Storying Teaching: Examining math teacher stories and how they shape perspectives on (in)equitable

Teachers understand much of their practice through stories (Clandinin & Connelly, 1996), which can then provide a framework for research on teaching (Carter, 1993). Teachers use stories both as a means of communicating professional knowledge to colleagues and to make sense of their own practice (Clandinin, 1985; Zeek, Foote & Walker, 2001). We not only argue here, as others have (Adler, 1998; Battey & Franke, under review; Clandinin, 1985; Zeek, Foote & Walker, 2001), that teachers' stories ground current practices, but also that stories shape what they see as possible for *future* practice. This article examines how an elementary school math teacher reacted to a teaching experiment designed to challenge traditional teacher-led instruction and ability-based grouping. Both practices, though common, have been shown to create inequities in student learning (Boaler, 2002; Boaler & Staples, 2008; Burris, Welner, Wiley, & Murphy, 2008; Gamoran & Mare, 1989; Greeno, 2006; Hiebert, Carpenter, Fennema, Fuson, Human, Murray, Olivier & Wearne, 1996; Horn, 2006; NCTM, 2000; Oakes, 1985). We had anticipated the teacher would reflect on the experiment in terms of the tasks, lessons and assessments. Instead, she reflected in terms of stories about two students. The first story was of a student whose participation she saw significantly change, which led her to see the affordances

of a more inquiry-oriented approach to teaching. In contrast, the other story was of a student who the teacher believed was doing the most work in her group, which led her to maintain a view of ability-based grouping as paramount. Unlike prior studies that focus on storytelling in teacher preparation, this analysis examines how an experienced teacher allows stories to anchor her perspective and influence her openness to new teaching possibilities. By recognizing how teachers story their practice as a sense-making tool, we can critically address this way of evaluating teaching to create effective learning opportunities for both professional development and teacher education.

Conceptual Framework

We live storied lives, or so learning theorist Jerome Bruner (1986, 1991) argued when explaining that stories operate as instruments of the mind that construct our reality. From religious parables to Aesop's fables, 19th Century West African griots to Gaelic bards, the idea of stories as educative is not new. In therapeutic settings, for example, storytelling is used to evoke emotional responses, offer alternative perspectives, and heal (Rosenthal, 2003). Across disciplines, the use of stories as educative case studies appears in medicine, law, business and increasingly, in teacher education. In the context of teacher learning, stories construct reality, provide perspective, and inform practice. The influence of story on teachers' perspectives is particularly apparent with expert teachers who have a rich reserve of "storied knowledge" (Carter, 1993) often passed from veteran to novice or as told and retold among peers. In this way, storytelling can build professional community (Zeek, et al., 2001) and link past or current practice to future intentions. In a survey of math teacher education, Adler, Ball, Krainer, Lin and Navotna (2005) emphasize a need for research to be presented as "authentic and interesting

stories, both practice-grounded *and* theory-driven, [including] combinations of 'reflective papers' by teachers with cross-analyses by teacher educators" (p. 378). In this article we present the teacher's reflective stories about students in combination with analyses of classroom video, student interviews and surveys that both affirm and complicate the teacher's perspective.

Story is vital to understanding the practice of teaching. Elbaz (1991) contends, "story is the very stuff of teaching...within which the work of teachers can be seen as making sense" (p. 3). As Carter (1993) points out, story has become "more than simply a rhetorical device for expressing sentiments about teachers or candidates for the teaching profession. It is now, rather, a central focus for conducting research in the field" (p. 5). Though less often used in studies of mathematics education, narrative inquiry, for example, is increasingly used in studies of teaching, teacher education and professional development because narratives are seen as the way humans experience the world (e.g., Bell, 2002; Clandinin, Pushor & Orr, 2007; Connelly & Clandinin, 1990; Johnson & Golombek, 2002; Ritchie & Wilson, 2000). In terms of teacher education and professional development, stories are effectively used as case studies describing the development of pre-service teachers (e.g., Ladson-Billings, 2001) or how experienced teachers undertake reforms (Frost, 2009; Kleve, 2008; Skott, 2001). These stories are emotive accounts of teachers learning, coping, and being socialized into the profession and, as Noddings (1996) argues, should be a more central part of teacher education. Although narrative inquiry was not the methodology of this study, to this body of literature we add teacher stories as on-going phenomena for experienced teachers that ground current practice and shape future intentions. As such, stories play an important role in pre-service teacher education *and* in professional development for in-service teachers.

Connelly & Clandinin (1984, 1985) argue that teacher stories articulate "personal practical knowledge," a knowledge that is not singularly governed by disciplinary content, theory or practice. Personal practical knowledge is informed by prior personal and professional experiences and is discovered in teacher actions and conversation (Clandinin, 1985). This special knowledge is invoked through imagery and is rooted in convictions gleaned from experience (Clandinin, 1985). Studies of personal practical knowledge explore teacher identity, professional history, and value systems or beliefs as integral to explaining classroom practice and future teaching (Adler, 1998; Battey & Franke, under review; Clandinin, 1985; Zeek, et al., 2001). We argue that as teachers story their practice they are distilling personal practical knowledge to a core lesson; that is, whereas stories convey some dimension of personal practical knowledge, conveyance of personal practical knowledge is not limited to story form.

Although most studies of teacher stories are studies of teacher's stories about themselves (Craig, 1999; Frost, 2009; Zeek, et al., 2001), this study considers what stories *about students* mean for teacher learning and reflection. Battey and Franke (under review) contend that when math teachers share stories, they are not only sharing knowledge and skills about what it means to teach math, they are also sharing stories about *who* can do math. As teacher educators and researchers, attending to teachers' uses of story provides significant insight in bridging from current practices or beliefs about students to the possibilities of something new.

Methods

Evaluating the aims of the teaching experiment and outcomes of student learning are not the focus of this article, although they were the focus of the research methods used (see Author, 2011 for those analyses)[1]. In presenting the research methods, it is important to recognize they

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[1] Briefly, students across treatments exhibited even learning gains, but those in the Open treatment were significantly more likely to characterize their experience as enjoyable on written surveys.

were intended to elicit the teacher's reactions to the tasks and to teaching in a new way inasmuch as they were about student experience. The teacher's interviews revealed, however, how stories about students served as her primary means to make sense of the experiment's aims, rather than her reflections on the teaching itself.

Setting and Participants

The setting is a California elementary school with an ethnically, racially and socioeconomically diverse student population. The teacher, Ms. Haynes, was an African American woman with fifteen years of experience teaching math and science at the elementary and middle school levels. Ms. Haynes taught two fifth grade math classes (n=27 and n=25) that were 50 minutes each, four times a week. The two students she focused on in her reflections were Penelope and Lisa. Penelope was female and Caucasian, and her story became an object lesson for the teacher on the affordances of a more inquiry-oriented approach to teaching. Lisa was female and East Asian, and Ms. Haynes used her story to justify the continued use of ability-based grouping in math.

Design of the Experiment

The five-week study involved a data and statistics unit organized around additive and multiplicative reasoning (Cobb, 2000; Konold, 1995).   Students were taught using two different group-based curricula that we designed: "Guided," which emphasized formal conventions followed by opportunities to practice, and "Open," which emphasized inquiry, invention and discussion. In describing her teaching, Ms. Haynes characterized it as approximating a "more Guided" approach. The instructional treatments were designed so as to fairly represent the unique strengths of each approach.   Using a crossover design, one section (n=27) experienced Guided while the other experienced Open (n=25), and then the sections switched with one week

of transition in between. The task in the first cycle of study was for groups to determine which of two search engines (bing® or Google®) was better for advertising an imaginary product based on distributions of website traffic over 30 days. The task in the second cycle was for groups to evaluate two versions of a fictitious video game, based on distributions of time it took testers to complete them.

In addition to experimenting with Guided and Open instruction, the experiment was also meant to disrupt the use of ability-based grouping. Students were arranged in three or four-person groups without regard to prior achievement, throughout the experimental unit. Previously, students were regularly arranged in ability-based groups and given different levels of mathematical work to complete.   To offer an alternative arrangement for the experiment, students completed a roster-format, free-choice sociometric network survey on which they identified good friends, peers with whom they had not frequently worked, and peers with whom they wanted to work (see author, 2009 for rationale). The results were used to create groups in which students were not friends and had not worked together much in math, but who wanted to work together. In reflecting on the two main dimensions of the experiment – the nature of instruction and the organization of groups – the teacher offered the stories of Penelope and Lisa, respectively, to argue in favor of the Open approach but against grouping without regard to prior achievement.

Teacher Interviews

Ms. Haynes was interviewed before and after the five-week study. The pre-interview focused on three areas generally – teaching and the use of group work (e.g., "What kinds of lessons or math topics do you find lend well to group work?"), predictions about group configurations created for the experiment ("Can you provide us some brief insights or

predictions for the Open/Guided groupings?"), and expectations for the study itself ("What do you see as potentially beneficial/challenging to you in being part of this study?"). The pre-interview was audio-recorded and transcribed, lasting approximately 18 minutes. The post-interview, also audio-recorded and transcribed, lasted approximately 35 minutes. The post-interview focused on three areas of the experiment – her teaching and learning ("Tell me a little bit about your experience over the last two weeks – what kind of a-ha moments have you had, if any?"), student reactions ("What do you think your students have come away with in thinking about working with each other in math as a consequence of this study?"), and perspectives on ability-based grouping ("What do you think of the decision we made to ignore student ability in going forward with this unit?"). Ms. Haynes' reflections on student engagement were not limited to conclusions about the students but instead extended as a basis for evaluating the experiment overall. The analyses we present here were guided by the teacher's primary use of student stories to evaluate the experiment.

Student Interviews

We were drawn to examine student interviews in light of how Ms. Haynes used stories of Penelope and Lisa to justify her future teaching intentions. The interviews were used as a way of considering how well the conclusions Ms. Haynes drew were reflected in what students said of their experiences. Although we focused on the interviews of Penelope and Lisa and their immediate group members, all of the students were individually interviewed prior to the study, at the mid-point before crossover, and at the end. Interviews were audio recorded and later transcribed, and were typically 10 to 20 minutes in length. Students were asked to describe prior experiences in math, how they saw themselves as math learners, their experiences in groups or with specific peers, and their impressions of the tasks in each cycle.

Student Surveys

Student surveys were examined in the same spirit as the student interviews, with the focus falling primarily to the written responses of Penelope's group and Lisa's group. At the midpoint before changing instructional approach and end of the study, students were asked to reflect on how their groups functioned and what they liked or disliked about the lessons from that week. The free response written surveys took students approximately 10 minutes to complete.

Classroom Video

Five groups in each treatment (Open and Guided) were videotaped (39 students) yielding approximately 100 hours of video. One week of baseline video (approximately 5 hours) was taken prior to the study to serve as a benchmark for instruction. Like the student interviews and surveys, the video analyses presented in this article are limited to those of Penelope's group and Lisa's group (20 hours).

Data Analysis

Understanding how the teacher reflected on the experiment's aims was the starting point for our analyses. In advance of the study, Ms. Haynes predicted some students would react in unique ways to the experiment and among them were predictions regarding Penelope and Lisa. During the study, Ms. Haynes would informally check in with the researchers and share her impressions of how students were engaging in the lessons. Building on the pre-interview, Penelope and Lisa became increasingly central in Ms. Haynes' reflections as impressions of other students receded. The re-emergence of Penelope and Lisa in the post-interview was the final indicator that these students were taking on a heightened significance in the context of Ms. Haynes' reflections.

Ms. Haynes described many students' experiences and struggles during the experiment –
sometimes these were shared informally just after the class period and other times more formally
as part of the post-interview. The prominence given to descriptions of Lisa and Penelope seemed
different in that these descriptions were not offered as discrete observations but rather as
trajectories with a beginning, middle, and end. Literary studies have gone far in defining *story*
beyond what might be colloquially understood as a string of events or descriptions by
highlighting three key aspects: 1) a situation involving struggle, 2) a protagonist who acts within
that situation with purpose, and 3) a sequencing that implies causality between action and
resolution (Scholes, 1982 as cited by Carter, 1993). Informally, it seemed that Ms. Haynes was
describing Penelope and Lisa as stories in this literary sense.

After recognizing the import Ms. Haynes gave to her student-centered reflections, we
wanted to systematically evaluate them as they appeared in her pre- and post-interviews. We
began by generating a table listing any student (or group) as they were mentioned in the
interview transcripts, followed then by the teacher's talk and the question that prompted the
description. We then eliminated all references that arose in response to a direct question calling
for a specific reflection (e.g., What did you think of Group 4?). This latter decision was meant to
distill which student-centered reflections the teacher was drawn to from those guided by the
interview protocol. Keeping the form of stories in mind, we then narrowed that list to any
individual mentioned in both the pre- and post-interviews, which we argue is necessary for the
reflection to count as a story. Ms. Haynes' descriptions of three students met these criteria:
Penelope, Lisa and Luke. We then looked at the content of the teacher's talk and determined if
there was a struggle, action and resolution involved. In comparing Ms. Haynes' descriptions of
Luke, there were no changes to what she identified as his struggle: to always know *why* a

mathematical process works rather than accept an algorithm. In contrast, for Penelope and Lisa, Ms. Haynes identified potential struggles for both students and referenced how each resolved her struggle through action during the experiment. Thus these reflections stood apart as *stories* and not mere descriptions.

Given the unique form and prominence given to these students' stories, we then examined other data sources – student interviews, written reflections and video – to consider what led Ms. Haynes to her conclusions and to what extent they reflected the students' experiences in their words or as may be interpreted from the videos. Video coding software was used to mark when each student volunteered or was called upon by the teacher during whole-class discussions. These coded instances were counted and the duration of each was recorded as a measure of student participation. Additionally, two independent researchers reviewed the video, counted each instance of student-teacher interactions, and then evaluated each instance as mathematically or management-oriented. This latter analysis was used to understand how the teacher engaged with a given group during the experiment. Thus what is re-presented as the stories of Penelope and Lisa in the following section, are actually hybrid accounts that reflect the teacher's story and what we focus on as important in understanding the story as a sense-making tool for her within the study.

<div align="center">Results & Discussion</div>

The Story of Penelope and the Open Approach

Ms. Haynes' post-interviews featured Penelope prominently: she referenced her specifically when asked generally about the experiment, spoke of her first when asked to reflect on students' experiences, singled her out when asked about groups generally, and referred to her again when asked if any particular students stood out. The story we reconstruct here, based on

video and interviews with Ms. Haynes and Penelope, is effectively: Penelope, a student Ms. Haynes described as having high math anxiety, encountered the Open approach where she developed a mathematical strategy that empowered her in unprecedented ways. Following the classic arc, the story is that of a protagonist overcoming adversity in a way that leads to positive resolution.

When asked to reflect on group configurations in the pre-interview, Ms. Haynes noted that the "anxiety of [Penelope] will come into play," which was interpreted to mean her fear of math would lessen her participation in the group. Anticipating that Open would heighten Penelope's anxiety (and Luke's struggle to always know why), Ms. Haynes specifically asked that their class receive Guided instruction before Open. Ms. Haynes returned to this description of Penelope in her post-interview when explaining what she had been like in math at other times in the year: "[Penelope is] quiet, intimidated, insecure, anxiety-ridden to where she would have to leave the classroom sometimes because she just falls into tears."

What Ms. Haynes described as Penelope's "anxiety" came across in Penelope's interviews as a general disdain for mathematics. For example, when asked to elaborate her feelings about math she pronounced it "not fun", "un-useful," and "boring", adding that it "waste[d] [her] time." There were also behavioral indicators of Penelope's negative disposition that seemed to be publicly known. Just as Ms. Haynes suggested Penelope could dissolve into tears, her group members anticipated that possibility as well. For example, at the close of the final Guided class period Penelope rested her head on folded arms at her table, prompting the following exchange with her peers:

Line #	Speaker	Talk
1	Macy	Penelope, it's okay, it's not big deal. Penelope –
2	Alyssa	It's just school. We're learning stuff. Don't be sad about it.
3	Macy	There's no need to cry about it, okay?

4	Penelope	I'm not crying. Who said I was crying?
5	Macy	I saw you.
6	Penelope	No, I wasn't.

What might have been fatigue or disengagement with a subject Penelope saw as boring and "un-fun" was interpreted as an excessively emotional display (Line 3). In constructing Penelope's story, this sense of adversity and the possibility or impossibility of overcoming it loomed large: it influenced Ms. Haynes' pedagogical decisions before the study, her observations of Penelope during the study, and her intentions for future practice shared with us following the study.

Continuing the story arc, during the study Ms. Haynes became particularly focused on Penelope's mathematical participation in changing from Guided to Open instruction.   During Guided, videos show Penelope diligently completing tasks but seldom engaging in whole-class conversations (speaking up 3 times on average of 20 seconds), and intermittently collaborating with her group members. On the third day, for example, Ms. Haynes stopped at Penelope's table and asked, "You two are working together?" gesturing to Penelope and Macy. As Penelope looked away, Macy reported that Penelope wanted to work alone, which Ms. Haynes warned was unacceptable. In contrast to Guided, Ms. Haynes would observe Penelope as more actively engaged during Open instruction. For example, on the third day Penelope presented a strategy she developed that later became the basis for formally introducing statistical quartiles. Penelope shared this strategy in her group first, and later Ms. Haynes called on her during whole-class discussion to develop the representation of quartiles to be displayed for everyone. During Open, Penelope spoke 3 times in the whole class setting but 4 times longer than in Guided (1 minute 20 seconds on average).

In terms of Penelope's story, what Ms. Haynes observed and shared during the study suggested a possible (even if temporary) resolution to her anxiety; that is, she saw the possibility

that a student's adversity could be overcome. Seeing Penelope develop a worthy mathematical strategy and then share it whole-class was evidence that something had changed. When asked in her post-interview to reflect in general, Ms. Haynes immediately returned to Penelope's story specifically: "Overall, I think [Open] was fabulous. And for one student in particular, Penelope…when she blew her table away in the second round, it empowered her on a level that I could never have gotten her to because she self-isolates. But in this form, she had to engage."

Through Ms. Haynes' telling, what began as a tale of anxiety developed into a story of overcoming adversity and reaching resolution. The story showed how a pedagogical approach could compel new behaviors in students that were unexpected, previously unachieved, and wholly welcomed: "[Penelope] moved forward and it empowered her and [her peers] could see that this kid knows math. She really does. She has anxiety about it, she has insecurities about it, but she knows." In understanding this story and the role it played in the aftermath of the experiment, what matters is not the specific conclusion Ms. Haynes drew about Penelope and the Open approach, but rather how the story functioned as an object lesson in considering a potentially new pedagogical practice.

How the Story Shapes Future Practice

Penelope's story was used in Ms. Haynes' reflections on her current and future practice, with particular attention paid to Penelope developing and presenting a rich mathematical strategy. This change in behavior and turning point to the story became evidence of the Open approach compelling a higher standard for individual excellence: "Penelope, who again is quiet, intimidated, insecure, for her to rise to take the lead, and her idea, what she used, it just raised the bar for her self-competence." Referring again to Penelope's strategy, Ms. Haynes explained that until that point she had been skeptical of Open, saying, "There was doubt, I'm like, I don't know

if they are going to get to quartiles – I didn't get to quartiles until college – and they got there on their own [with] some scaffolding!" When pressed to reflect more generally, Ms. Haynes continued to cite what students did rather than the curricular materials or lesson outcomes: "I actually enjoyed the Open more because again, you gave the power back to kids and their process and their learning…the excitement came from watching the kids develop their own strategies." Contrasting current and future teaching, Ms. Haynes reflected that her existing practice was not "empowering my kids. I was giving them what they were going to need but there was no accountability for their learning on their part: it was spoon feeding them." When asked what this meant for her future practice, Ms. Haynes replied, "I would do data this way next time I would do data…and I would start with both [classes] being Open."

While we argue the importance of Ms. Haynes' story of Penelope, it is important to recognize that she was not the *only* student Ms. Haynes considered as having a good experience of the Open approach. For example, in Ms. Haynes' post-interview she reflects on Cartwright who "hung in there [and] asked really good questions," and Goliath who was new but had the chance to "shine", and Robin who "just took the lead," among others. Therefore, despite its prominence, we are not arguing that Penelope's story *alone* informed Ms. Haynes' perspective, but that Ms. Haynes' story of Penelope served as the primary justification for considering the Open approach in her future practice.

In reconstructing this story, the language of empowerment (or giving power back) is inescapable: Ms. Haynes used it to describe the resolution of Penelope's story, the unique contribution of an Open approach, and in terms of what was *not* happening in her teaching. What made the story of Penelope significant in terms of the study, however, is how Ms. Haynes

used it as a sense-making tool to link the realities of her current teaching to the possibility of something new.

The Story of Lisa and a New Way of Grouping

Like Penelope, Ms. Haynes' descriptions of Lisa from pre- to post-interview were unique in assuming the form of a story. Recalling our aim of disrupting ability-based grouping, Ms. Haynes' story of Lisa was used to critique our approach and call into question its use as an equitable and viable alternative. The story we reconstruct here through Ms. Haynes' interviews, real-time feedback and requests during the experiment, and through Lisa's interviews and students' written reflections, is effectively: Lisa the protagonist, whom Ms. Haynes consistently described as a "high ability" student, is put in a group where she had to "be the leader" and overcome the burden of "weaker mathematicians" by single-handedly producing the group's work. Ms. Haynes used Lisa's story to justify why we she still considered "ability-based" grouping "paramount" after the experiment.

When presented with group configurations in the pre-interview, Ms. Haynes put a special mark on Lisa's name and said, "[Lisa] will be the leader" and described her group members in the study – Mike, Dante and Paloma – as being of medium, low, and low "ability", respectively. Although Ms. Haynes saw "ability" as linked to "exposure" (e.g., having a tutor), in her practice it was used in relation to student productivity. Prior to the study, Ms. Haynes divided her students into three groups and provided them work that was paced differently. Her description of this practice suggested that the rate of productivity (i.e., completing worksheets) defined group assignment and that "ability-based" grouping was therefore an assessment of that productivity (i.e., if you produce slowly, you are in a lower "ability" group). This close association between "ability-based" grouping and work productivity was not unproblematic for students. As Ms.

Haynes described, "If they weren't in the high group they felt stupid regardless of the fact that they were doing the same work, it's the pacing [that] was different. No matter how much you said to the kid, it's like 'I am in the dumb group, I'm in the slow group,'" suggesting her students also saw her links between "ability" (dumb), productivity (slow), and group assignment. In the post-interview, Ms. Haynes would again intermingle "ability" and productivity by offering her story of Lisa as grouped with "weak mathematicians so one person had to do a lot more work than the other three," which became the basis for critiquing our aim of grouping without regard to prior achievement.

Ms. Haynes' story of Lisa impacted the design of group configurations during the study. In the changeover from Open to Guided instruction, Ms. Haynes requested we provide Lisa someone she could "dialog with" in her group. We traded Paloma for Liliana, a student Ms. Haynes described as being of similarly "high ability" as Lisa. Ms. Haynes stood by this decision at the close of the study saying, "We switched…so Lisa in group four could have someone to dialog with. I think that helped us well," noting it happened because she told the researchers to "balance the groups more academically this next time around [before the changeover]."

Several factors may have informed Ms. Haynes' story of Lisa as singularly "able" to do work in her group, including Lisa's actions. As Ms. Haynes explained during the changeover between Open and Guided instruction, Lisa had approached her complaining that no one in her group was helping her complete the tasks. Though we were not present during that exchange, Lisa wrote about being the only productive and on-task group member in a reflection shared with Ms. Haynes at the same point in the study (see Figure 1). The responses to Questions 2, 3, 4, and 5 attest to the story of Lisa as engaged in a largely one-sided learning opportunity where she had to manage her off-task and inattentive peers who played almost no part in helping her learn (but

for the slight acknowledgment of Dante in Question 4). Her responses to Questions 7, 8 and 9 suggest that in that process she also came to understand the mathematical concepts well enough to clearly explain it to the others who were perhaps less "able" (i.e., requiring "kid friendly" words).

Written reflections from Lisa's group members would further bolster Ms. Haynes' story of Lisa as most productive. When asked "Who or what helped your group the most this week?" all four students (Lisa included) indicated "Lisa." While other students would occasionally mention peers in response to the same question (though never consistently the same person in a given group) more often they would say, for example, "the graphs" or "staying focused."

Ms. Haynes' story of Lisa as a "high ability" student among "weaker mathematicians" was also evident in classroom video from the way she interacted with the group. Moreover, how Lisa interacted with Ms. Haynes would further suggest she was the most mathematically on-task or productive person in the group. Video showed Ms. Haynes addressing the group directly 58 times over 5 days. Each interaction was coded in two ways: as being mathematically oriented or management oriented, and as teacher-initiated or student-initiated. With 100% inter-rater reliability between two independent coders, the results are depicted in Figure 2. Figure 2 shows how Lisa's self-representation to Ms. Haynes was the most mathematically on-task in the group (7 of 11 student-initiated interactions or 64%). Of the 48 teacher-initiated interactions, Lisa was involved in only four of them (8%). Breaking this down further, Lisa having only three management oriented interactions (all of which were directed at the group and not Lisa in particular) meant Ms. Haynes identified her as least often off-task or unfocused least often. Finally, the teacher-initiated mathematically oriented interactions further support the story of Lisa as most "able" and productive in that Ms. Haynes did not have to check in with her

regarding the math as she did, for example, with low "ability" Paloma, who she described as having "hide-and-seek down to an art so she will rely on everyone else doing the work."

In reconstructing the story of Lisa, the intermingling of "ability" and productivity was essential: it informed Ms. Haynes' "ability-based" expectations that Lisa would lead and be most productive in the group, which was then reaffirmed in students' written reflections, and seemed to shape the way she interacted with Lisa in practice. What made the story of Lisa significant in terms of the study, however, is how Ms. Haynes used it to justify the continued grouping of students by "ability."

How the Story Shapes Future Practice

Ms. Haynes' story of Lisa represented how mixing "ability" levels (as fixed descriptors) could jeopardize the goal of balanced productivity in a group. As mentioned previously, she explained:

> This [method of grouping] worked overall. The only thing we had to consider for the next time is some tables was [*sic*] really weak mathematicians. So, one person had to do a lot more work than the other three…while other tables had very, what we call [High], [Medium] students and so their conversation was going to be much richer."

Continuing to associate "ability" with productivity and how students engage mathematically, Ms. Haynes was not convinced that "mixed ability" could lead to rich, productive collaborations. Unlike descriptions of other students supporting the story of Penelope, *none* of the other groups

(92% of the class) elicited the concerns Ms. Haynes had for Lisa's group and yet she maintained that "ability grouping is paramount" for her future practice.

Interrupting the Story of Lisa

We understand why Ms. Haynes constructed the story of Lisa in this way. All accounts available to Ms. Hayne supported the story of Lisa as obligated to lead "less able" peers in doing work: her pre-study evaluation and predictions that Lisa would "be a leader", being approached by Lisa mid-way into the study to say she was the only one being productive, the group's written reflections suggesting Lisa was most helpful, and Lisa's in-class self-representations as most mathematically focused and least in need of managing. In the context of the study, however, having Ms. Haynes maintain a commitment to "ability-based" grouping as assuring rich and productive collaborations, flew in the face of our aim to show how grouping *without* regard to prior achievement is a viable, rich and more equitable alternative. Recognizing that Ms. Haynes' story of Lisa was critical to how she made sense of grouping, we focused our analysis on the videos of Lisa's group. Though it is perhaps as partial as the story Ms. Haynes tells, the re-storying of Lisa that we offer here, and could potentially offer for Ms. Haynes' reconsideration, explores how the imbalanced inner-workings of the group were related to *perceptions* of "ability" rather than revealing an inevitable outcome of what occurs when students of different "ability levels" collaborate.

In our re-storying, video evidence did not support the idea that "ability" as a fixed trait was the root cause of the group's troubles. Instead, the videos compelled consideration of how perceptions of "ability" kept these students from collaborating equitably. Behaviors that seem motivated by perceptions of "ability", like deferring to another even when you are right, fighting over control of the work, or mocking another's individual efforts, led students to organize

hierarchically in this group with Lisa placed at the top. This may have been because "ability-based" grouping was used extensively before the experiment, but what is important for our story, is that despite introducing a new participation structure and more "open" curriculum, the students reasserted the power vested in who is "able" through their interactions. We call the reassertion of fixed ability in defining how students should engage, the *politics of "ability."* The intentional use of "politics" is intended to suggest that the outcomes could have been different; that is, it was not a forgone conclusion that the students would organize hierarchically based on perceptions of "ability" but was rather a consequence of negotiating real-time interactions.

To demonstrate that what transpired was not about "ability," as Ms. Haynes concluded, we could present a series of examples where Mike, Paloma and Dante show evidence of engagement and facility with mathematical concepts, of which there are several. To do so, however, would focus on "ability" as a fixed attribute rather than showing how "able" is a positioning among individuals related to productivity. Thus we selected a representative episode of video that depicts how the students interactively created a hierarchy of "able", seemingly independent of who was being mathematically productive in the group. Specifically, we will show how the politics of "ability" result in the following interrelated positions in the group: 1) Lisa positioning and being positioned as most "able"; 2) Dante repeatedly weakening his position through self-deprecation and deference to Lisa even when mathematically on-task; 3) Paloma remaining silent throughout; and 4) Mike challenging Lisa as the most "able" but being mocked instead of supported for resisting a less "able" position.

On the third day the groups were asked to summarize the statistical measures they'd used to compare the various distributions of bing and Google website traffic. The transcript presented

below begins after the group had chosen *mode* as the strategy to summarize while Lisa completes a summary of *total*.

Line #	Speaker	Talk
1	Dante	How does this strategy work?
2	Lisa	You guys should be working together on that one. Paloma, are you? What are you doing? Help him with it? You should be helping Dante while I'm finishing this.
3	Dante	Am I right with this? Try to find the most frequent number clicked a day. For the mode? So we're probably just going to this—for the mode we're probably just going to this graph. Hey, Lisa, for the mode are we just going to this graph?
4	Lisa	What?
5	Dante	For the mode are we just going to this graph?
6	Lisa	Don't ask me, you guys are the ones working on it.
7	Dante	Aye, aye, Captain.

There are three significant exchanges in this episode that indicate hierarchy and an imbalance in productivity: 1) Lisa asserts herself as manager of others' mathematical productivity (Lines 2 & 6); 2) Lisa does not support Dante's attempt to be mathematically productive (Line 6); and 3) Dante ironically acknowledges a lower position in the hierarchy to Lisa (Line 7). The politics of "ability" were reflected in the behaviors that differentially positioned Lisa and Dante as more and less "able", respectively.

Immediately following the previous interactions, the dynamics shifted slightly as Mike took a more active interest in answering the questions. The worksheet asked students to record any calculations associated with comparing the distributions in terms of mode. Rather than offer a calculation, Mike offered a visual strategy of overlapping the graphs (Figure 3) saying, "Ok. So, look at the frequency of Google traffic hits and do this. Compare it like this. Like you did." Mike saying, "Like you did," was a reference to Dante having initially developed the strategy the previous day. On the previous day, the group was struggling to compare modal value graphs by aligning the distributions side-by-side. With support from Ms. Haynes, Dante showed the group

(and later the whole-class) that they could overlap the graphs and hold them to the light to see which website had the greater mode (see Figure 4). On this day, Mike reproduced the strategy capably in response to the worksheet's request for a "calculation" to compare modes. Mike and Dante were mathematically on-task at this point in the video, and yet when Lisa then asked, "Are you guys working on that? What did you guys come up with so far?" what followed underplayed their productivity.

Line #	Speaker	Talk
19	Dante	I have no clue. I don't know what I'm talking about.
20	Lisa	I thought you were listening to Ms. Haynes? Let me see. *Reaches for Dante's paper.*
21	Dante	No, for the mode, I have no clue what I'm talking about. *Slides his paper to Lisa.*
22	Lisa	Then why did you choose it if you don't know what you're talking about?
23	Dante	I learned it in the summer and then I forgot it.
24	Lisa	You're trying to – you're trying to act all smart, aren't you?
25	Dante	Yes, exactly.

By claiming he had "no clue" while ceding the worksheet to Lisa (Lines 19-21), Dante was undermining his mathematical conversation with Mike even though Mike had just reproduced Dante's legitimate visual strategy for comparing modal values. Lisa's mocking response marked Dante (and perhaps Mike by association) as less "able" than her (Lines 22, 24). Lisa's choice of words – "trying to *act* all smart" – rather than, for example, "You're *being* all smart" implies Dante can only *act* (and not *be*) "smart." Rather than challenge Lisa's insinuation, Dante takes on the less "able" position (Lines 23, 25). These exchanges, like those previously, depict co-constructed and hierarchical positioning within the group that reflects the politics of "ability" and not some foregone order related to what students could produce mathematically.

After assuming control of the worksheet, Lisa tried to walk through the answers, pausing repeatedly to be sure everyone was listening to her and not working on their own ("You guys, listen. Mike, you too…Paloma, are you listening, too? Stop what you're doing for now."). In her explanation, Lisa correctly defined mode but mistakenly identified bing as having the higher modal value. As she did so, Mike continued to use Dante's visual strategy of comparison but was stopped when Lisa insisted, "No, no, no, don't do that now. Mike, that's not as important as this," meaning not as important as listening to her walk through the worksheet's answers. Without saying anything, Mike dropped his hands as Dante said, "Okay, go." Again, Lisa behaved in a way that communicated a perception of being most "able" while the others, by abandoning their own work without verbal protest (though Mike was visibly reluctant), behaved in ways that suggested being less "able."

Following on from the previous, the episode ends with a series of contentious exchanges between Mike and Lisa that seem trivial: they fight over the worksheet. In re-storying Ms. Haynes' story of Lisa, however, we argue that control of the mathematical product (i.e., the worksheet) is meaningful in terms of positioning as "able" in the group.

Line #	Speaker	Talk
39	Lisa	*Starts erasing the writing on Dante's worksheet.* Okay, here, let me just…
40	Mike	No, you can't do this. No. You did everything else. You have to let us do it.
41	Lisa	Wait, wait, wait, wait. I'm trying to explain something to you.
42	Mike	Well, well, explain it without the paper.
43	Dante	Reeyer! [*Mimics sound of cats fighting*]
44	Mike	No, she's being annoying. She's doing everything.
45	Lisa	Because *you* guys aren't doing anything.
46	Mike	We're doing it right now. Okay, you know what? Focus on that problem. You said you were going to focus on that, so you're focusing on that. Thank you.
47	Lisa	Okay, do it without my help, then!
48	Mike	We will.

49	Lisa	*Laughs.*
50	Mike	So we're doing the mode? (Pause) Shut up. *Mike says this to Dante whose eyebrows are raised.*
51	Lisa	*Laughs.* Mike, yeah, tell them how you do it.
52	Mike	I'm doing it.
53	Lisa	Okay, fine. You guys are in trouble! *Laughs.*

What occurred in and around Mike's challenge of Lisa is perhaps the most explicit example of how the perceptions of "ability" intermingled with productivity. First, by objecting to Lisa leading them (Line 40), Mike challenged the perception of Lisa as most "able" by challenging her erasing of his and Dante's work on the worksheet (Lines 39 & 42). Second, by mocking Mike (Lines 51 and 53), Lisa communicated her perception that he could not do the worksheet; he would fail to be mathematically productive or "able". Third and finally, Dante's behaviors distanced him from Mike's challenge and further reaffirmed the perception that Lisa was most "able" while Mike was not. Whether using cat fighting sounds that Mike interpreted as support for Lisa (Line 43-44) or raising his eyebrows skeptically at Mike (Line 50), Dante had fallen into his place in the hierarchy and seemed to be suggesting Mike do the same. Fighting for control of the worksheet was not a trivial matter; we argue it spoke to how deeply and insidiously the perceptions of "ability" and control of productivity had created imbalance and inequity in the group's collaborations.

Recall that an aim of the experiment was to disrupt "ability-based" grouping. By using an alternative grouping strategy, our intention was to offer Ms. Haynes' students the use of new cultural tools, in this case a new participation structure (Wertsch, 1998), which had the potential to transform power and authority. Such changes can shift the balance of power for individual students and provide new ways of engaging the academic content and peers in learning (Cornelius & Herrenkohl, 2004). This was not, however, what happened for these four students:

Grouping without regard to prior achievement did not prevent them from asserting a hierarchy of "ability" through their real-time interactions.

Given what Ms. Haynes was privy to about this group, it should not have been a surprise that she was dissatisfied with the outcome. What was surprising, however, was her sole reliance on her story of Lisa as justification for rejecting an alternative to "ability-based" grouping that was largely unproblematic for the remaining 11 groups. Treating the story of Lisa as therefore consequential to Ms. Haynes' sense-making and as shaping her intentions for future practice, we explored an alternative "storying" of what transpired. What we offered argues that the group outcome was not a foregone conclusion or object lesson on "mixed ability" grouping; rather, the students' behaviors reflect the outcome of real-time negotiations in which perceptions of "ability" governed interpersonal behavior. We believe it is important to highlight the "politics" of what transpired given what is at stake when such stories go uninterrupted. Guided by her story of Lisa, Ms. Haynes remained convinced of an otherwise inequitable practice. Challenging such practices is integral to the greater project of promoting equitable opportunities in mathematical learning for all.

Conclusions

We have described Ms. Haynes' stories of two students that featured prominently in her reflections on a design experiment promoting inquiry-oriented instruction and grouping students without regard to prior achievement. The stories represent the teacher's stance on each of the experiment's aims: the story of Penelope became an object lesson on the merits of a more inquiry-oriented approach, while the story of "high-ability" Lisa became an object lesson rationalizing the continued use of "ability-based" grouping. Although Ms. Haynes expected challenges for these protagonists in her pre-interview – Penelope's anxiety and Lisa being

grouped with "weaker mathematicians" – we were surprised at how consequential these stories would prove for what she saw as possible for her future practice.

There are several implications of "stories" featuring so prominently in this experiment. The first implication is that stories have epistemic value; that is, they can orient a teacher within the landscape of his professional practice. In the course of teacher education or professional development, there are several opportunities to elicit stories: 1) in advance of new learning opportunities (whether an experiment, professional development session or teacher education course); 2) while a new learning opportunity is unfolding; and 3) through the teacher's reflections on the experience. Ms. Haynes gave us ample opportunity to identify these stories – she prophesied each protagonist's challenge in per-interviews, reported on their actions during the experiment, and drew conclusions about how each was resolved in her post-interview. And yet, it wasn't until the end that we saw how each story's arc said something about the aims of the experiment; that is, we overlooked the epistemic power of the stories as they were being told and instead, treated them as curious "anecdotes" of practice. In retrospect, these stories were not bounded by the experiment as we had understood them originally; they were used both reflectively *and* prospectively to make sense of practice. In this way, we argue that stories are an on-going phenomenon that teachers use to make sense of current practice and as gateways to what is possible for future practice.

Another implication of "story" that featured prominently, especially given the inherent nature of stories as incomplete, is that a single student's story could be used to draw conclusions about collective experiences. This means researchers and teacher educators should pay careful attention to *who* gets storied within a classroom community and perhaps press for *more stories* or *re-storying* as a means of disrupting overly narrow interpretations drawn from perceptions of

individual experience. Indeed it is the *resolution* of stories that marks their worthiness as an object lesson for the teacher, while marking for the teacher educator or researcher whether or not the story is in need of reexamination. This more "watchful" stance toward teachers' stories is not meant to replace their personal practical knowledge or sense-making with our own, but rather to broaden the perspective that stories offer on practice. In the case of teacher stories that justify inequitable practices or express bias (e.g., racism, sexism, classism, ableism), for example, this more "watchful" stance is even more important if our ultimate efforts are to promote a more equitable system of teaching and learning in schools.

A final implication of "story" featuring so prominently here, is that stories can offer a promising path for theory-practice relationships between teacher educators or researchers and teachers. Teacher educators and researchers should not see themselves as mere transcribers of teachers' stories but as interpreters in conversation with practitioners. Therefore working with the stories of practicing teachers is as necessary as using stories to introduce novice teachers to the profession. Broadening our focus on stories from pre-service to in-service calls upon teacher educators, researchers, and those involved in professional development to examine how stories can be used to affirm equitable teaching practices and how they may need specific targeting to disrupt those that do not. Recognizing the epistemic value of stories, teacher educators and researchers can structure learning opportunities that push practitioners to question and refine their practices.

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Figures and Tables

Group Work Reflections

1. What did you like about this week's lesson?

   I liked that we got to learn about the median, mode, range etc. and how to use it

2. What did you **not** like about this week's lesson?

   That my group got a lot from me but I didn't get a lot from them.

3. How well did your group work together?

   Just me mostly and my group were playing or talking nonsence

4. Who or what helped your group the most in learning and working together?

   JUST ME, MYSELF. :O

   Dante   sometimes

5. Who or what challenged your group the most in learning and working together?
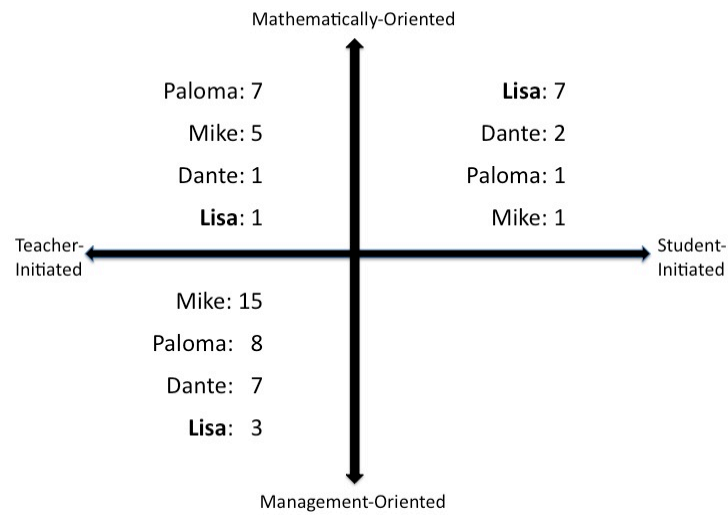
   Mike and Palmoa   sometimes   Dante

   Always talking or playing

6. How did you help your group in deciding between Google and Bing?

   Tried to convince them on the consistency.

7. How did you help your group learn statistics (e.g., mean, median, mode)?

   explain or make it kid friendly words.

8. How well did you learn the math concepts (e.g., mean, median, mode, range)?

   Very well, understood and will be able to explain to someone clearly.

9. Write any additional comments about this lesson or about working in groups below:

   I would like to work with people who would give me something back or helped me. not always me helping them only.

Figure 1: Image of Lisa's written reflection after the Open treatment

Mathematically-Oriented

Paloma: 7	**Lisa**: 7
Mike: 5	Dante: 2
Dante: 1	Paloma: 1
Lisa: 1	Mike: 1

Teacher-Initiated ← → Student-Initiated

Mike: 15	
Paloma: 8	
Dante: 7	
Lisa: 3	

Management-Oriented

Figure 2: Coding distribution of student-teacher interactions for Lisa's group

Figure 3: Mike reproducing Dante's visual strategy for comparing mode

Figure 4: Students following Dante's suggestion of a more efficient way to compare modes