Teacher Support for Mathematics Formative Assessment—Effects on Teacher Practice and Student Learning

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**Background**
- Middle-school students report less valuing of mathematics, low effort and persistence in math problems, lower math self-efficacy (Pajares & Graham, 1999; Valas, 2001; Wigfield, Eccles, & Pintrich, 1996)
- Difficulties with self-regulation—organizing thoughts, understanding complex tasks, choosing problem-solving strategies (Pajares & Graham, 1999)
- Students try to avoid complex tasks or pressure teachers to make them simpler (Clarke et al., 2014), but complex problems are required by new standards
- Teachers need strategies to support students in these practices; in math, hard to interpret students’ understanding (Even, 2005; Morgan & Watson, 2002)
- When students are involved in the assessment process, they feel more in control of and responsible for their own learning (Rieg, 2007)
- Peer collaboration can help maintain higher level of cognitive demand (Ferguson, 2009)
- AWSM is intended to support math teachers in using high-quality formative assessment strategies

**Objectives**
- Create professional development that...
  - Is centered on authentic mathematics assessment work samples
  - Provides a facilitator to support teachers in a collaborative peer review setting
  - Leverages formative assessment to improve teacher practice of assessment and increase student learning
  - Use student work samples to focus on key components of formative assessment
  - Use iterative design-research process with two pilot tests

**Approach**
- Sample: seven middle schools and their math teachers in a large urban district in Colorado
- Three-year IES Development grant
  - 2011-2012 materials development
  - 2012-2013 small pilot
  - 2013-2014 larger pilot

**Methods**
- Facilitators meet with teachers 14 times during the school year
- Sessions involve understanding dimensions of formative assessment, discussing and scoring anonymous samples, creating and peer reviewing work samples
- Facilitator helps to develop knowledge of formative assessment, models constructive criticism of the work samples
- Teachers try strategies and share results
- Formative feedback gathered through observations, focus groups, participant questionnaires, facilitator debriefs
- Pre-post measure of teacher assessment practice via work samples
- Difference-in-differences model for achievement on math MAP

**Results**
In focus groups, teachers reported:
- Making an effort to clearly communicate learning goals and success criteria
- Using ungraded assignments so students would understand how well they were mastering the learning goal
- Clear learning goals and success criteria facilitated communication with students and parents
- Formative assessment data helped them differentiate so that students were working on different assignments based on their level of mastery
- Pairing students for structured peer assessment helped understanding, persistence, confidence
- Changing feedback practices to focus on understanding, not just correct answers
- More in-depth math discussions
- Student self-assessment based on success criteria

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**Results**

For proximal student achievement in PD year (7 schools):
- Counterfactual higher than the treatment group at pretest (p < .0001, Glass’s Δ = -.07)
- Counterfactual group higher than the treatment group on the spring outcome (p < .0001, Glass’s Δ = -.08)
- Treatment x time interaction was not significant (p = .80)

For distal student achievement 1 year post-PD (1 school):
- No sig differences at pretest (p =.59) or spring outcome (p = .31)
- Treatment x time interaction was not significant (p = .67)

Post-training-year student data for 6 additional schools will be analyzed, as teachers have used strategies the whole year.

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