Developing Practical Measures to Inform Instructional Improvement Initiatives in Mathematics

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Background

• Three Research Practice Partnerships (RPPs) working to improve the quality of middle-grades mathematics instruction
  • Conduct research with rather than on practitioners

• Outline our perspective on practical measures
  • Supporting improvements the quality of mathematics teachers’ content-specific instructional practices and students’ learning

• CCRS – challenging non-routine tasks
  • Requires students to develop new mathematical capabilities
    • Figure out which procedures to use by analyzing tasks and identifying underlying mathematical relations
Background

• Supporting students’ development of these new capabilities requires significant changes in most teachers’ instructional practices
  • Introduce or launch rigorous mathematical task(s)
  • Small group or individual work
  • Whole class discussion
    • Teacher presses students to:
      • Explain and justify their reasoning
      • Make connections between different solutions

• Substantial teacher learning – requires sustained support
What Does it Take to Improve the Quality of (Mathematics) Teaching on a Large Scale?

• Identifying potentially productive instructional improvement strategies
  • Theory of action for instructional improvement at scale

• Implementing improvement strategies reliably across a range of school and district contexts
  • Improvement science
  • Practical measures
Long-term Goal: A System of Practical Measures

• Practical measures of high-leverage aspects of classroom instruction/learning environments that prior research has linked to student learning
  • Rigor of instructional tasks
  • Launch
  • Small group work
  • Whole class discussions

• Practical measures of supports for teachers’ learning
  • Content focused coaching
  • Teacher collaborative meetings
Illustration: Launch Practical Measure

• High-quality launches enable all students to begin working productively on tasks:
  • Clarify key contextual features of tasks
  • Clarify key mathematical ideas in tasks
  • Develop common language to describe key features
  • Maintain cognitive demand of tasks
    • Avoid suggesting a particular solution method to students
Illustration: Launch Practical Measure

- **Item 1:** Can you picture what is happening in the problem(s)?
- **Item 2:** Do you understand what you’re supposed to figure out?
- **Item 3:** Are you ready to get started?
- **Item 4:** List any words in the math problem(s) that you do not understand

- Specific items as *indicators of improvement*
Developing the Practical Measures of Instruction

Initial design
- Meetings with partners about their improvement focus
- Review existing research

Observe a range of classroom instruction

Cycles of revision
- Revise survey items
- Administer surveys
- Formal qualitative analysis of interviews
- Cognitively interview students
Predicting Future Outcomes

• The outcomes being predicted are typically proximal
  • The practical measures of instruction focus on *the current lesson*

• Launch measure:
  • Predicts whether students will be able to work productively on challenging instructional tasks *in this lesson*

• In the context of instructional improvement work, this is a strength:
  • The resulting data are directly actionable
Using the Practical Measures of Instruction

• Unreasonable to assume teachers will be able to respond productively to feedback on their own

• The practical measures of instruction need to be embedded in supports for Ts’ learning
  • Coaching and teacher collaborative meetings
Using the Practical Measures: Coaching

• Coaches work with teachers in their schools:
  • Work one-on-one with teachers in their classrooms
  • Facilitate teacher collaborative meetings

• Investigating whether practical measures can be levers for and well as indicators of improvement
Practical Measures as Levers for Improvement

- Productive debriefing meetings: Coach presses and supports teacher to connect:
  - Content learning goals
  - Students’ reasoning
    - Classroom observations
    - Students’ work
  - Instruction
    - Classroom observations
    - Practical measures
Practical Measures as Levers for Improvement

• Practical measures data a resource for productive debriefing meetings
  • Specificity of feedback – key aspects of a launch
  • Students’ responses frequently unexpected

• Nature and quality of the evidence of instruction
  • Negotiating improvement goals
Practical Measures as Levers for Improvement

• Instrumental uses: Decisions and actions are made by following prescriptive rules (e.g., assign students below a certain test score to tutoring)

• Coach-teacher debriefing meetings an instance of a conceptual use of data that seeks to explain by connecting data to local action

  (Moss, 2016; Murnane, Sharkey, & Boudett, 2009)

• “It is here that the primary potential of using data to improve schooling lies”

  (Moss, 2016, p.237)
Practical Measures as Levers for Improvement

• Conceptual explanations connect:
  • (Evidence of) students’ reasoning to (evidence of) instruction
    • Can formulate testable conjectures about how to improve instruction

• Conceptual explanations characteristic of:
  • High-quality formative assessment
  • Productive teacher collaborative meetings
  • High-quality professional development

• Contribution of the practical measures
  • Nature and quality of the evidence of instruction
  • Data support conceptual explanations that seek to explain
Using Practical Measures at Multiple levels of the System: District Leaders

• District math specialists:
  • Design and lead teacher professional development
  • Support coaches’ learning
  • Develop curriculum frameworks and guides
Using Practical Measures at Multiple levels of the System: District Leaders

• Measures of instruction provide feedback on impact of improvement initiatives across schools and classrooms
  • Inform focus of coaching and teacher collaborative meetings, design of pull-out professional development
  • Inform improvement of resources (e.g., curriculum guides)

• Differences by grade level, by school
  • Inform allocation of resources
Validity in Use

• Validity theory focuses on intended interpretations and uses of data
  • Overlooks important aspects of how data actually informs and impacts teaching and learning

• A comprehensive validity theory in education needs to:
  • Attend to the ways in which education professionals actually use data in their work
  • Attend to the ways in which educational organizations support data-informed practice at different levels of the system

(Moss, 2016)
Conditions that Influence Actual Use

• Identifying and specifying the conditions that need to be in place for particular practical measures to be used productively should be a key concern of validity theory
  • These conditions are consequential for the impact of the measures

• The ways in which practical measures are interpreted and used are influenced by both:
  • Users’ purposes, perspectives, and understandings
  • The contexts in which they work