professional development, teachers frequently mentioned getting assistance from teachers who had already used the instructional materials in their classroom.

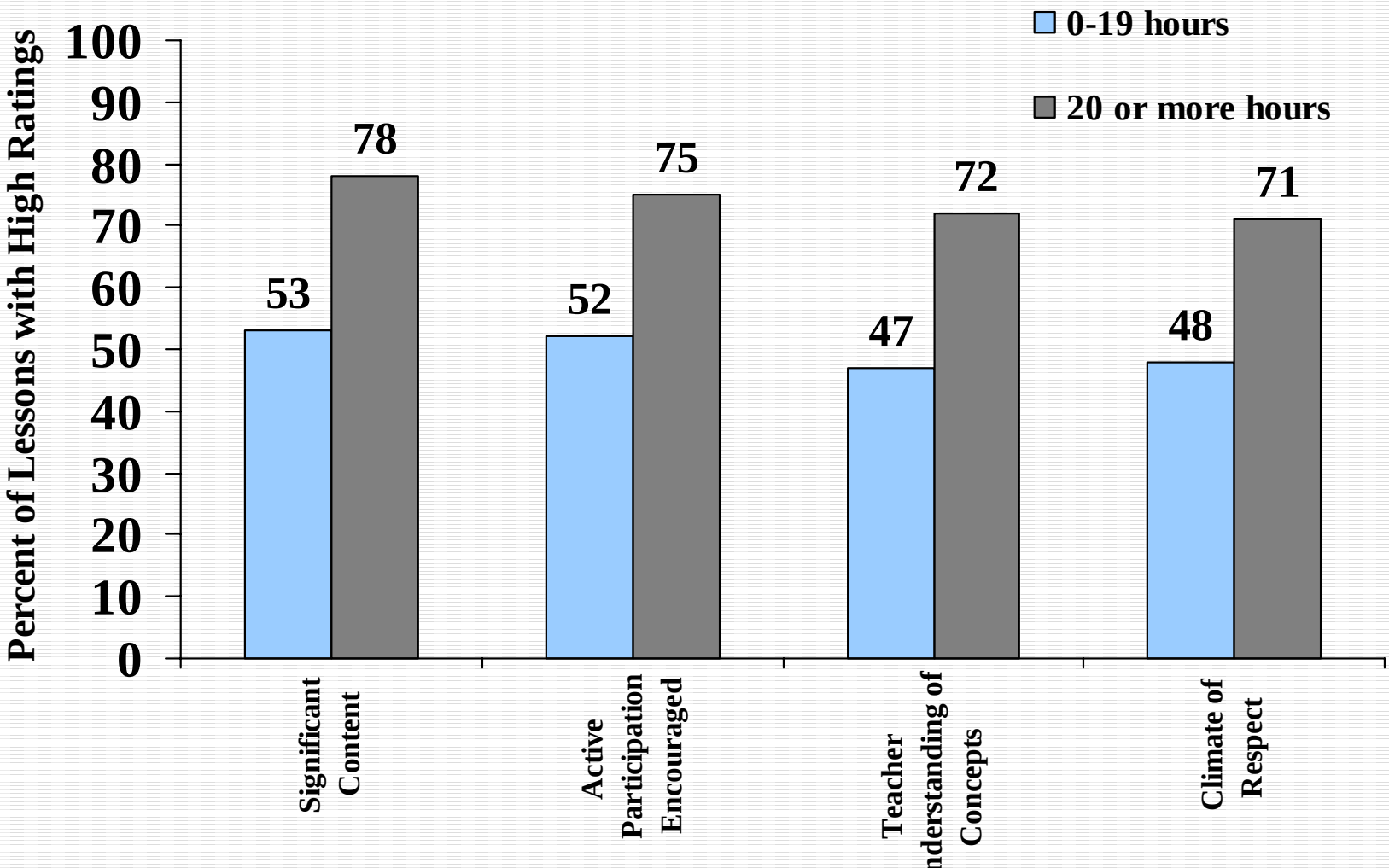
[What I liked best was] the opportunity to do hands-on with other teachers and with the help provided by the facilitators who used it with their students.

They [the trainers] know what works in the classroom. They are actual teachers and they have not been out of the classroom for very long.

Lessons Learned about Professional Development

In many cases we see the “form” of the reform, but not yet substance.

Key Classroom Observation Indicators by Level of Treatment



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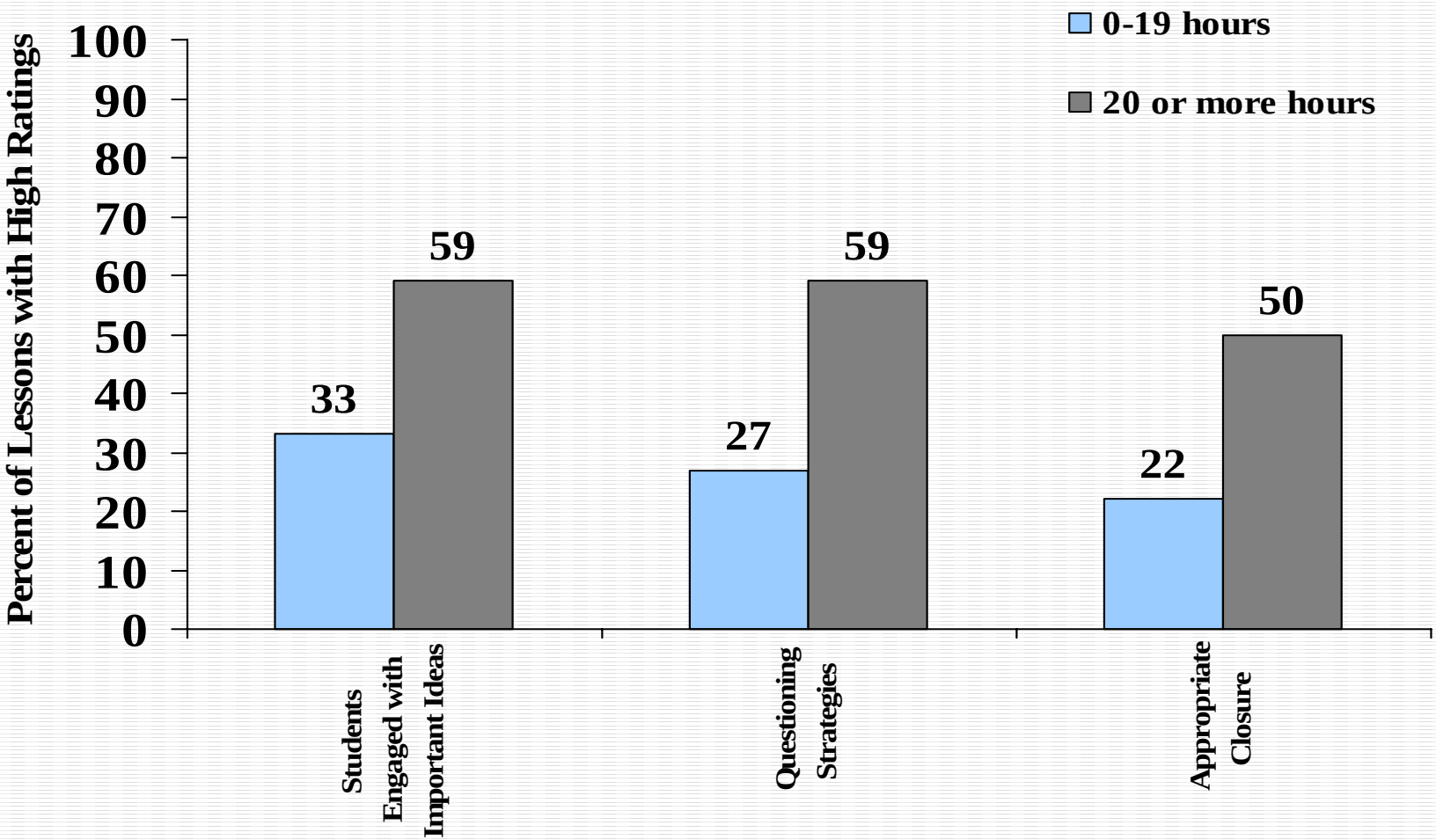


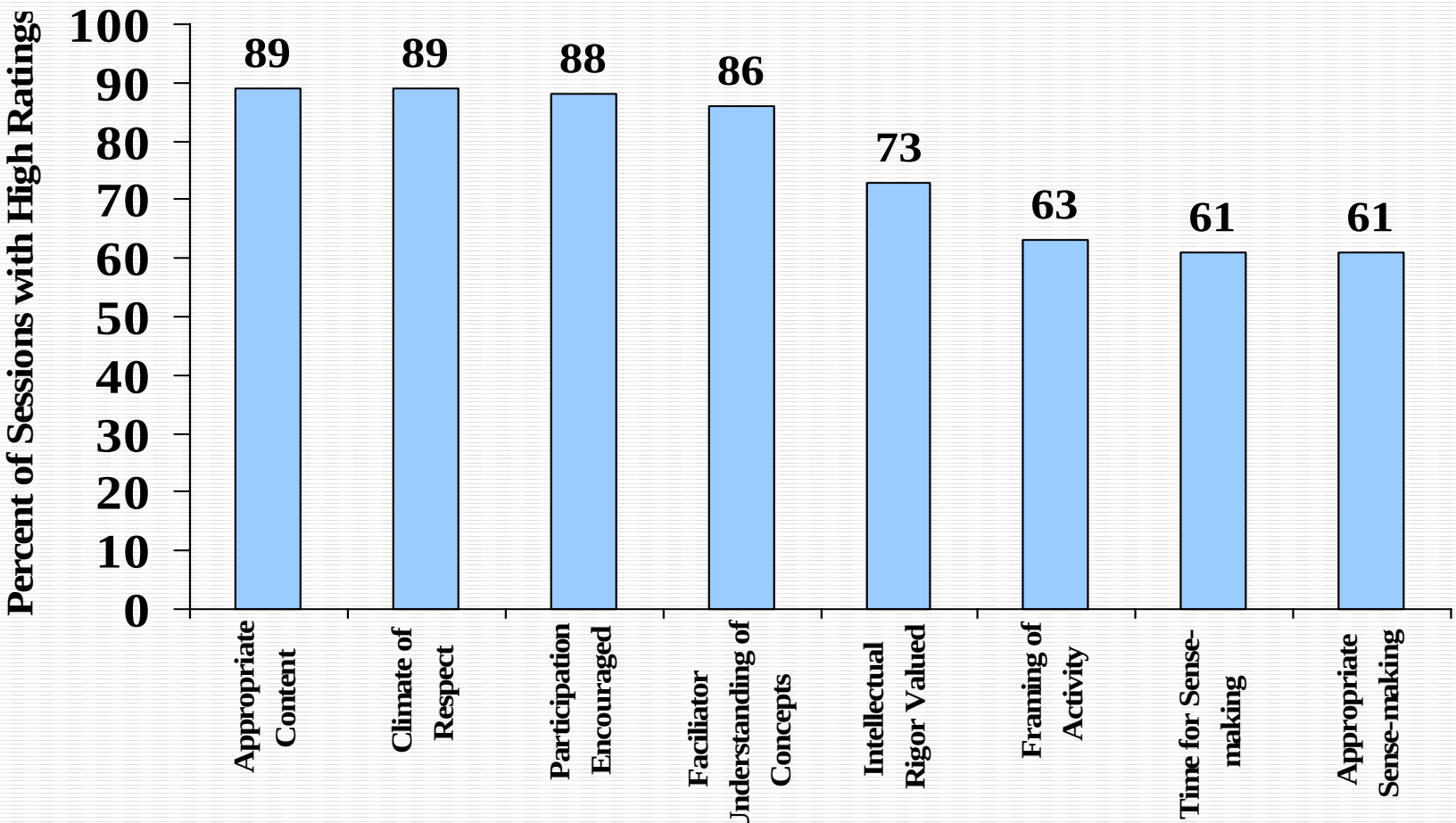
K-8 Mathematics

"Also we could not see any evidence that she [the teacher] understood how the content in the lesson fit into the big picture of the unit… She asked questions and her behavior indicated that she was cognizant of student thinking. However we did not see any evidence of a focus on student conceptual development."

6-12 Mathematics

"In all three lessons observed, teachers did not demonstrate that they understood the content or how the concepts in the lessons they were teaching fit into the concepts in the unit. They tended to zero in on the minutiae of a particular lesson and apparently did not recognize how the lessons fit into the bigger picture of the unit."

Key Professional Development Indicators



Challenges for Professional Development

Continuing education or remediation?

"We're putting them out in immediate need of a 50,000 mile tune-up."

Recommendations

- Focus on the big picture: what important mathematics concepts are being developed?

Recommendations

- Address both content and pedagogy within the context of the student instructional materials

Recommendations

- Emphasize use of materials as developers intended, rather than having teachers develop or adapt materials

Recommendations

- Both model effective pedagogy and make it explicit

Recommendations

- Provide opportunities for teachers to learn from experienced users of the materials

Recommendations

- Provide time for teachers to share experiences and insights and to get help during the academic year

Recommendations

- Provide sufficient orientation and support to teacher leaders and mathematicians

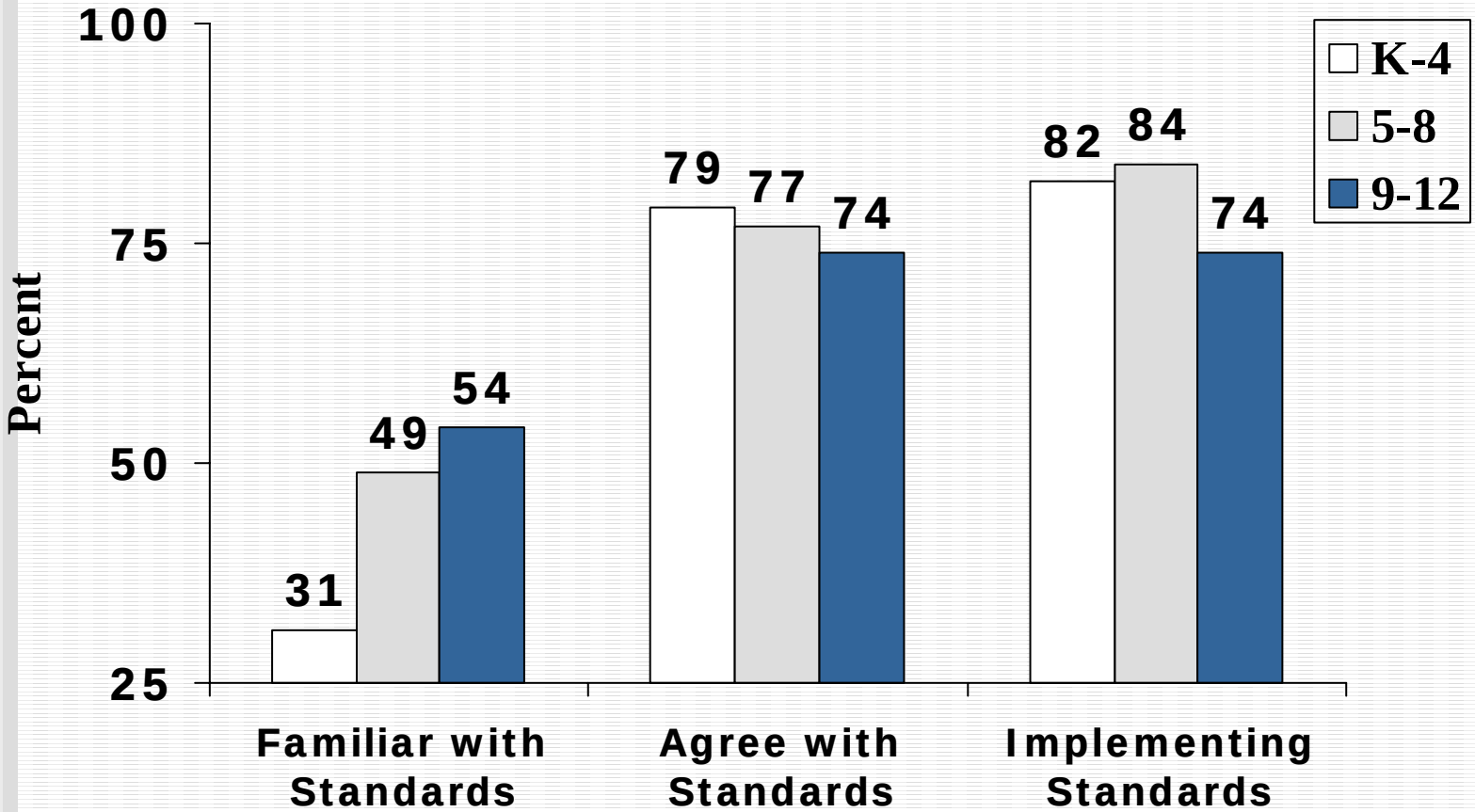
Lessons Learned about Professional Development

Even if professional development was fantastic and teachers really understood teaching for understanding, it is enormously difficult in practice.

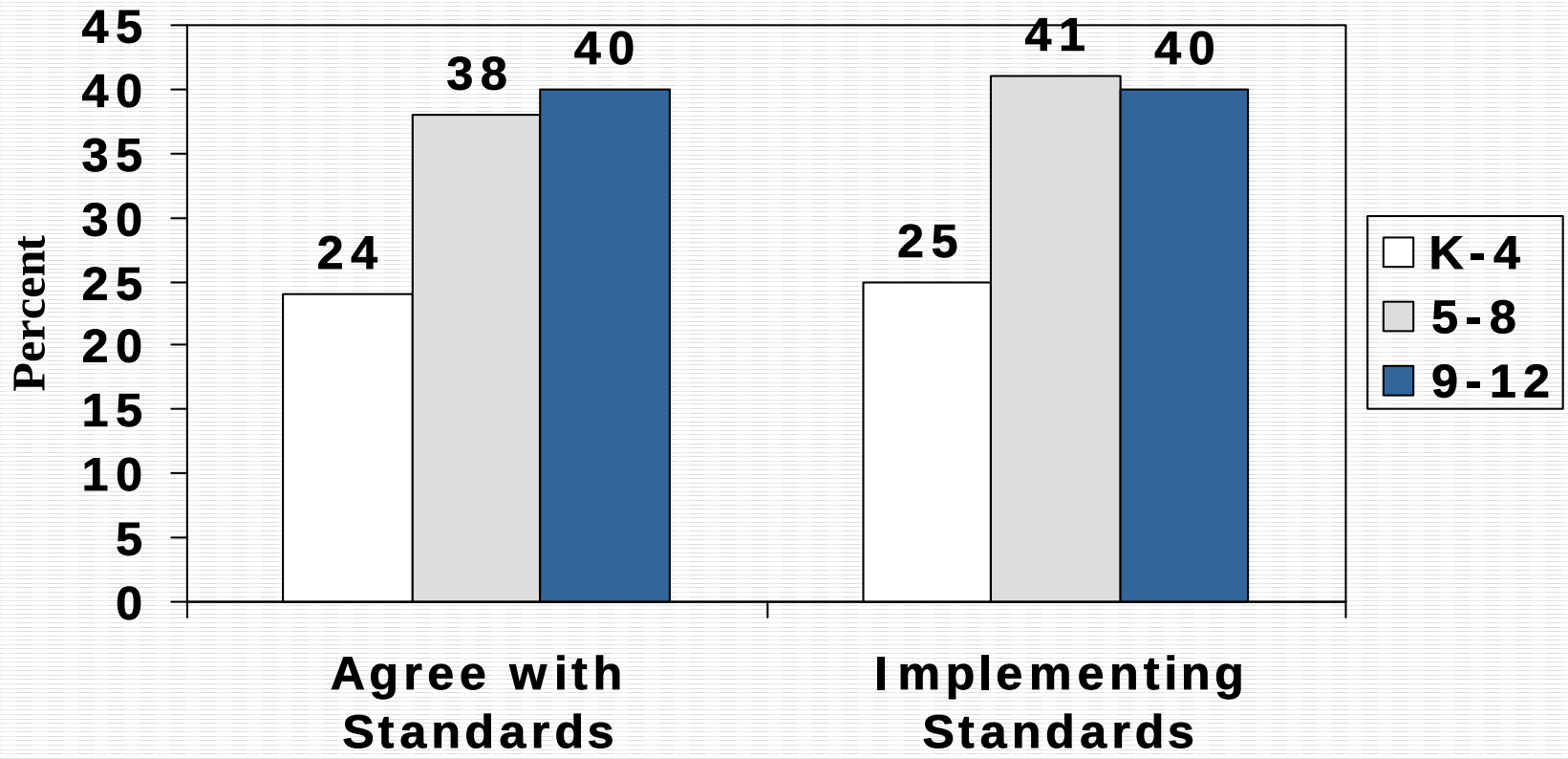
- LSCs definitely not representative
- Videos of “exemplary” classrooms even less representative

- In most districts, “what standards?”

Teacher Opinions Related to NCTM Standards



Percent of All Teachers Reporting Agreeing with and Implementing NCTM Standards



Research

Pre-service programs:

- How can we help ensure that undergraduate mathematics courses teach the recommended content in the recommended ways?

Research

Pre-service programs:

- What is the best use of limited time for K-5 teachers?

Research

Elementary Teachers:

- How do we get coherence?
  - Is teaching for understanding the common thread?

Research

A qualified teacher in every classroom:

- Is lateral entry the right approach?
- Or are we pouring water into a bucket full of holes?

- Need continued development of professional development materials.

Professional Development

- http://te-mat.org

Professional Development

- A National Convocation on Professional Development for Mathematics and Science Teachers: Sept 29 – Oct 1, 2002 Washington, DC

Research

Professional development:

- Need a theory of professional development to guide our designs.
- How do we scale up promising approaches?