CONTEXT MATTERS: EQUITY, SUCCESS, AND THE FUTURE OF MATHEMATICS EDUCATION

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This article presents a reflection on my research over the past 10 years, both the theoretical framings that have proven to be useful as well as some specific research findings. After presenting a definition of equity and its four dimensions (access, achievement, identity, power), I unpack a number of successful learning contexts in which I have conducted research and what they have revealed to me about equity. The contexts I explore include: 9 US high schools, 1 successful teacher community, 23 teacher candidates, and the achievement gap. Finally, I conclude with ways in which teaching and learning contexts, especially successful ones, might play a more prominent role in future research.

Contexts have always mattered to me. Perhaps it is because I was raised to believe that communities shape and support individuals into the beings they become. Some contexts bring out the best in me, while others hide my strengths. Considering my worldview, it makes sense that my research would pay particular attention to contexts.

In my research, I do not strive for the empirical findings to be generalizable to all students, or even all US students. My focus has always been to document successful learning environments for students who have been marginalized by society, highlighting the origins of such learning environments--be they personal or institutional. I do so for two main reasons: 1) as an existence proof to those in doubt that these environments and their associated student outcomes can be created and 2) as a means for informing how we might build more such contexts for learning. By marginalization, I mean through processes such as racialization, classism, sexism, and language bias. However, that is not to say that many of the foundational pieces of these successful environments are not applicable in settings where the students are white and/or middle/high income.

Contexts matter for a number of reasons. A focus on context helps remind us that no category of teachers or students (urban students, African American students, Latina/o students, even female, bilingual Latinas born in the US) is homogeneous. In fact, our beliefs, our lived experiences, our knowledge bases, and our agendas all influence how we "perform" in a given setting. All good teachers focus on context. They recognize the fact that among other things, a student's mathematical thinking is grounded in the kind of problem presented, how that student is positioned in the classroom with respect to others (DeAvila, 1988; Forman & Ansell, 2002), the norms of interaction (Seeger, et al., 1998), and the tools available to express one's ideas (Khisty & Viego, 1999; Moschkovich; 2007). For me, a focus on the context of learning also serves as a humanizing tool in mathematics education research. It moves us away from a kind of objectified way of knowing something (e.g., students or the "one" path to equity). And, contrary to what the larger public, many alternative certification programs, and some mathematicians think, mathematics teaching is too complex to be reduced to a list of basic skills or even strategies that can be followed by any college graduate. So, while it is important for mathematics educators to present their

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research in ways that are accessible to policy makers (Lubienski, in press), giving voice to the contextual factors that enable or constrain learning in a given situation is equally important. Richer descriptions of educational settings and their origins also are more likely to move away from a US-centric perspective and towards a more global reality in reporting mathematics education research.

My work is deeply grounded in socio-cultural theory, drawing on the notion that learning is intricately connected to the contexts in which it occurs (Lave, 1991; Lave & Wenger, 1991; Cobb, 2000; Atweh et al., 2001). We see this most clearly in research that has considered out-of-school vs. in-school mathematics performance (Nunes, Carraher, & Schliemann, 1993; Civil, 2006). Almost at the flip of a switch, highly competent street vendors are unable to complete similar mathematical problems when imported into a "school math" context. Like Franke and Kazemi (2001) who seek to "capture the evolutionary character of teacher learning rather than the more static characteristics (p. 56)," I aim to document the nature of effective teaching and learning contexts, not just their distilled "characteristics."

Most members of the mathematics education research community would agree that equity is a valued goal, maybe even the reason behind their research. However, much less consensus arises when the question is raised: *how do you think we should address equity?* Increase teacher content knowledge, create more multicultural curricula, develop professional learning communities, exert greater control over school policies, partner universities with local schools are just a few of the strategies that might start the list. For the most part, highlighting (successful) contexts is not likely to be an answer. Yet, attending to context is key for equity purposes. In this paper, I will unpack a few contexts in which I have conducted research and what they have revealed to me about equity along four dimensions. Then, I conclude with ways in which teaching and learning contexts, especially successful ones, might play a larger role in our future research. The contexts I will explore include: 9 US high schools, 1 successful teacher community, 23 teacher candidates, and the achievement gap.

Framing Equity

I begin with a definition of equity, partly because it is critical to how we might explore successful contexts and because so many definitions of equity exist. Equity means fairness, not sameness. So, when we look for evidence that we are achieving equity, we should not expect to find that everyone ends up in the same place. In 2002, I argued (Gutierrez, 2002) that at a basic level, equity means "the inability to predict mathematics achievement and participation based solely on student characteristics such as race, class, ethnicity, sex, beliefs, and proficiency in the dominant language" (p. 153). I argued for a focus on the dominant interpretation of this meaning as well as a critical one (something I will discuss later) and how equity could relate to the sustainability of our planet. It was important for me at the time to consider not just learning outcomes as they relate to a schooling context, but also to learning outcomes that relate to life and our relationships around the globe. I would like to elaborate on that definition to include four dimensions: access, achievement, identity, and power. Let me explain.

Access relates to the tangible resources that students have available to them to participate in mathematics. These resources include such things as: quality mathematics teachers, adequate technology and supplies in the classroom, a rigorous curriculum, a classroom environment that invites participation, reasonable class sizes, and supports for learning outside of class hours. The Access dimension reflects the predominant equity mindset of math educators in the 1980s that

students are affected by their "opportunity to learn" and continues today in more nuanced forms (Nasir & Cobb, 2007). However, a focus on access is a necessary but insufficient approach to equity, in part because equal access assumes sameness.

Beyond opportunities to learn, we also care about student outcomes, or what I categorize as *Achievement*. This dimension is measured by tangible results for students at all levels of mathematics. Achievement involves participation in a given class, course taking patterns, standardized test scores, and participation in the math pipeline (e.g., majoring in mathematics in college, having a math-based career), among other things. Moving from mere access to achievement is important when considering that there are serious economic and social consequences for not having enough math credits to graduate from high school, not scoring high enough on a standardized achievement test to gain acceptance to college, or not being able to major in a math-based field that can confer a higher salary and prestige in society. The achievement dimension was most prominent in the late 1980s and early 1990s when a greater emphasis was placed on standardized test scores and continues today into the more narrowly defined "achievement gap," something I will discuss later in this article.

However, because there is a danger of students having to down play some of their personal, cultural, or linguistic capacities in order to participate in the classroom or the math pipeline and because some groups of students historically have experienced greater discrimination in schools, issues of *Identity* have started to play a larger role in equity research in mathematics education (Abreu & Cline, 2007; Martin, 2000; 2007). From my view, students should be able to become better persons in their own eyes, not just in the eyes of others. For most mathematics educators, identity issues might include understanding mathematics as a cultural practice in ways that might further develop the appreciation of one's "roots." Examples of this approach are present in the ethnomathematics program (D'Ambrosio, 2006). But, we cannot stop there, as identity is much more than just one's past. More centrally, the identity dimension concerns itself with a balance between self and others. A window/mirror metaphor is useful here (Gutiérrez, 2006). That is, students need to have opportunities to see themselves in the curriculum (mirror) as well as have a view onto a broader world (window). For example, using mathematics to analyze social justice issues might offer a mirror to students who have been marginalized by society while it provides a window to students who benefit from the status quo. Identity incorporates the question of whether students find mathematics not just "real world" as defined by textbooks or teachers, but also meaningful to their lives. It includes whether students have opportunties to draw upon their cultural and linguistic resources (e.g., other languages and dialects, algorithms from other countries, different frames of reference) when doing mathematics. As such, we need to pay attention to the contexts of schooling and to whose perspectives and practices are "socially valorized" (Abreu & Cline, 2007; Abreu, 1999, Civil, 2006). The goal is not to replace traditional mathematics with a pre-defined "culturally relevant mathematics," but rather to strike a balance between the number of windows and mirrors provided to any given student in his/her math career.

However, even if students have access to quality mathematics, achieve a high standard of academic outcomes as defined by the status quo, and have opportunities to "be themselves and better themselves" while doing mathematics, it is not enough to call it equity if mathematics as a field and/or our relationships on this planet do not change. As such, a final piece of equity involves *Power*. The Power dimension takes up issues of social transformation at many levels. This dimension could be measured in voice in the classroom (e.g., who gets to talk, who decides the

curriculum) (Morales, 2007; Zevenbergen, 2000; Adler, 1998), opportunities for students to use math as an analytical tool to critique society (e.g., exploring "risk" in society) (Mukhophadyay & Greer, 2001; Skovsmose & Valero, 2001; Gutstein, 2006), alternative notions of knowledge (D'Ambrosio, 2006), and rethinking the field of mathematics as a more humanistic enterprise (e.g., recognizing that math needs people, not just people need math) (See Gutiérrez, 2002, for a more developed argument).

For the most part, Access and Achievement can be thought of as comprising the dominant axis. By dominant, I mean:

> …mathematics that reflects the status quo in society, that gets valued in high stakes testing and credentialing, that privileges a static formalism, and that is involved in making sense of a world that favors the views and perspectives of a relatively elite group. (Gutiérrez, 2007; p. 39).

These are the components students will need to be able to show mastery in the discipline as it is currently defined and to participate economically in society. This axis, where access is a precursor to achievement, measures how well students can play the game called mathematics.

On the other hand, Identity and Power make up the critical axis. By critical, I mean:

> …mathematics that squarely acknowledges the position of students as members of a society rife with issues of power and domination. Critical mathematics takes students' cultural identities and builds mathematics around them in ways that address social and political issues in society, especially highlighting the perspectives of marginalized groups. This is a mathematics that challenges static formalism, as embedded in a tradition that favors the West. (Gutiérrez, 2007, p. 40).

The critical axis ensures that students' frames of reference and resources are acknowledged in ways that help build critical citizens (Skovsmose & Valero, 2001). In some sense, identity can be seen as a precursor to power. This axis builds upon the idea that mathematics is a human practice that reflects the agendas, priorities, and framings that participants bring to it. As such, a diverse body of people are needed to practice mathematics, not just to build a 21st century workforce, but so that they might participate democratically. Moreover, mathematics needs a diverse body of people so that the field can sustain itself in the most vibrant way possible.

To be clear, all four dimensions are necessary if we are to have true equity. Learning dominant mathematics may be necessary for students to be able to critically analyze the world; while being able to critically analyze the world may provide entrance into dominant mathematics. It is not enough to learn how to play the game; students must also be able to change the game. But, changing the game requires being able to play it well enough to be taken seriously. As researchers concerned with equity, we must keep in mind all four dimensions, even if that means that at times one or two dimensions temporarily shift to the background. A natural tension exists between mastering the dominant frame while learning to vary or challenge that frame. As such, access, achievement, identity, and power are not going to be equally or fully present in any given situation. For example, teachers cannot be expected to address power issues everyday in the classroom in ways that are meaningful to every student. Similarly, when identity or power issues are being brought to the surface, at times the connection to mastering dominant mathematics may take a lower priority. The goal is to attend to and measure all four dimensions over time.

Equity in Teaching and Learning Contexts

Given this broader definition of equity, we might ask ourselves: How do access, achievement, identity, and power play out in different contexts? Which contexts matter? How do they matter for promoting equity? In this section, I will unpack a few contexts in which I have conducted research and argue what they have revealed to me about equity. In each of these contexts, I ask: what is the nature of this context and how does it contribute to our understanding of equity?

Nine US High Schools

I have always believed we learn best from understanding "success" cases. In that vein, I first began my research trajectory with the question: What is the nature of a public school that propels its students to not only take more mathematics than is required by the district, but also to show significant gains in standardized achievement? Steeped in "opportunity to learn" theories, my first cut was to take an institutional/policy analysis, focusing on tracking as it affected students' access (Gutierrez, 1996). I drew upon the Longitudinal Study of American Youth (Miller, Suchner, Hoffer, & Brown, 1992), a data set following students from grades 7 - 12. Using hierarchical linear modeling to capture the effects of students nested within schools, I sorted the 52 schools based upon overall student gains in mathematics, course taking patterns, and differentiation within student outcomes. From the larger data set, I chose nine US high schools that were non-selective and serving a large proportion of Latina/o, African American, and/or working class students. Four of these schools were chosen for their clear student gains and signs of success; four other schools were chosen for negligible signs of success with little or no gains (e.g., less than 50 percent of students at the school reached the second year of Algebra by grade 12); one school was chosen to represent middle-of-the-road schools. My goal was to understand the nature of these schools and their accompanying success (or lack thereof). I supplemented the quantitative student data with teacher questionaires, teacher interviews, and school documents.

Though much research at that time had focused almost exclusively on the practices and outcomes of individual teachers or school wide cultures, I changed the contextual frame to consider teacher community in relation to institutional issues. For me, a single teacher was not the appropriate context for getting at broader notions of equity. And, a school level analysis was likely to minimize the role of subject matter in teachers' everyday work commitments (Gutiérrez, 1998; Stodolsky & Grossman, 1995; Talbert, 1995; Siskin & Little, 1995). I was interested in the four schools where a large proportion of their students were excelling in mathematics and where that distribution was spread out over the entire student body. For me, that had to involve more than one maverick teacher or a silver bullet policy. The math department seemed a useful unit of analysis.

What distinguished the effective math departments from the ineffective ones? Tracking was not the pivotal policy. In fact, two of the four successful schools had tracking policies in place with support structures to push adolescents towards higher-level courses and half of the ineffective schools were de-tracked. The number of formal departmental meetings, years and degrees of staff members, math/science magnet designation, and overall school culture also were not key to distinguishing success. Instead, the effective departments stood out as different from the ineffective ones in four main aspects of their organization and culture. They had a rigorous and common curriculum, commitment to a collective enterprise, commitment to students, and innovative instructional practices.

A rigorous and common curriculum meant there were very few lower level math courses in which students could get lost or bored. In fact, students were offered little choice in the kinds of courses they could take, as streamlined paths led to the most advanced courses, and 3-year minimum requirements for graduation were implemented. Additional courses were created to get students back on track or help them double-up courses in a given year so they did not lose sight of the end goal. In their curricular design and their course requirements, these effective math departments presented to students a culture that taking higher-level math courses was not only expected, but also just the norm.

The second component to these effective math departments was a commitment to a collective enterprise. That is, unlike the norms of privacy found in many schools, teachers in these departments regarded themselves as part of a community of practice (Lave & Wenger, 1991, Wenger, 1999), learning from and with colleagues. One of the first signs of this collective priority was the practice of rotating teachers' courses assignments so that no single teacher owned all of a single category of students (e.g., freshmen, seniors, honors students) or subject matter (e.g., all geometry classes, all algebra classes). Teachers explained that rotating the courses meant that they not only had a chance to get a broader sense of the math curriculum (e.g., reminding themselves of how algebra is the foundation of calculus), but it also allowed for repeat students--ones who were in a teacher's class for more than one year. The impact of these repeat students was that teachers often had to think twice about judging a student as either innately competent or incompetent, as they noticed that some students were just late bloomers, going through family issues, or better at certain topics than others. This course rotation also led to more teachers discussing their work, and sharing lesson plans. While many of the ineffective departments could be described as operating under an "independent contractor" mode, the effective departments relied upon each other for professional development. At times they attended workshops and courses together based upon the subject matter taught, while other times they required individual teachers to report back to the group on things they had attended. These departments could be described as having collective autonomy in the sense that they did not conduct all business as a whole group. Rather, they had a common vision of what they were trying to accomplish and used frequent discussions and activities to address their goals.

The third component was a commitment to all students. More than just a slogan, this commitment came through in teachers' actions. For example, rather than the deficit frames or stereotypes held by members of the ineffective departments, teachers held constructive conceptions of students (e.g., as creative, smart) and held them accountable to high expectations. Partly related to the "repeat" students that teachers mentioned, they held flexible conceptions of the learning process (e.g., that not all learning could be easily measured, that maturity contributed to proficiency). They also shared the responsibility for learning, seeing it as partly their role to motivate students to want to learn.

The fourth component distinguishing the effective math departments from the ineffective ones was innovative instructional practices. In terms of instruction, while I found ineffective and/or traditional teachers in effective departments and successful teachers in ineffective departments, they were exceptions rather than the rule. Overall, while teachers in the effective math departments for the most part continued to lecture, they moved beyond worksheets and practice of basic skills. Moreover, as a group they attempted to make the mathematics relevant to students' lives, partly by offering choices of topics for larger projects. Some such projects included basketball standings,

ages of actors/actresses at the time of receiving an Oscar, and African American voter registration. Technology was also more prominent in these effective departments than in the ineffective ones. The majority of teachers used graphing calculators to model concepts and to help students see dynamic patterns or "the bigger picture." Moreover, students were expected to work in groups--partly to attend to the personal need for students to be engaged with peers, but also to encourage reasoning and conjecturing.

Although I have outlined the four components individually here, no single component would be enough to create the success these departments saw. More likely, the effects were synergistic--building off of each other. I termed this departmental culture "Organized for Advancement" (Gutiérrez, 1995; 1996) suggesting it involved a conscious "stance" (Cochran-Smith & Lytle, 1999) on the part of teachers to organize themselves and structure their work in ways that advocated for students and their learning above everything else. That is, it is not the mere presence of these components as resources for teachers that matter, it is also the meanings that emerge for teachers and students as these resources are put into use in local contexts (Adler, 2001).

From an equity standpoint, three of the four dimensions are highlighted: access, achievement, and identity. More specifically, when mathematics departments organize their formal and informal policies, courses, interactions, and supports for students in ways that promote high standards, students not only gain access to quality mathematics, they tend to achieve in ways that relate to both broader participation and test scores. When students are offered the opportunity to choose their own topics for projects, to a certain extent they are invited to express their identities and/or draw upon their cultural resources. What was clear to me at the end of this study was that although I could distill the results of the nine schools into a set of four characteristics that distinguished effective from ineffective, I was only scratching the surface. I needed to explore in greater depth the nature of a single math department, partly to understand the dynamics involved. And, while I was convinced that these OFA math departments were addressing access and achievement, I was skeptical that identity and power issues were sufficiently acknowledged (Gutiérrez, 1999).

A Successful Teacher Community

The focus shifted in my next study to ask not only what was the nature of a successful mathematics department, but also how was this teacher community created and sustained? Again, I continued to search for: what does this community reveal about equity? This math department was situated within a school that served 67 percent Latina/o students, 15 percent African American, and with 98 percent qualifying for free lunch. Their success was measured by: students taking more than the required number of math courses while in high school, large number of students in calculus (30 in 1996; 42 in 1997; 61 in 1998; 80 in 1999), calculus classes reflecting the broader student body (e.g., with respect to race/ethnicity, class, language, and school success), and 80 percent of the calculus students college bound (Gutiérrez, 2003). The following vignette attempts to capture the school context.

> We enter Union High School through the backside of the building and pass through a set of metal detectors and two armed Chicago Police officers standing post. Students (primarily working class and Latina/Latino) no longer enter through the front because it faces a main road that provided access for a shooting in the 1980's. Streams of students with large red identification tags swinging from their necks push past each

other to get to their classrooms and to socialize with their friends. Students are ushered through the halls by security staff in red shirts and teachers (mainly white and middle class) who also display identitification tags. A look at school test scores indicates many of the freshmen are several years below grade level in skills, especially mathematics and English. Union is what the media often portrays as the degradation of public schools in the inner city.

We might expect this school to offer an array of low level ("business math," "consumer math") courses, a watered-down curriculum with perhaps one AP calculus where those few student who make it through the public school system are still interested in college and a possible career in math. Instead, we find 3 full calculus classes.

Each teacher has his own personal style. One has a dry sense of humor, cracking jokes with his students and then quickly getting down to business. Another has a soothing voice accompanied by energetic presentations and passion about mathematics. Still another has a relaxed and youthful air to being with students who are close to him in age. In all three classrooms, we see Latina/o students (primarily) with some African Americans and just a few whites all working in groups, communicating and arguing about mathematical concepts and strategies for approaching problems. They alternate between Spanish and English language, between graphing calculators and pencil/paper forms, between time spent at their desks and at the chalkboard or their small-group white boards, between their textbook written by Harvard professors and worksheets made by their own teachers, between understanding mathematics as the "forest" (big picture/concepts) and the "trees" (details/symbols), and learning from examples that incorporate students' and teachers' lives--all with the goal of understanding the meaning of derivative and integral.

In each class, teachers are walking around to groups of students posing provocative questions and/or providing feedback for student work. Mostly, the teachers project a facilitator role, encouraging the students to help each other. Students pick up on this fact and are getting up from their tables to confer with other groups before returning to share the information obtained or to tutor other students when everyone in their group has reached an answer. These classes could not be described as quiet. Rather, they have the "hum" of intellectual activity that would make most teachers proud. And, with forty percent of the school's senior class present in these three calculus classes, who wouldn't be? These classes reflect both some of the goals that NCTM has put forth in the Standards and the formats used in countries where math achievement is high.

Through classroom observations, teacher and student interviews, and an analysis of school documents, the strong role of teacher community came through. In the words of one teacher:

> I think actually individual really good teachers help some kids that wouldn't make it otherwise, but I think the task of a department or of a school is to build up a community, a spirit, a plan that makes it broader than just one individual teacher, you know. And I think that may be the key lesson of what we've done at Union, that it's bigger than one teacher. And the power of a bunch of teachers working together is like greater than, the whole is greater than the sum of its parts.

In fact, only through community were teachers able to support students cognitively and emotionally in ways that advanced them to calculus.

Like the math departments that were Organized for Advancement, this department rotated its course assignments so that no single teacher owned a set of students or topics. The lack of teacher tracking in this successful teacher community was less a result of a school policy and more reflective of the stance that teachers took to create more democracy and opportunities for learning among themselves. Teachers could also be found sharing and discussing curricular materials; communicating and reflecting on students and their teaching; reinforcing to each other that all students can learn calculus; relying upon each other for professional development and support for students. Like the OFA departments I had studied, a key feature of this successful context lay in teachers placing students' needs, not just mathematics, at the center of their work.

While the broader mathematics education community has embraced the idea of "Lesson Study" (Fernandez & Yoshida, 2004; Crockett, 2002) and "Communities of Practice" (Stein et al., 1998; Franke & Kazemi, 2001; Sherin & Han, 2004), it is important for equity purposes to consider whether teacher community should be an end in itself (as a universal model of professionalism and growth) or a means to something larger. In fact, the vision of student empowerment, not just professionalism, drove the norms and practices of this teacher community. In the words of the department chairperson:

> More than anything we provide a vision for kids…having them believe in themselves as a group, having them be able to do math as a group, having them believe they can go to college as a group, and then at a whole 'nother level, um, it's like a political level… Organizing, I mean, I, I mean, at some level my way of teaching tries to organize them to be actors rather than acted upon.

As such, we learn that for equity purposes, the guiding mission of a community of practice may be as important if not more so than its presence.

Upon further exploration, this successful teacher community could not easily be distilled into a set of static characteristics without regard to how the community developed or was sustained through threat. A look into the history of this community of practice showed it was built partly on the biographies of the most veteran teachers (many of whom held identities that were marginalized in society), partly on a university partnership that provided professional development, and partly on strategic recruitment and socialization of new members over a period of 10 years (Gutiérrez & Morales, 2002). When teachers' practices and beliefs were threatened by a new principal who sought to focus staff on basic skills, the community's strong commitment to students and a reform curriculum, coordination of courses, mentoring of new teachers, and joint lesson planning allowed them to continue many of their practices without administrative support or sanctioning. Their community of practice had effectively helped them subvert the system so they could continue to be advocates for students. As such, this study highlighted the importance of not only chronicling the nature of a successful teaching/learning context, but better understanding the origins and trajectory of that context so that we might build others like it (Gutiérrez, 2002a).

Again an important aspect of this math teacher community moved beyond mere access and achievement (in terms of how many students made it to calculus) to include issues of identity and power. Identity issues included language and culture, but in complex ways (Gutierrez, 2003; in press a). Teachers did not rely upon Mayan mathematics, or some pre-scripted contexts for Latina/o students such as tortillas instead of bread. Rather, they developed a deep understanding of

their students (e.g., who uses Spanish when and with whom, who prefers graphing calculators to paper-pencil forms, who is a leader in the school, etc.) and used that knowledge to create working groups and an atmosphere where students felt comfortable using Spanish or code-switching (regardless of their English proficiency levels) and negotiating that practice with non-Spanish speakers. Like the window/mirror analogy, teachers wanted to build upon the resources that students already possessed (Moschkovich, 2007), but they also saw the importance of students communicating their arguments in English--a language for which they would be held accountable on standardized tests. This meant sometimes students helped each other present their work. Identity issues also came through in the potlucks that teachers hosted. Students celebrated their mathematical successes with family members and invited speakers, in the midst of home cooked foods.

While more attention has been brought to the kinds of clear-cut curricular interventions that can give power to students, (e.g., using mathematics to explore whether there is discrimination in the ways banks loan money) the issue of power in this teaching context related more to student voice/ownership in the classroom and to an understanding of the ways mathematics and power are related in society. At the time of the study, the calculus students showed outward signs of agency (e.g., developing t-shirts that claimed the calculus space, creating a second "honors" assembly because their efforts had not been acknowledged in the larger school's gathering, creating a body of calculus representatives that provided feedback on teaching to their instructors). However, the true nature of power became more prominent a year later when I had the opportunity to follow 8 of the graduates into their college years at the University of Illinois, the flagship university of the state. Having moved from their neighborhood communities where most of their interactions involved other brown skinned, mainly working class people, the university setting presented a new space where they were often challenged to prove themselves in terms of intellect and their right to be present. Whether it was deficit-oriented professors or white and/or middle class students with negative stereotypes of urban schools, the high school graduates argued that just bringing out "the calculus card" was enough to change the power dynamics. That is, they understood and were able to draw upon the social capital conferred to them by having participated in a calculus program in high school.

23 Teacher Candidates

Having learned the importance of "community" and "stance" in the work of effective mathematics teachers, I shifted my focus to teacher education. More specifically, I studied 23 teacher candidates who remained as a cohort for 2 years as they moved through our certification program. I wanted to know how one might develop in individuals the knowledge and disposition to teach high quality mathematics to urban students. The context of the program in which I work is primarily white, middle class females, strong in mathematics (mainly procedural knowledge) with little exposure to or solidarity with marginalized students. While (re)learning mathematics in ways they were not taught is important (Ball, 1988), the more formidable struggle is to get teacher candidates to recognize that not all students are like them. Part of that challenge lies in getting them to acknowledge and build upon students' frames of mind.

I was frustrated with the limitations of readings and cases studies and was committed to the idea that "learning is becoming" (Wenger, 1999). As such, I was most interested in engaging my pre-service teachers in a community of practice like the successful teacher communities I had

studied. I had already spent two years working on a similar project with a local teacher on a professional development grant. While she was committed to the highest levels of professionalism and engaged my pre-service teachers in a kind of community of practice, she did not hold a "stance" on teaching that placed her mainly African American and working class students and their needs first. She received her national board certification during the final year in which we worked together, however, in my eyes she was only minimally successful along the access dimension of equity, and unsuccessful along the other three dimensions. [See Reed & Oppong (2005) for similar results on national board certified teachers]. At best, the pre-service teachers in that project were able to identify beliefs and practices they would not replicate. At worst, our partnership further engrained already held stereotypes of working class students and students of color.

For the new project, I chose a teacher who had won awards for his teaching of calculus at the college level, who chose to teach in an alternative high school serving students who had been unsuccessful in other schools, who put his Latina/o and African American students and their needs first, and who chose to teach an NSF-supported mathematics curriculum. Although only in his first year of teaching, he offered greater opportunities for modeling the kind of equity practice for which I was looking. As such, we engaged in a one-year partnership with him and his students.

The partnership project had several components that attempted to engage pre-service teachers in the kinds of practices that effective teachers of marginalized students do on a regular basis (Gutiérrez, 2004). The university students were asked to: email a high school student on a weekly basis about things other than just math class, do mathematical problems that the high school students were doing, view video of the high school students doing the same problems, think about those math problems from the point of view of the student and the teacher, debrief with the partner teacher the events of the classroom video, prepare lesson plans for the high school classes, and host a fieldtrip to the University of Illinois where the high school students were given a chance to understand college life.

The success of the teaching context with which we partnered lay in a high percentage of students engaged on a daily basis in Interactive Mathematics Program (IMP) activities, focusing on conceptual understanding. Although no standardized achievement data was available, most of the students received solid grades in the two courses with which we partnered: algebra and data analysis/probability. Because the high school students had left their previous schools for reasons of childcare, gang involvement, or lack of support, their commitment to the math classroom here signaled a certain level of achievement. Like many of the math departments I have studied, effective teaching in this context involved a heavy reliance on cooperative learning, emphasis on National Council of Teachers of Mathematics (NCTM) process standards, students working in Spanish and English, regular use of graphing calculators, student presentations of their work, a rigorous curriculum, and supplemental activities that were relevant to students' lives.

Because I was interested in developing in pre-service teachers their knowledge and disposition to teach quality mathematics, the partnership project aimed to get them to experience mathematics in ways that reflected the goals of the NCTM Principles and Standards (NCTM, 2000). The students had read and discussed the principles and standards, some agreeing more than others that it represented guidelines for a quality mathematics curriculum. Now, they were being given an opportunity to do activities from a real text, to see high school students doing those very activities, to video-conference with their teacher his approach and its consequences, and to decide for themselves whether this was a quality mathematics curriculum.

In the beginning of the project most of the teacher candidates were impressed with the manner in which the Interactive Mathematics Program engaged them in concepts not just procedures and gave them opportunities to connect their mathematical understanding with other topics or the real world. On first pass, and with themselves as the reference frame, the pre-service teachers saw the curriculum as quality mathematics. However, when asked to reflect on the students with which we were partnering and how this curriculum might be appropriate, they were less sure, pointing out that the IMP curriculum assumed a certain level of proficiency in basic skills (something they did not feel the students had) and offered few opportunities to practice the ideas learned. They were also concerned that students could get lost in the heavily reading-based text. Their perspectives failed to fully engage equity issues, reflecting somewhat of a deficit framing on the students of color who were our partners.

When the pre-service teachers had the opportunity to view video of the high school students doing the activity, they were happily surprised to find that the students were engaged in reasoning and problem solving, making conjectures and defending their arguments. At the end of this session, many of them changed their minds and saw the power of a curriculum that focused on concepts and that required students to collect their own data. They saw the manner in which the teacher framed his questions to draw out his students' thinking and fostered student-student interactions. In fact, some argued that this kind of curriculum and teaching was at the heart of addressing equity issues in school because so many inner city kids were usually only asked to memorize procedures or prepare for standardized tests. From our equity lens, they were now able to see issues of access (to a quality curriculum and quality teacher) and some achievement (ability to make conjectures and defend arguments).

As the year progressed, we became more and more familiar with the classrooms with which we partnered and developed a more natural feel to the debriefings of lessons with the teacher. As we gained trust and shared common rituals, the pre-service teachers were able to pose more nuanced questions and our partner teacher was able to be more vulnerable with us. In community, we sought to better understand the students' needs and to best support them to develop mathematical proficiency. At one point in the year, the teacher was recounting a situation that had happened in his class and he wondered outloud if he had done the right thing. He explained that one day in class he was lamenting how the context of the problems in IMP failed to address the lived realities of his students. As the conversation between he and his students pursued, the idea of white textbook writers arose and what might this curriculum look like if the high school students had written it instead. At the time of the conversation he was aiming to show solidarity with students, recognizing that their identities and lived realities were important. However, upon later reflection, he wondered whether bringing up the subject and showing his disappointment with the curriculum would now make it hard for students to want to do the activities in class on Monday. Should he even have said anything to his students?

This question stimulated much discussion among us and raised the issue of whether "high quality curriculum" could be considered in universalitistic terms. Several of the students saw the importance of recognizing the bias in curricular materials with one's students. In the end, the teacher ended up creating a separate project on the probability of "seeing oneself" in a variety of magazines in his data analysis and probability class.

For the first time, my students were starting to see issues of identity and power. They realized that they had not considered whose perspective was privileged in designing curriculum and that

teaching involves making these kinds of in-the-moment decisions that can create or break down solidarity and trust with students. More than just having access to an NSF-supported curriculum that challenged them to reason, problem solve, communicate, make connections, and represent mathematics to each other and to their teacher or being able to use Spanish in class, they saw that students also should be given opportunities to see themselves in the curriculum or analzye the world around them. At the end of the project, what was less clear for the pre-service teachers was the extent to which students were being prepared for standardized tests they might encounter in their lives. Their struggle highlights the tensions between dominant and critical mathematics.

What this study revealed to me was the importance of successful contexts, not just for students in public schools, but also for developing teachers. That is, a key feature of the context of learning that differed between the teachers with which we partnered was being able to see real outcomes for students in ways that began to address their identities and power in society, especially with a teacher who held a stance of solidarity with his students. That is, my pre-service teachers were only able to abstract ideas and strategies from things they witnessed or participated in. This feature of success further highlights how all communities of practice are not equal (Gutiérrez, 2005).

I would like to end with some research I have been doing on the achievement gap (Gutiérrez, in press; Lubienski & Gutiérrez, in press) because it helps illuminate how our attention has been diverted from broader equity.

The "Achievement Gap"

"Gap gazing" along with more general "gaps analyses" is an example of the kind of work that is currently embraced in the mathematics education research community as a way to address equity. By gap gazing, I mean research that documents the gap in mathematics achievement between rich and poor students and between primarily brown/black students and white students, while offering little in the way of intervention. In its most simplistic form, this approach points out there is a problem but fails to offer a solution. Even researchers who conduct gaps analyses with the purpose of closing "the gap" fail to recognize that it is the analytic lens itself that is the problem, not just the absence of a proposed solution. Though I see many more problems with using the achievement gap as an analytic lens [See Gutiérrez, in press b], two concerns that are pertinent here are: a) it abstracts data from contexts and b) it ignores the many successful contexts serving marginalized students that have been documented in the literature. Let me explain.

Most of the research conducted on the achievement gap involves large-scale data sets. In these data sets, there is little room for attending to local dynamics, as the purpose is to define generalizable trends. However, by failing to attend to contexts, a "gaps" focus renders policies as "one size fits all," eventhough we know that teaching and learning are not universalistic (Ladson-Billings, 1995a, b). That is, such analyses fail to attend to the meanings that students and teachers ascribe to practices and resources that are at their disposal. In addition, the most significant variables shown to close the achievement gap do so only minimally and do not involve schooling contexts (Lee, 2003; Hedges & Nowell, 1999). Rather, they focus on income or family background, something of which few mathematics educators or researchers have control. Partly because gaps analyses provide little understanding of successful learning contexts beyond a few static variables and because they rely on correlations, they are almost useless in helping us understand either the dynamic relation between these variables or how to develop more such effective learning environments. Moreover, without the larger socio-political frame, achievement

gap analyses perpetuate the notion that the problem of low achievement in mathematics is a technical one. That is, if only we knew better how to develop teacher knowledge or teach students of color, we could close the gap.

The fact is, we know quite a bit about what is successful in terms of teaching marginalized students mathematics. For example, we know that effective teachers of diverse students (especially teachers of Latinos and African Americans) come to know their students in meaningful ways (e.g., do not rely upon stereotypes, are able to relate to their students in ways that attend to their mathematical and personal needs, build upon their cultural/linguistic resources), scaffold instruction onto students' previous learning experiences without watering down the curriculum, create classroom environments that have the feel of "family" (including a heavy reliance on group work), believe all students can learn advanced mathematics, and draw upon a deep and profound understanding of mathematics when choosing tasks (NRC, 2004). Programs such as QUASAR, MESA, Project SEED, and to some extent the Algebra Project have had success with students who are not being reached by traditional schooling practices (Hilliard, 2003). What often is lacking is not the knowledge, but the public "will" to support or develop more successful learning contexts such as these.

Perhaps more importantly, an achievement gap focus fails our definition of equity, as it attends only to the dominant mathematics that comprises the access and achievement dimensions. Equity problems among students are complex; no one variable is the lever. Therefore, although the policy arena may pressure us to keep things simple, the designs of our studies and ultimately our solutions must mirror that complexity.

Future Research

My point in highlighting some of the research I have conducted on successful learning environments for marginalized students is not to say that these environments are generalizable to all students. Rather it is to suggest that only in deeper exploration of these environments can we begin to understand the meanings that emerge for teachers and students. Moreover, my emphasis on the potentially dangerous consequences of using an achievement gap focus is not to suggest that everyone must conduct the same research or even that marginalized students do not benefit at times from studies that document inequities. However, in an era of randomized trials and experimental designs, I argue there is a great need to reclaim a space for studies that focus on learning in context, especially if we are committed to a definition of equity that moves beyond mere access and achievement.

More specifically, I encourage the mathematics education community to conduct less research that documents the achievement gap, identifies causes of the achievement gap, and/or focuses on single variables to predict student success. Instead, we need more research on effective/successful teaching and learning environments for black, Latina/o, First Nations, English language learners, and working class students. More rich descriptions of these contexts, including their origins of development are necessary if we are to fully engage a diverse society. Indeed, we need to learn more about and build upon effective models that already exist. From these studies more intervention work is possible. A cursory read of this article could leave one wondering if I am calling for erasure of all large-scale quantitative research or research on populations other than marginalized students. I am not. However, I am challenging us to consider the ways in which the contexts we study come through in our work and how that may relate to our stated goals of equity.

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