REFRAMING FAILURE: AN ANALYSIS OF HIGH SCHOOL MATHEMATICS TEACHERS' LEARNING

Nicole A. Bannister
Clemson University
nbannis@clemson.edu

This paper examines how teachers engaged in equity-oriented reforms learn through interactions in teacher groups. Analysis of teachers' framing of a freshman mathematics student failure problem showed that over time teachers' frames shifted from invariable framings based on student characteristics and systemic issues to actionable framings based on classroom systems contributing to student failure, thereby promoting teachers' concentration on courses of action linked to instruction. By joining the frame analysis and community of practice literatures, this study contributes an empirical example of development within teacher community alongside analytic tools for documenting teachers' learning within these groups.

Research suggests that teachers' participation in a strong teacher community has the greatest potential for yielding the kinds of teacher learning that produces equitable student outcomes, though what that learning is or how it might be taking place is largely unaccounted for in the literature (Gutiérrez, 1996; Horn, 2005; Little, 2003; McLaughlin & Talbert, 2001). This "black box" of teacher learning (Little, 2003) has resulted in schools and districts moving forward with well intentioned yet underconceptualized reforms involving *professional learning communities,* based on an inferred causal connection between teachers' participation in these communities and improved student achievement. Many teachers have nevertheless been required to spend professional development time participating in what Grossman and colleagues (2001) call *pseudocommunities*, characterized by members "playing community" and behaving "*as if* we all agree" (p. 955), which surely sidesteps the important work that needs to be done inside of the professional learning community to achieve equitable student outcomes. This paper addresses this phenomenon by examination of the professional community as a learning resource for teachers. The research question driving this investigation asked: *How do teachers engaged in equity-oriented reforms learn through interactions in teacher groups?*

Theoretical Framework

Teachers' Learning in a Community of Practice

Teachers' participation in their professional communities is a social endeavor. This activity catalyzes a dual process of participation and reification, which is the fundamental process through which learning happens (Wenger, 1998). This learning-as-a-social-phenomenon stance supports a more general conception of teacher community, meaning that these groups do not necessarily have a certain level of functioning, improvement-oriented stance, or meet some other criterion; rather, they are the places where learning unfolds (Coburn & Stein, 2006). By adopting a *community of practice* perspective – which Wenger (1998) characterizes as communities where members are mutually engaged in an activity, held together by a joint enterprise, and have a shared repertoire of customs for praxis – *learning* is defined as a change in participation within that community. This definition of learning recognizes the co-construction and distribution of knowledge across teachers and takes the wider social context into consideration. This framing is critical for this study because it allowed for an equity-oriented description of the teacher group in

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

my study with the understanding that such a description is neither unitary nor consistent, which helped me see teacher groups for what they are: key sites for negotiation of meaning related to their joint enterprise (Coburn & Stein, 2006).

Frame Analysis as a Means for Capturing Learning

This study aimed to understand teachers' learning through interactions in a community of practice context, and so conceptual tools that capture learning as changes in participation within the group are needed. Theoretical and empirical work on frame analysis proved useful for making sense of these interactive learning processes as they unfold (Benford & Snow, 2000; Goffman, 1974; Snow & Benford, 1988). Snow and Benford (1998) use the verb *framing* to conceptualize the signifying work of spreading ideas, meaning making, and mobilizing others into action. I borrowed conceptual tools from this work and coupled this literature with the communities of practice literature because of their common interest in understanding the processes surrounding participants' interaction, with focus on "how people use interpretive frames strategically to shape others' meaning-making processes in an effort to mobilize them to take action" (Coburn, 2006, p. 347). By analyzing teachers' framing processes, I gained analytic purchase on making sense of teachers' engagement in these negotiation of meaning processes, such as how participation in teacher groups and reification of equity-oriented reforms shaped their ideas and guided the community's action. It stands to reason that teachers' collective engagement in framing processes is likely to generate evidence of and describe changes in teachers' participation in a community of practice (Wenger, 1998), which I interpret as evidence of learning. Thus, examination of the ways in which teachers engage in framing processes through interactions in teacher groups stands to result in more manageable units of interactions for the analysis of their learning.

Methods

Context, Settings, and Participants

This research takes place in the context of *Adaptive Professional Development,*[1] a larger design-experiment project situated in part at Clark High School (all names are pseudonyms), a diverse, large, urban comprehensive high school in a large northwestern school district in the US. Our research team worked with the Clark mathematics teachers using a mutual appropriation approach – that is, we collaborated with the teachers to create activities that fit theoretical principles about equitable mathematics teaching while serving the teachers' goals (Cole, 2006). Our precepts included pedagogical principles about equitable mathematics teaching, such as the use of pedagogical strategies to engage learners in important mathematical ideas (Boaler, 2002; Horn, 2006; Moses, 2001). In addition, we used learning principles for teachers, such as prioritizing providing teachers with collaborative time in the school day to make sense of new practices in their classrooms (Horn, 2005, 2007; Horn & Little, 2010).

During the 2004-2005 school year, I followed the interactions of the mathematics department at Clark in my role as a researcher. I observed classrooms, attended department meetings, and provided classroom support to teachers. Susan, a veteran teacher, confided that she struggled with issues related to students, teaching, and mathematics. She asked for my help and so I provided her with additional classroom-based support several days per week, such as co-planning instruction, revisiting content, modeling teaching, making sense of student work, and interpreting student interactions. However, even with this support Susan still faced a crisis: over 75% of her freshmen students were failing her first-year mathematics course. This crisis caused

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

the other teachers of first-year mathematics to examine their pass rates, and the results were stunning: more than 50% of students taking the first year (9th grade) mathematics course at Clark were failing. Teachers were in a panic over these data and asked our research team to help them make changes to their existing curriculum and pedagogy with the aim of improving all the success of all students.

Realizing the ambitious nature of the Clark teachers' plans for implementing starkly different pedagogical and curricular equity-oriented reforms, our team designed an intervention for the 2005-2006 school year to support their reforms. We created the "Freshman Team" intervention by providing the four teachers of first year mathematics with an extra planning period (in addition to their personal planning period) so that they would have dedicated time each day during the school day to collaborate around issues of teaching and curriculum. We also helped Clark find a new teacher trained in equity-geared teaching practices who could take on the "missing" four first year classes, in addition to being a part of the collaborative team and having her own personal planning period. The Team was composed of five teachers: Susan (10+ years experience), Zack (3+ years experience), Rose (30+ years experience), Julie (5+ years experience), and Linda (new teacher). The Team met during every sixth period meeting, and in a typical week they had three 50-minute meeting and one 110-minute meeting.

Research Strategies

I crafted a case study around the Freshman Team at Clark because this method focused the investigation and analysis on the complexities and particulars of teachers' learning around about struggling students in context of equity-oriented reforms (Merriam, 1998). Sustained attention to one group and context fostered in-depth exploration and analysis of the "richly brewed particulars" (Dyson, 2005, p. 2) of teachers' learning. These choices ultimately allowed me to use the case of Clark to theorize about teacher learning inside teacher community more generally and respond to a need for case studies of this nature (NAE, 2008).

My study targeted high school mathematics teachers because they teach a high status, high stakes content area that consistently plays a gatekeeper role for students (Moses, 2001; NRC, 1989; Schoenfeld, 2002). Making matters worse is the fact that a disproportionate number of poor and minority students compose this group, meaning that working-class students and students of color are marginalized in their mathematics classes more than their peers (Moses, 2001). These harsh realities have renewed interest and urgency in creating *equitable mathematics classrooms*, which I characterized as spaces where we cannot distinguish high performers from low performers based on race and social class (Schoenfeld, 2007). Following Martin's (2006) lead, "race is viewed here as socially, politically, and relationally constructed so that issues of marginalization, power, dominance, and devalued social status assume prominence" (p. 198). Moreover, these classrooms are spaces where "mathematical identities, excellence, and literacies of marginalized students" (Gutierrez, 2008, p. 357) are supported.

I focused my study on teachers engaged in equity-oriented reforms for two reasons. First, in keeping with prior reasoning, a specific portrait of teacher learning about equity-oriented reforms directly speaks to single-system attempts to change disparities in student achievement by educators. To achieve this goal, I selected a group of teachers who not only chose to engage in equity-oriented reforms but who also had some success with their efforts to improve equitable outcomes. This particular group is made more exceptional as case of teacher community because it was designed for optimizing teachers' learning (e.g., attending to issues of equity through conversations about curriculum and pedagogy became a part of teachers' daily work) and had

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

considerable external support by our research team.

Second, there is presumably a greater impetus for teachers engaged in equity-oriented reforms to question their assumptions and practices, thereby rendering their learning more visible. I made this assumption because a major goal of equity-oriented reforms involves providing *all* students with opportunities for making sense of essential mathematics ideas. It follows that the conditions surrounding teachers' enactments of reform, such as instruction and classroom culture, must also align with this goal in order to yield equitable outcomes. As such, my focus on a group of well-resourced, highly motivated teachers collectively engaged in equity-oriented reforms was a strategic choice for increasing observable instances of teachers' collective sensemaking about these reforms.

I collected a variety of qualitative data about the teachers' work, including audio records and fieldnotes of Team meetings, artifacts from Team meetings and activities, and teacher interviews. Primary data were transcriptions of audio records from Team meetings. The data corpus was designed to capture teachers' framing of the struggling student problem over time in context of their equity-oriented reforms. The data set included 35 records of Freshman Team meetings, 31 of which were from weekly long meetings. Of the 35 meeting records, 26 had fieldnote records and 32 meetings had audio records.

Data Analysis Procedures

I began data analysis by strategically reducing my data set using my unit of analysis, *episodes of pedagogical reasoning* (EPRs), which Horn (2005) defines as "units of teacher-to-teacher talk where teachers exhibit their reasoning about an issue in their practice" that are "accompanied by some elaboration of reasons, explanations, or justifications" (p. 215). My decision-rule for locating EPRs was based on topical shifts related to struggling students. After, four episodes were selected for closer analysis because they contained extended talk about the struggling student problem. I selected episodes that (a) represented development across time, (b) had three or more Team members present, (c) had quality records available, and (d) had substantive discourse dominated by teachers.

Date	Oct. 2005	Jan. 2006	March 2006	May 2006
Diagnostic Frames for Struggling Students	Fixed Student Attributes	Personal and Systemic Issues	Classification Schemes for why Students Struggle	Status, Race, and Tracking
Proposed Solutions (Prognostic Frames)	Inform parents of problem and changes students need to make	Conceptual solutions (e.g., see students as capable, students should take math in evening)	Student and peer observations; Email students' other teachers for strategies and extra support	Expand implementation of and training in Complex Instruction
Location of Problem ⇩ Location of Solution	Student ↻ *Invariable*	Personal Circumstances, The System ↻ *Invariable*	Abilities Students are not Good at Yet ⇩*Actionable*⇩ Classroom-based Interventions	Classroom Enactments of Society and The System ⇩*Actionable*⇩ Classroom-based Instructional Responses

Figure 1: Overview of Teachers' Framing Practices

The transcripts and corresponding meeting summaries for selected EPRs were coded using

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

three core framing tasks identified by Snow and Benford (1988) to help identify how teachers framed the struggling student problem in context of their equity-oriented reforms. Specifically, I looked for (a) *diagnostic frames* to understand how teachers conceptualized the struggling student problem; (b) *prognostic frames* to understand how teachers conceptualized interventions related to the struggling student problem; and (c) *motivational frames* to understand how teachers made a case for their framing. After coding the transcripts of the EPRs for these framing moves I looked for themes within and across the data (see Figure 1 for an overview).

Results

Finding 1: Evidence of Within-Group Development in a Teacher Community

Teachers' Shifting Frames Show Development within a Teacher Community over Time.

The Freshman Team teachers concentrated on diagnosing struggling students in the episode from October (EPR 1), including invariable student characteristics related to work ethic and classroom behavior. Though teachers agreed to send home good news cards, call parents, and mail home letters with improvement strategies, by locating their diagnoses within the context of fixed student characteristics teachers had little access to actionable responses proximal to everyday instruction. In January (EPR 2) teachers' initial diagnoses of struggling students were challenged by information learned from reviewing academic histories of identified struggling students: ELL students and special education students were not supported when they were mainstreamed into a regular classroom, some students only recently performed poorly, and some struggling students had slipped by unnoticed. Participants put forward conceptual strategies such as encouraging students to take an evening class, moving students to work with another teacher, and seeing students as capable. Teachers were once again left with little actionable responses proximal to everyday instruction, though their diagnoses generally shifted away from simple assignment of blame, such as struggling students are students who "choose to fail," and trended towards external factors that influenced students' performance, such as lack of ELL support and special education transitions.

In March (EPR 3) teachers used classification schemes (Horn 2005; 2007) to diagnose the "core group of struggling students that seem to drive the whole school crazy," which included locally meaningful categories like the Taylors (smart students who are lazy) and the Paiges (students who are very far behind their peers academically). Teachers went beyond these categories and offered reasons why these students perpetually struggle, such as with students like Autumn, who had never experienced what it felt like to be successful in math class. Teachers presented myriad strategies for action, including the systemic response of generating a school-wide list of struggling students so that a comprehensive effort could be made to help them. More proximal classroom responses included strategies such as using a new teacher to help run triage with difficult students, peer and student observations, and emailing struggling students' other teachers for ideas and to garner additional support for students. This episode highlighted teachers' increasing specificity with their diagnoses of why students' struggle, resulting in a larger repertoire of actionable responses and focus on classroom-based intervention strategies.

In May (EPR 4) teachers considered the effects of status and race on the struggling student problem. Rose made the diagnosis that "white kids automatically have more status" because of Clark "not having a middle" and "not having a good pool of white kids" in Math 1. Though Rose's prognosis was unclear, Julie extended the status problem idea Rose originated by diagnosing the growing racial divide of students caused by the tracking practices that were in place at Clark. Julie made meaning of Rose's "not having a middle" and "not having a good pool

of white kids" comments by linking these problems to tracking (as opposed to suggesting abstractly that they need more "good" white kids in Math 1 at Clark). Teachers talked through the pros and cons for a variety of solutions to the tracking problem, such as offering a within-class Honors option, using harsher grading schemes, calling all classes Honors, giving placement tests, and detracking altogether. Rose ended the episode with the diagnosis that the most important strategy for these issues relates to groupwork, thereby linking the problems of status, race, and tracking with the Team's pedagogical reforms. Though teachers' diagnostic frames reflected classroom enactments of society and the system, their solution frames reflected classroom-based instructional responses.

What is important to note is that teachers' diagnoses in later episodes contrasted earlier diagnoses, especially the in the first and second episodes where teachers were focused on understanding the attributes of struggling students. While teachers continued to use frames related to fixed attributes and personal circumstances, their primary diagnoses shifted towards the nuances behind why particular students struggle and status-related issues. While the former frames places the onus for achievement primarily on the students, the latter provide teachers a means for action. Teachers' frames became more nuanced in their representation of the struggling student problem, disentangling issues of ability from school-savvy and systemic problems like racism and tracking. Thus, there is a preponderance of evidence that shows how teachers developed and drew upon a larger repertoire of frames of the struggling student problem over time, with focus and priority given to solution frames that were related to everyday instruction. More generally, by tracking teachers' shifting frames around problems of practice, the case of the Clark Freshman Team offers a counternarrative to static characterizations of teacher community and shows within-group development in a teacher community over time.

Finding 2: Evidence of Teachers' Collective Learning

Teachers' Collective Learning is Manifested through their Framing Practices.

Examination of teachers' framing practices across episodes yielded teachers' evolving narratives of the struggling student problem, which I claim made teachers' learning in the Freshman Team community of practice more transparent. Teachers' participation in the Team gave them the opportunity to engage in extended talk about the struggling student problem. Participation in these conversations fostered teachers' reification of the struggling student problem, evidenced by the different frames they used to diagnose problems, propose solutions, and give rationale for their ideas. The participation and reification processes worked in tandem to coordinate and localize the meanings of these frames. The prior result showed how teachers' reification of the struggling student problem changed through interactions in their teacher group. These shifts served to mark and describe changes in teachers' participation in a community of practice, which is a process Wenger (1998) characterizes as learning. This analysis thus showed that the Clark teachers' collective learning was manifested through their framing practices.

As an illustration, in October (EPR 1) each teacher participated in the Team debriefing and reified the struggling student problem through diagnoses that centered on fixed student attributes. In January (EPR 2) teachers developed a community-owned framing for why students struggle (struggling students must not understand anything and must be used to failing, which is a status problem), which depended on teachers modifying another teacher's framing. In March (EPR 3) teachers reified potential classroom-based interventions using specific students as representative cases for a larger group of struggling students. Teachers intertwined their category systems and frames and then negotiated meaning around these frames through the processes of participation

and reification, out of which their classroom-based interventions emerged. This resulted in conversation turns that contained different kinds of linked frames that had the overall effect of building resonance for their ideas with the Team. In May (EPR 4) teachers again intertwined and linked their framing practices to negotiate the meaning of status, race, and tracking in context of the struggling student problem. What is significant is how the Team negotiated the meaning of all these frames; the Team haggled over every offered frame. This important process helped the Team iteratively make progress on their collective understanding of these issues.

Teachers increasingly used a variety of linked frames to help build resonance for their ideology, courses of action, or rationale for action, which likely contributed to which frames were picked up or ignored by the Team. What is more, teachers moved towards using the group to negotiate the meaning of these frames, which corresponded to episodes with more actionable solution responses. By examining shifts in the Team's framing of the struggling student problem in the context of their engagement in fundamentally temporal, fundamentally social learning actions, this dissertation documented the Team's movement towards more classroom-based actionable responses and away from less obvious actions based on invariable student characteristics. These shifts accounted for a change in participation in the Freshman Team, which contributes an empirical example for teachers' learning in a community of practice.

Discussion

This paper aimed to describe high school mathematics teachers' learning as they took on issues of equity in their workplace group. As with many stories of learning, my data tell a developmental story, though not a linear one. My analysis thus required tools that could preserve the messiness of learning and at the same time tell a nuanced learning story in a productive way, which I accomplished by joining the communities of practice and frame analysis literatures. Analysis showed that teachers' frames shifted from invariable framings based on student characteristics, personal circumstances, and systemic issues to actionable framings based on classroom systems that contributed to student failure, which promoted teachers' concentration on courses of action linked to their instructional practices. As a result of this analysis, this study yielded significant findings about teachers' shifting framing practices and learning, and advanced the literature with analytic tools for making sense of teachers' development, shifting frames, and learning in context of teacher groups.

As is often the case with the study of rich data, this analysis raised issues that merit further study. For example, the process of offering frames appears to catalyze a response by the group, creating potential for group interactions around this framing. Through more research is needed to confirm my speculation that offering and then discussing rams around problems of practice yields productive learning opportunities inside of teacher community, my hypothesis is that this avenue of research would generate findings that help explain how opportunities to learn connect with teachers' learning inside teacher community. A limitation of my analysis is that I do not make claims about teacher's individual learning, though my speculation is that an individual's consistent orientation to invariable frames closes off learning opportunities readily available and important to the group. This raises an emerging analytic issue concerning learning opportunities alongside analysis of individual learning that merits further study. Moreover, I predict that my use of key conceptual tools from frame analysis was but the tip of the iceberg when it comes to the application and utility of the larger social movement literature to the teacher community and teacher learning literatures; in any case, more research needs to be conducted to understand the interplay of these literatures and open up an entirely new way for conceptualizing this work.

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

Endnotes

1. Ilana Horn, Principal Investigator.

References

Benford, R.D., & Snow, D.A. (2000). Framing processes and social movements: An overview and assessment. *Annual Review of Sociology, 26*, 611-639.

Boaler, J. (2002). Learning from Teaching: Exploring the Relationship between Reform Curriculum and Equity. *Journal for Research in Mathematics Education, 33*(4), 239-258.

Coburn, C. E. (2006). Framing the problem of reading instruction: Using frame analysis to uncover the microprocesses of policy implementation *American Educational Research Journal, 43*(3), 343-379.

Coburn, C. E., & Stein, M. K. (2006). Communities of practice theory and the role of teacher professional community in policy implementation. In M. Honig (Ed.), *New Directions in Education Policy Implementation: Confronting Complexity*. Albany: State University of New York Press.

Cole, M. (2006). *The fifth dimension: An after-school program built on diversity*. New York: Russell Sage.

Dyson, A.H. (2005). *On the case: Approaches to language and literacy research*. New York: Teachers College Press.

Goffman, E. (1974). *Frame Analysis: An essay on the organization of experience*. New York: Harper & Row.

Grossman, P., Wineburg, S., & Woolworth, S. (2001). Toward a theory of teacher community. *Teachers College Record, 103*(6), 942.

Gutiérrez, R. (1996). Practices, beliefs and cultures of high school mathematics departments: Understanding their influence on student advancement. *Journal of Curriculum Studies, 28*(5), 495-592.

Gutiérrez, R. (2008). A "gap-gazing" fetish in mathematics education? Problematizing research on the achievement gap. *Journal for Research in Mathematics Education, 39*(4), 357-64.

Horn, I. S. (2005). Learning on the job: A situated account of teacher learning in high school mathematics departments. *Cognition and Instruction, 23*(2), 207-236.

Horn, I.S. (2006). Lessons learned from detracked mathematics departments. *Theory into Practice, 45*(1), 72-81.

Horn, I. S. (2007). Fast kids, slow kids, lazy kids: Framing the mismatch problem in mathematics teachers' conversations. *Journal of the Learning Sciences, 16*(1), 37-79.

Horn, I.S., & Little, J.W. (2010). Attending to problems of practice: Routines and resources for professional learning in teachers' workplace interactions. *American Educational Research Journal, 47*(1), 181-217.

Little, J. W. (2003). Inside teacher community: Representations of classroom practice. *Teachers College Record, 105*(6), 913-945.

Martin, D. B. (2006). Mathematics learning and participation as racialized forms of experience: African American parents speak on the struggle for mathematics literacy. *Mathematical Thinking and Learning*, 8(3), 197-229.

McLaughlin, M. W., & Talbert, J. E. (2001). *Professional communities and the work of high school teaching*. Chicago: University of Chicago Press.

Merriam, S. B. (1998). *Qualitative research and case study applications in education* (2nd ed.). San Francisco: Jossey-Bass Publishers.

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

Moses, R. P. (2001). *Radical equations: Civil rights from Mississippi to the algebra project*. Boston: Beacon Press.

National Academy of Education. (2008). Taking stock of the research on teacher professional communities. *National Academy of Education Notes, 10*(1), 1-12.

National Research Council. (1989). *Everybody Counts: A report to the nation on the future of mathematics education*. Washington, D.C.: National Academy Press.

Schoenfeld, A.H. (2002). Making mathematics work for all children: Issues of standards, testing, and equity. *Educational Researcher, 31*(1), 13-25.

Schoenfeld, A.H. (2007). Standards, equity, and the math wars, *Northwest Mathematics Conference*. Bellevue, WA.

Snow, D.A., & Benford, R.D. (1988). Ideology, frame resonance, and participant mobilization. In B. Klandermans, H. Kriesi & S.G. Tarrow (Eds.), *International Social Movement Research* (Vol. 1, pp. 197-217). Greenwich, CI: Jai Press Inc.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.