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Constructing and Resisting Disability in Mathematics Classrooms: A Case Study Exploring the Impact of Different Pedagogies

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Abstract This study demonstrates the importance of a critical lens on disability in mathematics educational research. This ethnographic and interview study investigated how ability and disability were constructed over one year in a middle school mathematics classroom. Children participated in two kinds of mathematical pedagogy that positioned children differently: procedural and discussion-based. These practices shifted over time, as the teacher increasingly focused on memorization of procedures to prepare for state testing. Two Latino/a children with learning disabilities, Ana and Luis, used multiple cultural practices as resources, mixing and remixing their engagement in and identifications with mathematics. Ana, though mastering the procedural performances necessary for success in the second half of the year, authored herself as separate from mathematics, creating distance between herself and those she considered "smarties." Luis identified as a creative mathematical problem-solver, and was initially positioned as a "top" mathematics student. As the pedagogy shifted towards memorization, Luis resisted the pedagogy of procedures, and continued to identify as a creative thinker in mathematics. Yet his teachers saw him as increasingly disabled, and eventually placed him in a group only for those in special education. This group, which Luis named the "unsmartest group," was seen as least competent in mathematics by both teachers and students. The narratives of Luis and Ana highlight mathematics classrooms as relational and emotional, and demonstrate different strategies of resistance to the construction of mathematical disability.

Keywords Disability studies, Special education, Identity, Equity, Urban schools, Learning disability

1 Introduction

Sociocultural scholarship in mathematics has established the situated nature of mathematical knowledges, understanding ability as constructed through participation in certain kinds of mathematical practices (Boaler, 1997; Boaler & Greeno, 2000; Gresalfi, Martin, Hand & Greeno 2009; Nasir, 2002). Yet within mathematics education, analysis of disability is most often excluded. If ability is constructed within mathematics classrooms, then so is disability, and the dynamic interplay between the two necessitates further inquiry. This study explores how understandings of mathematical disability were constructed within one classroom over the course of a school year, and how individual children made sense of their positionings as math learners. This paper is a case study of two children who were twelve years old at the beginning of the school year: Ana and Luis. Both identified as both Dominican and American. Both children were identified by the school as learning disabled. The two children approached mathematics learning differently. Ana preferred to be shown how to perform procedures. Luis refused to follow mathematical procedures that he did not understand. He referred to himself as "the talking kind of math learner," emphasizing his creativity and persistence when given the opportunity to solve complex problems. In their seventh-grade mathematics classroom, the first half of the school year included problem-solving and open-ended mathematical discussion. In the second half of the school year, those activities were eliminated, as the class focused on memorizing procedures for a high-stakes test. Situated within these

different pedagogical practices, Luis and Ana were differently positioned as able and disabled.

Research on mathematics teaching and learning for disabled people has long been overwhelmingly published in psychology or special education journals rather than in mathematics education journals (Lubienski & Bowen, 2000; Lambert, under review). This separation has significant consequences, as recommendations for best practices for math learners with disabilities have predominately been situated within behavorialism, focused on memorization of explicitly taught procedures (Woodward & Montague, 2002). Pedagogy in mathematics for children with disabilities has focused on basic skills and direct instruction while pedagogy for children without disabilities has focused on conceptual understanding and problem solving (Woodward & Montague, 2002; Woodward, 2004). Underlying this division is an assumption that children with disabilities are not capable of constructing knowledge without explicit instruction. Challenging these assumptions, Peltenburg, van den Heuvel-Panhuizen & Robitzsch (2013) found children with disabilities spontaneously using the adding on strategy for subtraction, even though they had not been explicitly taught that strategy.

Although increasing numbers of disabled children are being educated in inclusive mathematics settings, there is little research on children with disabilities in these settings. The study discussed in this article aims to document the participation and engagement of disabled students in multiple mathematical pedagogies, bringing to light how pedagogy interacts with disability. After describing the conceptual frameworks, I will present an ethnographic portrait of this classroom, and then present narrative analysis of interviews with Luis and Ana. This study was designed to answer the following research questions: (1) How do children in a seventh-grade mathematics classroom construct and enact understandings of ability and disability in mathematics over one academic year? (2) How do two children with learning disabilities develop understandings of themselves as mathematics learners over one academic year?

2 Conceptual Frameworks

2.1 Disability studies

While disability is primarily understood through a medical model, alternative models exist. Disability Studies (DS) grew out of the disability rights movement that proposed the social model of disability. Although individuals have natural biological variation, it is the social effects of difference that disable (UPIAS, 1975). To understand disability, one must investigate how meaning is made of human differences,

> *Disability studies takes for its subject matter not simply the variations that exist in human behavior, appearance, functioning, sensory acuity and cognitive processing but, more crucially, the meaning we make of those variations. The field explores the critical divisions our society makes in creating the normal versus the pathological. (Linton, 1998, p. 2)*

DS scholars such as Simi Linton have also foregrounded embodiment as critical to

understanding the experience of disability (Linton, 1998; Overboe, 2009). In addition, DS attends to both individual and collective resistance by people with disabilities (Peters, Gabel, & Symeonidou, 2009; Van Hove et al., 2012).

Disability Studies has been critiqued for not attending sufficiently to race, class, sexuality, and language (e.g. Bell, 2011; Ferri & Connor, 2005). Encouraging greater connections between these positionings and disability through the use of intersectionality (Crenshaw, 1989), Artiles (2013) writes, "Because the medical model foregrounds the individual as the unit of analysis, it disaggregates race from disability and other markers of difference (e.g., gender, social class, and language) resulting in a fragmented individual"(p. 335). While focused on disability, this paper will describe some points at which gender, race, and language intersected with conceptions of ability and disability. Additional research is planned to address these questions more directly.

The two children discussed in this article, Ana and Luis, both had Individual Educational Plans (IEPs) for Learning Disabilities (LD). To qualify for these services in United States schools, they were identified by teachers and tested by school psychologists. LD illustrates the complex social construction of disability as the diagnostic borders of LD have been in dispute since its inception (e.g. Ysseldyke et al., 1982; Scruggs & Mastropieri, 2002; Gallagher, 2010). LD is conceptualized medically as a neurological deficit, located in the individual, which causes an unexpected failure to learn. In the United States, the diagnostic criteria for LD have shifted from a discrepancy between academic achievement scores and intelligence test scores, to an individual's response to intervention (Fuchs, Mock, Morgan, & Young, 2003). In the United States, LD is disproportionally diagnosed by racial, ethic and gender categories (Losen & Orfield, 2002; Artiles, 2013). Qualitative studies have documented racial biases in the identification process (Harry & Klingner, 2005). In addition, both African-American and Latino/a children are more likely to be placed in a restrictive setting than white children with LD (Skiba, 2013).

Disability Studies, in particular the educational branch, Disability Studies in Education (DSE) has provided alternative analyses of LD. A diagnosis of learning disabilities can be understood as an interactional event, in which both teacher and student simply need to act in a particular way for the diagnosis to be achieved (Dudley-Marling, 2004). McDermott, Goldman and Varenne (2006) focus not on the individual, but on the US school system, placing children under the gaze of professionals ever vigilant for signs of individual failure.

In the last ten years, increased research attention has been paid to mathematical disabilities (MD), a specific form of LD in the area of mathematics. Most scholars have used medical perspectives to define MD, locating deficits in such areas as numeric processing or mental representations of the number line (e.g. Butterworth, Varma, & Laurillard, 2011; Geary, Hoard, Nugent, & Byrd-Craven, 2008). A small group of scholars have situated the study of mathematical disability in mathematical development (e.g. Mazzocco et al., 2013; Lewis, 2014). There has also been a small but growing group of scholars interested in providing critical, perspectives on the construction of mathematical learning disability (Ben-Yehuda, Lavy, Linchevski, & Sfard, 2005; Borgioli, 2008; Heyd-Metzuyanim, 2013). For example, Heyd-Metzuyanim (2013) explored how a mathematical learning difficulty was co-constructed through interactions between a student and teacher, scholarship that disrupts medicalized notions of disability

as individual deficit. Other recent scholarship on mathematics and disability has foregrounded embodiment, focusing on how children who are deaf and/or blind experience mathematics differently, challenging assumptions not only about learners with disabilities, but about what constitutes mathematical thinking (Healy & Fernandes, 2011; Freitas & Sinclair, 2014).

2.2 Sociocultural frameworks

Sociocultural research in mathematics has established that participation in different kinds of mathematical activity constructs different kinds of mathematical knowledge (Boaler & Greeno, 2000; Gresalfi, Martin, Hand & Greeno, 2009). Students who participate in lecture-based mathematics classrooms tend to view mathematics as a series of disconnected problems solved individually, using the methods taught by the teacher. Students who participate in discussion-based mathematics classrooms tend to view mathematics as collaborative, creative problem solving. This study builds on this scholarship. The participants in this study experienced two kinds of mathematical pedagogy, allowing analysis of how children made sense of themselves within differing pedagogies. Participation in classrooms is analyzed through the lens of *cultural practices*, repeated patterns of engagements with particular goals (Nasir & Hand, 2006).

Participation in cultural practices not only shapes knowledge, but identity (Holland, Lachicotte, Skinner, & Cain, 1998). Through participation in the cultural practices of mathematics classrooms, learners develop self-understandings about their competence and place in mathematics (George, 2009). For example, during this study Luis stated, "I am the talking kind of math learner." Taking up the cultural practices of his mathematics classroom, Luis framed his own place in a mathematics based on discussion. Children participate in multiple cultural practices of mathematics, both in school and outside. The development of identities occurs in multiple sites, across time. Each mathematical context has a different set of discourses and practices. Identification is a process through which individuals must sort through the multiple possible self-understandings. Bakhtin described how multiple discourses "struggle for influence within an individual's consciousness (just as they struggle with one another in surrounding social reality)"(Bakhtin, 1981, p. 348). In this study, children had multiple, often contradictory self-understandings about themselves as math learners; the complexity and contradictions within the children's narratives are critical evidence of the complex lived worlds of mathematics.

Mathematical classrooms position learners, constructing particular definitions of ability in mathematics (Gresalfi et al., 2009). Mathematical ability is broadly understood in the US context as an innate individual possession, instead of the product of effort and engagement (Dweck, 2006). Even successful mathematics students conceptualize ability in mathematics as an innate gift other students effortlessly possess (Hodgen & Marks, 2009; Brown, Brown, & Bibby, 2008). Mathematics continues to be represented as the domain of high-achieving white and Asian males, stereotypes that female, African-American, learners must negotiate and actively resist in order to construct identities as successful mathematicians (e.g. Martin, 2006; Solomon 2012; Stinson, 2013). In addition, competence in mathematics is constructed through ability groupings. Children use these groups to make sense of themselves as mathematics learners (Boaler, Wiliam, & Brown,

2000; Hodgen & Marks, 2009). In addition, ability grouping offers different pedagogical experiences for children at different levels. Students in lower status groups may take up identities as mathematical failures, while students in higher status groups may resist mathematical risk-taking, anxious to preserve their status (Hodgen & Marks, 2009).

3 Methodology

This project required longitudinal analysis of individuals participating in their mathematics classrooms, as well as multiple interviews over time to understand how learners made sense of that participation. These methodologies were designed to be sensitive to the complex and layered experiences of the children. As a white, non-disabled upper-middle class woman researching the experience of Latino/a children primarily from low-income homes, some of whom are disabled, I see my positioning as critical. As an outsider to the community of the participants, I designed my project to build strong relationships with my participants over time. While this paper focuses on data gathered in Ana and Luis's seventh-grade year, I began to develop relationships with the children in their sixth-grade year in order to facilitate trust as well as deepen my analysis. To help me understand how my own positioning was interacting with my findings, I made reflexivity a major goal of my work.

3.1 Participants in contexts

Located in a large city in the United States, Central Academy was in the neighborhood of Midwood, in which over half of the population is originally from the Dominican Republic (Latino Data Project, 2008). Central Academy is a middle school serving grades six through eight, roughly ages eleven through fourteen. The children in this classroom almost all identified as Dominican, with the diversity within that ethnicity very present, including varied levels of bilingualism and multiple skin tones (Bartlett & Garcia, 2011). Some children moved effortlessly between Spanish and English, while others told me "I am not good at Spanish." At the time of the study, 85% of the school qualified as living in poverty. Ninety-one percent of the school was Hispanic, with 6% African-American, and the remaining 3% white and Asian-American. Nine percent of the children in the school were classified as English Language Learners. Fifteen percent of the school qualified for Special Education services. Children with Individual Education Plans (IEPs), legal documents required for special education services in the United States, were all placed in one out of four classes at a grade level with a special education coteacher. This class was comprised of roughly half children with IEPs, with the remainder of the children randomly assigned. Central Academy had a history of high scores on state exams. In 2009, 86.5% of children in the seventh-grade scored either a passing or the highest grade on the state exam in mathematics, placing the school in the top 25% of schools city-wide. The school was a pilot site for a merit pay experiment in which teachers received a bonus for test scores.

Although this study spanned two grade levels, this paper will focus on the seventh-grade year. Like almost all of her students, Ms. Marquez is Dominican-American. She had nine years of experience teaching mathematics at the secondary level. Ms. Alton, the special educator who joined the class halfway through, is African

American. She was in her first year of teaching.

3. 2 Data collection and analysis

Participant observation Data includes twenty-two total visits to the seventh-grade mathematics class in order to create an ethnography of the cultural practices of the classroom. After each visit, I wrote extensive field notes. Thirteen classes were video-recorded and transcribed.

Analysis of participant observation Using grounded theory (Glaser, Strauss & Strutzel, 1968), I developed claims about the cultural practices (including discourses) of the mathematics classroom, and then tested those claims concurrently. To understand the mathematical practices, each ninety-minute class period was separated into different activity segments. Each segment was coded for type of mathematical pedagogy (Figure 1). Coding was inductive, using categories of *procedural pedagogy* and *discussion-based pedagogy*, discussed further in the Findings section.

Focus children Twelve children were selected as focus children, constructing heterogeneity in terms of gender, disability status, and current ability (defined as how the teacher perceived their performance in mathematics at the start of the school year). All focus children identified as Latina/o (using language such as "Dominican -American," "Spanish" or "Hispanic"). According to teacher records, this group of children represented heterogeneity in terms of home languages; some lived in homes in which both English and Spanish was spoken, some lived in homes where primarily Spanish was spoken, and some lived in homes in which primarily English was spoken. Two children were currently identified as English Language Learners, and two additional focus children had previously been identified as English Language Learners. All the focus children participated in the first round of paired interviews. Three children, one girl and two boys, declined to participate in the final individual interview. The final group included 6 girls and 3 boys. Six children had IEPs and 3 did not.

Interviews The focus children were interviewed twice in their seventh-grade year, once in the first semester and once at the end of the second semester. The first interview was semi-structured in pairs to increase discussion. The final interview was individual, with individualized questions for each child. Focus children were presented with particular moments from participant observation, and asked to reflect on those experiences in a modified stimulated recall procedure. Ms. Marquez was interviewed once at the beginning of the first semester. Both Ms. Marquez and Ms. Alton were interviewed together at the end of the second semester.

Interviews were analyzed by the extraction of short narrative segments related to mathematical experience (Riessman, 2007). Narratives were analyzed for themes and structure, or how the participant shaped meaning through the structure of the narrative (Riessman, 2007). Because all narratives in interviews are shaped by interaction between participants (Linell, 1998), narratives were also analyzed dialogically as well as identifying voices (Skinner, Valsiner, & Holland, 2001) that circulated in the narratives.

4 The construction of ability and disability in the mathematics classroom

This section begins with an ethnographic portrait of the seventh-grade mathematics class, followed by a description of the changes in classroom practices in the second semester.

4.1 Social selves learning mathematics

Meeting for ninety minutes each day, the class followed a consistent schedule. Working independently, the children first solved two to four mathematics problems called the "Warm Up." Ms. Marquez asked the children to talk about the problems with their seat partners. Ms. Marquez would then lead a discussion of the problems, which she called "going over" the problems. This whole class discussion was as short as fifteen minutes and as long as forty-five minutes. Next, Ms. Marquez split the class into three groups of eight. Ms. Marquez and a student teacher each taught one group, while the third group worked independently. On most days in the first semester, children rotated between these groups. The work was different at each station, ranging from solving a complex word problem to practicing multiplication facts with flashcards. During the first semester, the children were given both mathematical tasks that encouraged open discussion and procedural worksheets. The children were put into randomly constructed groups without ability grouping.

There was evidence of strong social ties in this classroom. Both boys and girls spoke in interviews of the importance of their friendships, particularly how working in groups with other children was supportive when problems were challenging or "stressful." Children actively worked to create networks of interconnections, "webs of care" (Luttrell, 2013) that sustained their emotional and academic engagement in school.

Even though Ms. Marquez spoke fluent Spanish, during class she only used Spanish to affectionately chastise children. While children often used Spanish to talk socially, I never heard a conversation between two children about mathematics in Spanish. Other research with Latino/as in mathematics classrooms has found bilingual children using both languages as resources to solve problems (Moschkovich, 2007). The absence of Spanish in academic work sent a message to children that there was no overlap between Spanish and mathematics, a sentiment I heard in interviews. Several children echoed a disjunction between their understandings of themselves as a collective cultural group, which they associated with social interactions, and doing mathematics in school, echoing larger narratives of school as an ideologically monoglossic space (Garcia & Torres-Guevara, 2009). Luis, a focus child, challenged this separation, using metaphors of race and borderlands to understand mathematics. He told me that he thought of the number line at zero as the contested border between Mexico and the United States. Despite scholarship demonstrating the crucial use of home and community funds of knowledge as resources to be leveraged for Latino/a children learning mathematics (e.g. Civil, 2002; Telléz, Moschkovich, & Civil, 2011) this mathematics classroom did not leverage these moments as resources to support learning.

4.2 Two kinds of mathematical pedagogies

One day early in the first semester, I sat down with Ms. Marquez after class. "You

probably noticed," she said, "that there are two halves in my class." She went on to describe the two distinct mathematical pedagogies she used in the class: *discussion-based pedagogy* and *procedural pedagogy*. These two categories overlap with other ways to describe pedagogies in mathematics, such as reform versus traditional, but are not synonymous with them. Ms. Marquez connected discussion-based pedagogies to what she called 'voice,' or developing her students' engagement in mathematical discussion. She connected procedural pedagogy to the memorization of specific procedures for standardized testing. Ms. Marquez understood her teaching practice as "switching" between these two kinds of mathematical pedagogies. I found considerable evidence of this switching in her class. Most of the ninety-minute classes in the first semester began with 30-45 minutes of discussion-based pedagogy, before shifting to procedural pedagogy. These two ways of being a mathematics learner were built from different cultural practices, with different ways of constructing disability.

Discussion-based pedagogy When Ms. Marquez was facilitating discussion-based pedagogy, she assigned tasks that led to multiple strategies. During discussions, Ms. Marquez typically listened to the children's answers, represented their thinking on the whiteboard, and verbally summarized their thinking. When children disagreed, she facilitated their discussion, using strategies such as revoicing (O'Connor & Michaels, 1993), rephrasing the child's strategy and connecting it to the strategies of others. During discussions, Ms. Marquez insisted that accountability rested in the hands of the children (Engle & Conant, 2002). These discussions were important in teaching the children the cultural practices of discussion-based pedagogy: sharing and debating multiple strategies, adopting a questioning position towards mathematics, and leaving answers open to debate. The children took up these practices during discussion, particularly the voice of questioning. Luis seemed to epitomize the competent discussion-based learner. He participated eagerly in mathematical problem-solving and discussion, even hiding complex problems under a textbook and continuing to work in secret when the class moved on. Ms. Marquez valued Luis for his engagement, naming him in the first semester one of her "top conceptual students."

Procedural pedagogy When Ms. Marquez engaged in procedural pedagogy with her children, she taught a particular procedure to children, and then engaged them in repeated replication of the procedure. Charts were posted that listed the steps to the new procedure. These practices centered on individual memorization of particular methods. Ms. Marquez spoke often of "remembering" particular procedures. While some children were able to recall such procedures, other children seemed to spend more time forgetting than remembering. A competent procedural mathematics learner must be able to solve a range of disconnected mathematical problems independently, ideally using only memory. Ana excelled at these practices. She had intense focus in class as the teacher modeled new procedures, and then would "practice and practice" until she "got it," in her words.

4.3 Shifts in cultural practices

In the first semester, instruction was somewhat balanced between these two pedagogies. Separating each 90-minute class session into different activities, I used the participant

categories of discussion-based pedagogy (D) versus procedural pedagogy (P) to code for mathematical activity over the course of the school year (Figure 1). There are different numbers of codes each day because I coded each separate activity. Some class sessions had multiple different activities in mathematics, and some days had only two. Out of thirty-six different activities in the first semester, twenty-two were procedural, and fourteen were discussion-based. In the second semester, only three out of twenty-three activities were discussion-based. Ms. Marquez told me that she eliminated discussion-based activities in order to prepare children for the state exam.

While during discussion-based mathematics, Ms. Marquez insisted that students listen and understand their peers' strategies, during procedural mathematics Ms. Marquez reminded students to use "what they want on the test." The children echoed this language; "What are we supposed to do— I mean what do *they* want us to do." "They," test-makers, became the critical arbiters of mathematical correctness, replacing the children themselves.

At the beginning of the second semester, a special education teacher, Ms. Alton, joined the class. Ms. Marquez created new student groups designed to separate the students with IEPs so that they could receive services from Ms. Alton. These groups remained the same until the end of the second semester. Ms. Marquez sent children off to the groups naming the groups: "in my independent group," "in my middle group" and "Ms. Alton's group." For Ms. Marquez, two groups were hers, while the group led by Ms. Alton was not. Ms. Alton consistently led the group that consisted only of children with IEPs, including Luis. Ms. Marquez spent most of her time with her "middle group"; which included some children with IEPs who were able to memorize procedures such as Ana, as well as some children without IEPs. The last group, which had no children with IEPs, Ms. Marquez called "my independent group." This group worked without the supervision of an adult, quietly joking and talking as they solved problems either alone or with another classmate.

During the second semester, the work each day was the same for all groups: a packet of procedural worksheets. Ms. Alton's all –IEP group moved at a much slower pace than the others. She insisted that all children follow along the worksheet together, with her voice controlling the talk. Ms. Alton consistently tried to facilitate connections between procedural and conceptual understanding, yet she did not allow the children to work independently. She moved too slowly for most and too fast for a few. The snail's pace prompted a girl named Elisa to comment sarcastically, "Apparently we are not supposed to go on," as she waited for the entire group to be ready to do the next problem. Luis resisted these practices, refusing to follow along at the pace of the teacher. Instead, he would work independently or with a partner. Speaking in a soft voice, Ms. Alton asked him to leave the room when he would not stop working with a partner rather than the whole group, telling him, "this is why you are always outside." Later that day, Ms. Alton described Luis to me as a "behavior," suggesting that he had a Behavior Disorder, a diagnosis that was not on his IEP. This is a particularly troubling discourse considering that she may have been suggesting Luis should be classified with a Behavior Disorder, a label that is disproportionally applied to Latinos (Artiles et al. 2010).

In the first semester interview, Ms. Marquez used the terms "procedural," to describe children who she felt excelled at procedural activity, and "conceptual," to refer

to children she felt excelled at discussion-based activity. Ms. Marquez referred to Luis as one of the "top kids" in the first semester. Ms. Marquez allowed these children to make comments even after she said that a discussion was finished. Ms. Marquez was concerned about Ana, whom she described as "not good at that side," the conceptual part of the class. She called a conference with Ana's mother to discuss her concerns about Ana's ability to understand conceptual mathematics. During the second semester, focused on test preparation, positioning based on procedural and discussion-based pedagogy shifted. Some children were able to be successful in both kinds of mathematics. Ana, who was initially a concern for Ms. Marquez, returned to the honor roll through her focus on memorizing procedures. Luis, the star conceptual student in the first semester, became a concern for Ms. Marquez in the second semester. Ms. Marquez told me that she "discovered that Luis cannot do rote." In addition, as ability grouping entered the classroom, Luis was placed in the lowest level group. According to Ms. Marquez, Luis was placed in that group because of his difficulty memorizing procedures.

While engaging in discussion was a marker of ability in the first semester, it was devalued in the second half of the school year. Thus far I have focused on the teachers' conceptions of the hierarchy of ability and disability in mathematics. As the year progressed, and procedural pedagogy was increasingly valued, I heard children echoing these constructions of ability and disability in mathematics. In the second semester, two boys sitting side by side, working feverishly to complete a worksheet on addition and subtraction with integers, had the following discussion,

Child 1: You are stupid.

Child 2: You are stupid.

Child 1: Look who is talking. I am further down the worksheet than you.

As in other studies, children assigned smartness to those who performed procedural mathematics quickly, echoing teachers who value learners' speed in completing rote tasks (Rubin, 2007; Hatt, 2012).

This emphasis on speed was not as dominant in the classroom in the first semester. During that time, Ms. Marquez praised children for their engagement in discussion, and the quality of their questioning. Both in class and in interviews, there were alternative ways to understand competence in mathematics. A girl named Carmen told me that in mathematics, there are "many ways, and none is better." This message of equity through strategic multiplicity was less prevalent in the second semester, as "what they want on the test" became the valued procedure.

5 Narratives and self-understandings

In this section, I discuss how Ana and Luis took up the multiple discourses and practices sketched above, constructing self-understandings in relation to mathematics. This section derives primarily from narrative analysis of two interviews with each child, one in the first semester and one in the second semester, supported by ethnographic analysis. Quotes are from transcripts of interviews, unless noted otherwise. I looked not only at the process

through which these children constructed self-understandings, but how those self-understandings evolved over time.

5.1 Ana

When I asked Ana to describe her ethnicity or race, she told me, "I speak Spanish, but also English," insisting on being understood as bilingual. When I asked her where her family was from, she told me "the Dominican Republic" and "Dad is also Ecuadorian," again resisting single parameters of identity. She was formerly categorized as an English Language Learner. Her family spoke primarily Spanish at home.

In an interview at the end of her sixth-grade year, Ana told me that she loved mathematics. At the beginning of seventh grade, Ana presented herself in class as an engaged mathematics learner. Ana closely followed mathematical conversations, keeping her gaze on the speaker, and nodding frequently. However, by the middle of the first semester, Ana decreased these behaviors. The teachers identified as having difficulties in understanding mathematics conceptually, but as the class transitioned to memorization of procedures, Ana joined the honor roll. Yet by the end of her seventh-grade year, Ana had distanced herself from her success in mathematics.

Ana frequently complicated whatever notions I presented to define her. When Ana talked about herself as a learner, she frequently stopped, paused, and reframed the discussion. She most often described herself by explaining what she was not: not a "smartie," not "those people who get on honor roll," and "not a nerd." Ana presented herself as complex and multifaceted, from her social identifications to her understanding of self as a mathematics learner. Ana consistently resisted being labeled as one kind of person.

When I asked Ana about a successful moment in mathematics class in seventh-grade, she told a narrative of her interactions helping another child, when she felt "like a teacher." She preferred working closely with other children, rather than interaction with teachers, "cause teachers like, is right there, and you know, like, do this, do that." She emphasized how the proximity of teachers was intimidating. However, both receiving and giving help to peers was empowering. The focus children in this study insisted again and again on the importance of helping their friends learn. Becoming a teacher, rather than a passive learner, allowed them agency over mathematical activity, as compared to "do this do that."

When I asked Ana what kind of a mathematics learner she was, she began with "I just learn whatever [my teacher] is saying, I learn everything from there." Ana focused intensely on the teacher's methods, and then she replicated that procedure. This allowed her to be successful in mathematics as long as procedures stayed the same. When her teacher "changes it," Ana became "a little bit confused." In Ana's narrative, learning was memorization. Ana understood herself as a mathematics learner within the practices of procedural pedagogy, describing herself as the kind of learner who had to "practice and practice" until she "got it."

When asked about her seventh grade year, Ana remembered, "Tests. Lots of tests." Ana narrated the stressful nature of this experience. She began by establishing her competence, and then moved on to tell a narrative of forgetting,

Ana: I would understand, but I'll get too, nervous and forget something. Like I will

> get, like, uh, like, in a math problem, like, uh, when she gives me a math problem, and I am just like, *okay, I should know this, I need to remember*, and she is like, *relax, just try to remember,* but I, I'm like *I should know this already*.

Notice the hesitation in the narrative, echoing the feeling of not knowing, not remembering. I italicize reported speech, in which Ana narrates both her voice and the voice of Ms. Marquez. Ana used Ms. Marquez as an internal voice of counsel, telling a worried Ana to "relax" and "try to remember." This narrative demonstrates how kids take in outside voices, transforming them into internal speech which allows them to them control their emotions and actions (Vygotsky, 1978; Holland et al., 1998). In her interviews, Ana frequently narrated conversations with Ms. Marquez about learning, particularly about the stress Ana felt as the test approached.

Ana's narration is similar to psychological perspectives on mathematics anxiety, in which feelings of anxiety interfere with the working memory necessary to solve mathematics problems (Ashcraft & Moore, 2009). Ana's narrative begins with emotion, then forgetting; "Cause when you are kind of nervous, you forget things." I approach mathematics anxiety as both embodied and constructed through the cultural practices of the mathematics classroom, In their second semester interviews, six out of nine focus children reported strong feelings of panic when taking tests in mathematics, or even doing regular mathematics work. This suggests that "mathematics anxiety" may widespread in mathematics classrooms dominated by memorization and test-preparation.

By the middle of the second semester Ana was on the honor roll. Ms. Marquez told me, "Ana worked her butt off to get an A-. It didn't come easy." Ana told me she got into the honor roll because she did extra credit, differentiating herself from others who did not have to work as hard. Ana understood "smart" as "knowing things quick" and "already knowing what to do." Ana used discourses I heard from Ms. Marquez about effort to understand herself as a hard worker, but while Ms. Marquez may have intended that her effort narrative replace fixed conceptions of mathematical ability, Ana allowed both discourses to exist side by side. The public narrative of mathematical ability as a possession (Dweck, 2006), as something you "have," was not completely displaced by a narrative of effort.

This understanding of mathematics as a gift was particularly gendered for Ana. I asked Ana if learning mathematics was different for boys and girls, she responded, "I think it is different for a girl and a guy in math, because we make it like girls are more, I don't know, I guess they get it, they are kind of, I am not saying they are smarter, but they may understand a little better." Ana was the only focus child who identified gender differences in mathematics, beginning by suggesting girls had more of some unnamed quality— "we make it like girls are more." She continued, "but there is a like, Ritchie, he is super smart. So I guess he would, like right away got it. Cause he, cause some students, they go to . . . math camp." Ana suggests that the public narrative is that girls are more successful in mathematics, but that Ritchie is "super smart," that he "right away" can do it. She ended the narrative with, "but I'm not, I don't like camp." Again, Ana pauses, hesitates, carefully phrasing her self-understandings. Here, she might have been about to place herself in either the smart or not smart category. She stops, and reframes the question based on her interest, "I don't like camp." Ana's self-understanding frames her as different than the boys in interests, not intelligence. Her narrative echoes

those of high-achieving girls in other studies who downplay their own ability in mathematics, actively constructing identities that exclude mathematics despite their success (Boaler & Greeno, 2000; Solomon, 2007).

Ms. Marquez was informed in the second semester that the eighth grade mathematics classes would be tracked by ability, and that she was responsible for placing her students in groups. When speaking to the class about it, Ms. Marquez used the language "advanced class" and "regular class." Ana said that she felt "pressure" from the tests, "cause next year they are going to separate the children like into a high . . . a high class where smarties and them . . . and just a regular class." I asked her where she wanted to go, and she told me, "the regular class, cause, if I go to . . . people that get into honor roll, I have been on honor roll, but those people have like, you know, more than me, and it's kinda hard." Ana began with "if I go to" and paused, as if she was not sure how to name what she previously called the "high class." She replaced that with "people that get into honor roll," but immediately ran into trouble. At this point, Ana herself was on the honor roll in mathematics. She tried again, this time differentiating herself from "those people" by what those people "have," "you know, more than me." Again, Ana constructed mathematical ability as a gift she did not possess. Ana constructed ability and disability in mathematics through her understanding that certain people had "more" smartness and other people, like herself, worked hard.

Ana resisted positioning as a disabled learner in the first semester by disengaging herself from her mathematical activity. Even as she re-engaged in class in the second semester, Ana still resisted the way she was positioned as a mathematics learner. Ana, despite her turnaround in mathematics, ended her year with narratives of de-identification with mathematics, telling me that "I don't really like math, so I'm not really like, like a . . . you know."

5.2 Luis

Luis described himself as "Latino," "Hispanic," and "Spanish." His family was from the Dominican Republic, and "my great great grandpa is from Spain." As with Ana, Luis presented himself through multiple identities, emphasizing multiplicity. His family spoke English at home. Luis was a powerful figure in the classroom socially; he was referred to both by teachers and children as the leader of a group of boys called "Luis and his lackeys." Luis made jokes in class, and seemed always under the watchful eye of his teacher Ms. Marquez. She appreciated Luis, sometimes laughing at his jokes, and also by calling on him frequently.

Luis was able to distinguish between the two pedagogies of the classroom. During his first interview in the first semester, while describing his mathematics classroom to me, Luis compared the two kinds of mathematical work in his classroom: "problems that give you problems" and "worksheets which are nothing." He preferred the former because you can "get interested in it." Luis believed the challenges of discussion-based pedagogy were integral to his engagement; "I like challenging more stuff, and the more challenging, it is like a problem, the more challenging, the more problems in your head, so it makes you think about it more." Mathematics was his favorite subject, "cause it's the most challenging subject." Luis persisted every time he was given "problems that give you problems." Luis resisted memorizing rules, particularly those for addition and

subtraction with integers, a major focus of the year. He only solved these problems accurately by using the "giant number line in my head" instead of the posted rules, a practice that he whispered to me and considered to be a "secret."

Unlike Ana who constructed understandings of herself as a mathematics learner through engagement in procedural pedagogy, Luis used discussion-based pedagogy to understand himself as a mathematics learner. Luis described himself as the "talking kind" of mathematics learner;

> **Luis**: It means the one that always has something to say about math, like questions a lot about math, or he wants to debate about things, so like if someone says the answer is 54 and I think it is 12, I am going to keep on . . . I'm gonna . . . like let's say even if I end up being the one that has the wrong answer and the answer really is 54, then I will go around it and say, like, oh it is 54, but the way you did it is harder because I just changed it by multiplying like this and I am trying to find the easier ways, so I look like, yeah.

In this narrative, Luis valued persistence and creativity over correct answers.

Luis's understandings of mathematical ability shifted slightly over the course of the year. In his first interview Luis rejected ability differences between learners in his mathematics class; "if I am thinking about it in one way, and another person thinking about it in another way, he might be smarter than me at that, but nobody is better than nobody else." This was the only time in this first interview that Luis used the term, "smarter," and he did so based not on static characteristics, but based on particular kinds of problems, "smarter at that." He echod the "many ways, none is better" other children used to understand ability within discussion-based pedagogy. In his final interview, however, Luis explained to me about the new groups in the class, telling me, "the groups were like smarter than others" although the "teachers they don't say that." He referred to his own group, the group with all students with IEPs, the "unsmartest group." Here, he used "smart" exactly in the way he critiqued in his first interview: a fixed way to define people. Luis continued to explain how that difference affected his experience in the different groups. The more the children knew in each group, the better the children were able to help each other. This was why he did not want to be in the "unsmartest group," because "it was harder for me to work" when the other children were less able to help. Again, "helping" was critical in the children's narratives of mathematics learning. Luis never shifted his self-understanding of being the "talking kind" of mathematics learner. These self-understandings emerged in both the first and second interviews. Even as he was demoted from a high to low status in his mathematics class, Luis continued to understand himself as a strong mathematics student because of his insistence on understanding ability through persistence and discussion. This conflicts with the emergence of "smart" in his second interview, demonstrating how self-understandings are emergent and often contradictory as children make sense of multiple cultural practices.

In the middle of the second semester, I told Ms. Marquez how Luis had described his favorite kind of mathematics: "problems that give you problems." I told her this in the hallway of the school, just as I was about to leave for the day. I was surprised when she began to cry. As we sat down to talk, she shared her frustrations with the shift in her

curriculum away from problems and discussion towards test preparation. She felt she had failed Luis, placing blame squarely on policies that made test scores the only relevant marker of learning.

5.3 Implications for the future

At the end of the second semester, the eighth grade mathematics teachers, reversing an earlier policy of untracked mathematics classes, had insisted that children be placed in eighth grade algebra based on "ability." The eighth grade mathematics teachers also mandated that no child with an IEP could be placed in the advanced classes because there was "not enough support." These placements have significant consequences, as placement in eighth grade algebra has significant effects in preparation for college-level classes (Spielhagen, 2006). Ms. Marquez wanted Ana in the most advanced mathematics class for eighth grade. Ms. Marquez spoke of creating a class for Luis that stressed conceptual learning over rote memorization. Ms. Alton disagreed with both suggestions. A conceptual class, she argued, would not give Luis what he "needs." According to Ms. Alton, Ana should not be in the advanced class because she needed "additional support." Ms. Marquez was visibly angry during this interview as we discussed these placements. Ms. Alton was calm, yet insistent that Luis and Ana, and all the children with learning disabilities, needed appropriate "support" and could not be placed in classrooms without it. From one perspective Ms. Alton was simply making sure these children received support services, yet from another perspective, she (and the eighth grade teachers) used discourses of care to segregate children, a practice that disability studies scholars have identified in disability professionals whose jobs depend on such differentiation (van Hove et al., 2012).

6 Conclusion

The two children in this study identified as particular kinds of children in school, as particular kinds of math learners, and particular kinds of abled and disabled learners. Situated within such multiplicity, identity was dynamic and fluid. Even as Ana was increasingly positioned by teachers as able in mathematics, she increasingly distanced herself from "smarties" who "had more than me." Even as Ms. Marquez attempted to disrupt these fixed ability notions and replace them with the importance of effort, Ana made sense of these multiple discourses by combining them. Some children, like her, were able to get good grades in mathematics through effort, while others simply had "more than me." Luis may have begun using the word "smart" that he once rejected, but he maintained his beliefs in the importance of discussion and persistence in mathematics. Neither child's identity in mathematics could be summarized in a single category. Rather, the focus is on the process of identification with mathematics.

Mathematical practices and discourses also were situated within cultural practices around schooling, including high-stakes testing and special education. Both Luis and Ana were positioned by their label of LD, denied opportunities because of assumptions built into their labels. This discrimination was disguised by discourses of support and care. Ms. Alton understood learning disabilities as a "need" for "extra support." Ms. Alton understood support in mathematics as limiting discussion and providing adult guidance

for problem-solving. Luis and Ana's differences as learners of mathematics remind us that there is no single mathematical profile of a child with a learning disability. It was their participation in different kinds of cultural practices around mathematics that disabled and enabled them differently at different points in the year. Perhaps some readers will insist that Luis was truly learning disabled, and Ana not, or vice-versa. This paper asks a larger question: what are the contexts in which individual children appear enabled in mathematics, and what are the contexts in which they appear disabled? And how can we create enabling rather than disabling mathematics classrooms for a broader range of learners? Mathematics education must include disability in calls for equity, as well as include learners with disabilities in research. As a mathematics education community, we can honor these children's resistance by continuing to foster broader conceptions of mathematical competence for all children.

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