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Unpacking Teacher Practice Through a Moves-Based Formative Assessment Framework Using Video-Based Cycles of Inquiry

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PURPOSE

While research has shown that teachers who engage in formative assessment practices may have the most powerful impact on student learning (Black & Wiliam, 1998; Wiliam, Lee, Harrison & Black, 2004; Hattie, 2012), less is known about the development of teachers' knowledge and use of formative assessment as they plan, enact, and reflect on their practice through a cycle of inquiry. Though integrating formative assessment (FA) into day-to-day instruction shows promise for decreasing achievement gaps, it is a complex and challenging practice for teachers (Coffey et al, 2011; Furtak, 2012; Gotwals et al, 2015), and not enough is known about which practices are most effective in particular contexts.

Our qualitative case study focuses on how in-service middle school math teachers plan with, enact, and reflect on specific formative assessment moves (Author A, 2014) and how FA-focused video-based lesson study might foster participants' attention to issues of more equitable learning opportunities for students in middle school math classrooms. Drawing upon a learning progressions framework (Heritage, 2008; Corcoran, Mosher, & Rogat, 2009; Black, Wilson & Yao, 2011), that when applied to *teachers as learners* allows for the exploration and mapping of teachers' conceptions of "thinking and doing" formative assessment, we study the differences between novices and experts, with an emphasis on growth in formative assessment practice for all teachers along a continuum (Shavelson, Moss, Wilson, Author, Baron, & Wilmot, 2010).

The study asked:
1. How do in-service teachers define formative assessment and relate a moves-based framing of formative assessment to their instructional practices?
2. How will teachers apply the FA moves framework during a cycle of inquiry as they plan, enact, and reflect on their mathematics lessons?
3. How might introducing the FA moves framework to teachers during a cycle of inquiry (of planning, enacting, and reflecting) foster participants' attention to issues of fostering more equitable learning opportunities for students in middle school math classrooms?

THEORETICAL FRAMEWORK

While there is no single empirically validated theory of teacher learning on which we could have designed our model of professional development (Borko et al, 2010), we agree that professional development for teachers should be collaborative, teaching-for-practice focused, and situated in authentic problems of teaching and learning (Lampert, 2003; Ball & Cohen 1999; Borko et al,

2010; Sleep & Boerst 2012). The video-based lesson study professional development experience for teachers we designed is built around a cycle of inquiry, with sessions dedicated to planning, enacting, and reflecting on teachers' FA-driven lessons because we view teaching as a cyclical process and that time spent articulating, unpacking, and reflecting practice holds great potential for improving teaching (Grossman, 2005; Grossman et al, 2009).

Recognizing that it may be difficult for teachers to change their assessment practices quickly (Cizek, Fitzgerald, & Rachor, 1996; Stiggins, 2001; Webb & Jones, 2009; Bennett, 2011), we designed the cycle to facilitate "moves-based" discourse among participants who shared a common challenge (Ball et al, 2009). Responding to calls for a common grammar of practice (Grossman & McDonald, 2008), we shared with teacher-participants an intuitive language (*priming, posing, pausing, probing, bouncing, tagging and binning*) for formative assessment moves, in order to invite more productive discussion about the rationale and choices a teacher makes at particular turns of talk with students during lessons.

This moves-based framing of formative assessment, the "FA moves" framework (Author A, 2014), conceptualizes formative assessment as a dynamic, pedagogical process of moves between teacher and students (See figure 1). It helps teachers to learn more about students' understandings and to productively respond to those understandings (not merely "misconceptions" or "wrong" answers) during instruction. It requires acts of planning, instructing, and reflecting on soft data to make better decisions. It places a premium on feedback loops in classroom talk, building up of repertoires of auditory and verbal skills, and providing instructional space for students to use academic language and register during lessons. Teachers engaging the FA moves framework have reported the framework helping them to fostering equity of participation and access to content in their middle school mathematics classrooms (Author A, Author B, Rossi Becker, 2017).

Our choice to focus on a small group of mathematics teachers (n =6) reflects acknowledgement of the role student achievement in middle school mathematics can play in college-going trajectories (Balfanz, 2009). It also reflects our commitment to adhere to characteristics of PD cycles that research consensus asserts are critical to increasing teachers' practice (Desimone, 2009): content focus, active learning, coherence, duration, and collective participation. We strove to enhance teacher-participant experience of coherence and active learning by making the FA-driven cycle of inquiry adaptive, iterative, and practice-based (Horn, 2008). Teachers exercised autonomy and made choices (e.g., lesson topic covered, timing of video recording of lesson enactments, which video clips to analyze, ground rules for feedback) within the cycle of inquiry. The number of participants ensured a high quality experience.

Video recordings of practice augmented the process of unpacking teaching and assessment *for* learning during a cycle of inquiry. (See, e.g., Santagata, Zannoni & Stigler, 2007; Tripp & Rich,

2011; Blomberg et al, 2013). Video allows a community of teachers-as-learners to slow down, unpack, and critically examine classroom interactions and cultural routines while keeping a focus on the guiding content-based questions for the PD. The stop-motion nature of personalized, video-based conversation allows the teacher-presenter to *own* the lesson while trusting colleagues to offer advice for improvements based on a well-defined FA moves framework. This design affords multiple opportunities to observe, analyze, and discuss the nuance of practice from insider and outsider perspectives (Darling-Hammond & Sykes, 1999; Stigler, Gallimore & Hiebert, 2000).

METHODOLOGY AND DATA SOURCES

We employed case study methods to address our research questions (Yin, 2014). We set the boundaries of the case within one cycle of inquiry: participants' planning a lesson using a common lesson planning template, enacting their lessons (which we video recorded), and reflecting on their lessons. Given the emerging knowledge base of a teacher learning progression regarding formative assessment practices in the classroom (Author A & Author B, 2017), a case study approach was the most appropriate method and allowed us to exercise an iterative data collection and analysis process (Creswell, 2013). We relied on qualitative data from pre- and post surveys, interviews, teachers' lesson plans using a common lesson planning template, video recordings of lessons, document review and post-video interviews using a video-stimulated recall (Sherin, Russ, & Colestock, 2011) protocol. All interviews were transcribed. Memos written immediately following interviews and lesson observations augmented analysis.

Participation was voluntary. The six seventh and eighth grade mathematics teachers (n=6) taught in a high-needs K-8 school district in California. Average class size was 30. On state tests taken two years prior to this study fewer than 42 percent of students in the teachers' classes met or exceeded standards in mathematics and English Language Arts.

Participants' years of teaching experience ranged from two to thirty. Four participants had taught mathematics for more than 15 years. Four held undergraduate degrees in mathematics or engineering. One taught mathematics at community college. All had 2-4 years experience teaching middle school students with the mathematics curriculum.

Data analysis aimed at answer the research questions and identify themes and categories (Miles and Huberman, 1994). To verify and compare recurring themes, we triangulated the evidence ensuring we had data from each stage of the inquiry cycle (planning, enacting, reflecting) to support conclusions. Self-report data (interview and survey responses) were triangulated with lesson plans and lesson enactment evidence (video clips) during analysis.

FINDINGS

Our empirical study focuses on how in-service teachers take up three specific instructional questioning moves--*posing, pausing, and probing* --associated with formative assessment practice, and attempt to coordinate those skills with other pedagogical goals for the classroom, including fidelity to the new Math Standards (CCSSI, 2010) which emphasize student elaboration and verbal sense-making routines.

According to observed data (video clips) and interview data the experience of unpacking one's own practice through the lens of the FA moves during a cycle of inquiry led to transformations in how study participants defined FA and their beliefs and practices about how they could foster better equity and access to content in their middle school mathematics classrooms. (We highlight two cases and present all six in the full paper).

"Tom's" transformation
When teacher Tom began the cycle of inquiry, he defined FA as "checking for understanding" and "discovering misconceptions." Tom's definition expanded to include "engaging students emotionally and academically." Reflecting on his video clips through the lens of the FA moves inspired him to renew focus on student engagement--*priming* for *all* his students, especially the ones Tom described as "when you turn your head they're disengaged." By foregrounding his question moves, Tom began to more deeply examine his *bouncing* strategies and how he could better *tag* student responses to ensure equity of voice for his ELLs.

Tom credited his video lesson experience with catalyzing changes in how he formed and worked with groups of students. Since the cycle, he had put "the struggling students" in "his group." He was focused on increasing interactions that gave "more scaffolding. More baby steps." The FA moves gave Tom different ways to support these students via "flexible moves." This differed from "just urging them 'use your brain, use that brain of yours,'" which was Tom's interpretation of his interactions with these "struggling students" captured on video.

"Brianne's" transformation
At first Brianne defined FA as "ongoing assessment" conducted while students were working in groups. FA was "fun" and "visual discovery." While "doing FA" students got "feedback" without a clear purpose or learning target. Brianne's insight into her pausing moves, particularly when she planned for specific posing and probing prompt tied to the unit inspired her to "get more systematic" with her instruction. Though Brianne wanted to "teach for conceptual understanding," she saw that her *posing, pausing* and *bouncing* enactment translated into not eliciting enough information about her students' understanding. This happened during whole class instruction and group time: "I really didn't know if students understood the differences between linear and exponential functions, or if they were just following their groupmates."

During the cycle of inquiry, Brianne came up with a *bouncing* technique she called "4 corners and center" to hear from more students. To improve her posing moves in the next cycle, Brianne committed to trying a "questioning bank." During the video reflection phase, to give "everyone a chance to speak," Brianne resolved to "wait more" and plan better transitions.

SIGNIFICANCE, LIMITATIONS AND FUTURE DIRECTIONS

Our work adds to the existing knowledge base on the use of teachers' reflective practices to advance the skills required to bring about more powerful classroom mathematics discussions and make teaching and learning more visible. As Hattie (2012) argues, "when teaching and learning are visible, there is a greater likelihood of students reaching higher levels of achievement (p. 21). Yet making teaching and learning visible requires an accomplished teacher as evaluator and activator (Hattie, 2012).

Our study suggests that the FA moves framework for focusing the unpacking of teaching practice during video-based professional development expands mathematics teachers' notions of what formative assessment is and surfaces new ways of seeing students' engagement with lesson materials. Because our study focused on mathematics teachers, we cannot say if this would be true for teachers of other disciplines including ELA (Author B, Author A, and Lovell, 2015). More research is needed to explore the influence of discipline specific knowledge and student learning progressions (see e.g., Lehrer, Kim, Ayers, & Wilson, 2014) on the nature of FA practice.

We address the question of how formative assessment-focused cycles of inquiry might foster teachers' attention to issues of equity and access in middle school math classrooms. Focused on middle schools grappling with the Common Core Standards and the goals of increasing student listening and talking skills in diverse classrooms, our video-based work around a cycle of inquiry is providing a common language for formative assessment that is accessible, useful in a variety of contexts, and contributes to stronger connections across research communities and communities of practitioners.

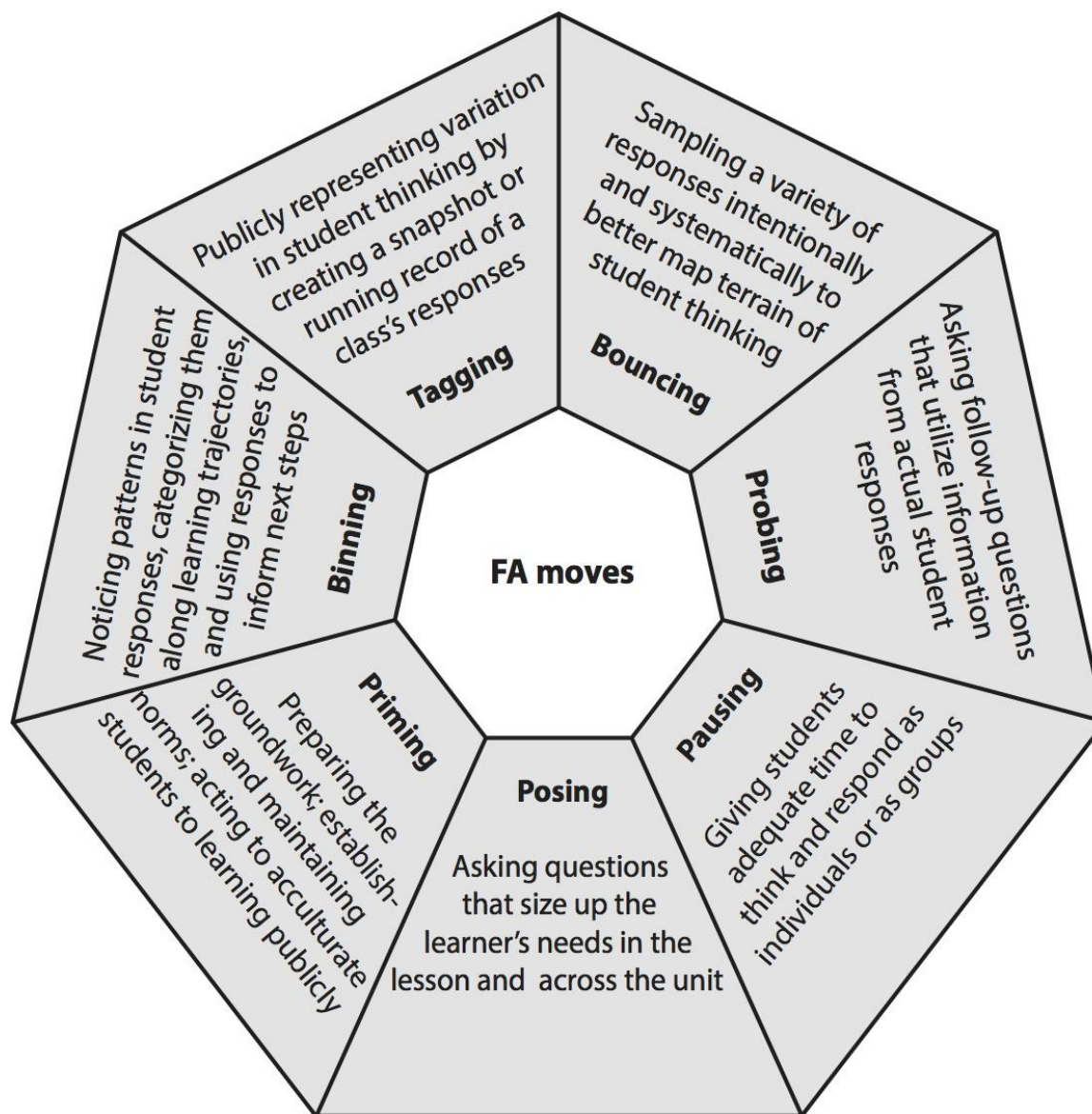[one figure and references follow]

FIGURE 1

Figure 1: FA Moves Wheel

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