# The Equity Practice of a Mathematics Teacher in a Secondary School Committed to College Preparation, Community Connection, and Social Justice

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## Abstract

This paper outlines current theories of teacher practice that seek to promote equity from critical perspectives, and contributes to the empirical research on critical mathematics equity practice. Part of a larger study of equity and mathematics teacher practice in an urban public school, this paper reports specifically on the involvement and practice of one experienced 8th grade teacher chosen for her experience as a community activist and her participation in the creation of the school. It reports on the considerations that went into the planning of the school and its mathematics program, and the tensions and difficulties this teacher faces as she seeks to make her practice more critical.

Data include documents related to the school's creation, classroom observation notes, and an initial interview. These data indicate that the mathematics program structure and curriculum draw from existing data on equity practice, and were carefully considered to align with the school's dual goals of college preparation and preparation of students to work for social justice. The focal teacher's description of her existing practice reflects the critical pedagogy literature and the literature on implementing social justice curriculum in mathematics. The teacher provides examples of social justice mathematics projects she has implemented, and highlights tensions and difficulties she faces in that implementation. She articulates tension between the desire to implement critical mathematics projects and other the priorities she feels are most important for equity and social justice. At the same time, she exhibits a commitment to continued struggle for equitable change.

This teacher's efforts demonstrates work toward mathematics equity from a critical perspective, built from the ground up and initiated by fulltime secondary educators dedicated to school-wide efforts at equity, social justice, and social change. The tensions and difficulties articulated by this teacher-activist provide a picture of the complexities of such work, even in a favorable context. This teacher's experience raises questions about expectations of classroom teachers' developing curricula that are both mathematically rich and critical. As this study continues, it will provide a more detailed view of the tasks facing critical educators working toward mathematics education that contributes to reducing inequity.




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We are a social justice school so I really do want to be teaching about math in the service of how to make the world a better place. You know, frankly, flashing some stuff on the board about integers or graphing inequalities, or you know, what's the area of this polygon isn't that.

—Ms. Myles, Focal Teacher Interview, Spring 2007

## The Equity Practice of a Mathematics Teacher in a Secondary School Committed to College Preparation, Community Connection, and Social Justice

For years, many have recognized that the U.S. public education system does not produce equitable outcomes for all students. Significant differences in high school graduation rates, college attendance, wages, and other measures associated with educational attainment continue among groups identifiable by race, ethnicity, class, gender, and language background (Horn & Carroll, 2006; Knapp & Miller, 2006; Laird, DeBell, & Chapman, 2006; Rose & Hartmann 2004; Stoops, 2003). In mathematics education, equity is a serious and ongoing concern (Lee, 2004; National Council of Teachers of Mathematics [NCTM] 1989, 2000; Perie, Grigg, & Dion, 2005; RAND Mathematics Study Panel, 2003). This paper reports on preliminary analysis of the tensions and difficulties faced by an experienced educator as she teaches 8$^{th}$ grade mathematics in an environment specifically designed to support equity and teaching for social change.

Arguments for equity in mathematics education have taken various forms. Math educators have frequently made the case that all citizens need increased familiarity with more math concepts for successful lives in and out of the workplace (National Council of Teachers of Mathematics [NCTM], 1989, 2000). Some contend that in a changing, technologically-centered, and globalized economy, access to high-paying jobs depends on high levels of advanced mathematics education, making mathematics education



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more and more a determinant of who will, and who will not, succeed economically (Malloy & Malloy, 1998; Moses & Cobb, 2001; Oakes, 1990; Oakes, Joseph, & Muir, 2003; Schoenfeld, 2002). They therefore argue that equitable access to advanced mathematics education for marginalized students is a mark of fairness or justice in a democratic society. Moreover, equity advocates have argued that attention to equity in mathematics education is not only an issue of economic justice or fairness for individuals, but also necessary for U.S. economic competitiveness. On this view, unless more students gain access to upper level mathematics (e.g. algebra, calculus, statistics), demographic shifts will result in shortages of engineers, scientists, and other workers in mathematics-intensive fields, undermining the ability of the United States to compete globally, and thereby reducing all citizens' economic prospects (Holden, 1989; Jackson, 2002; Mathematical Science Education Board, 1989; Seeley, 2005). Consequently, equitable mathematics education is largely viewed as in the best economic interests of both individuals and the nation as a whole.

Economic rationales for equity have been critiqued on the grounds that increased technological proliferation may actually decrease the mathematics skills required for many jobs in the American economy (Stanic, 1989) and that very little of the math taught in schools directly relates to daily life (Mukhopadhyah & Greer, 2001). Equitably preparing all students to compete for a small pool of high-status, math-related jobs does not address the question of the economic prospects of those for whom such jobs are simply not available nor the question of whether advanced mathematics study has benefits beyond the workplace. As capitalism expands, so does class stratification between and within countries and uncertainty for workers everywhere. For many, the

real value of advanced education is declining. For example, in recent years a significant number of computer-programming jobs have moved to India, not because of a lack of skilled programmers in the U.S., but because Indian workers are paid less and receive fewer benefits, making them more attractive as a labor force. To compete with Indian labor, U.S. labor in this case does not primarily need better mathematics skills to become better programmers, but rather a willingness to settle for lower wages. Such conditions reduce the appeal of math education as a stepping stone to economic security and raise the question of what benefits advanced math education can realistically provide for all students. What happens to teachers' ability to motivate students for mathematics study when that work ceases to carry with it a chance to improve or maintain living standards? If we base our rationale for equity on a demographic imperative, what happens to efforts to improve mathematics education for marginalized students when shortages of mathematicians or engineers do not materialize (Teitelbaum, 2004)? As time passes we must repeatedly ask how well our vision of school mathematics correlates with the varied experiences and needs of all students, how the relevance of mathematics to students' lives may be changing, and how these changes affect teacher practice toward equity.

Attention to such questions should not be mistaken for disagreement with the ideal of "mathematics for all," but, we should examine more carefully how policies, and curricula designed to improve mathematics education for all students really work in specific contexts—not just in terms of standardized test scores, but also in terms of broader mathematics literacy and the degree to which the mathematics education available to students addresses their own material and ideological interests, those of

their families, and those of their communities. Attention to how math-for-all rhetoric has been justified by those from different ideological perspectives and how these different perspectives influence the ways efforts toward mathematics equity come to fruition can open possibilities for mathematics teachers interested in equity to approach their work differently. For example, instead of only working to address student deficiencies in particular math skills or processes, teachers might also attend to the ways students with different approaches to mathematics, or different understandings of the benefits of mathematics, might enrich both their own lives and the field of mathematics (Gutierrez, 2002)[1]. Or, instead of assuming that all students will benefit in the same ways from reforms, teachers might give more attention to how the mathematics they teach meets the needs of particular students in nuanced ways that avoid stereotypes about the capabilities of particular groups, while also recognizing that students in different social positions have different political and economic interests (Lubienski, 2003).

In this spirit, more compelling arguments for equity in mathematics education come from educators interested in taking equity research beyond efforts to raise standards or close achievement gaps and toward broader notions of social justice. Such efforts include considering how mathematics education helps all students develop more fully as humans and not just as future workers (Meyer, 1989; Secada & Meyer, 1989; Stanic, 1989) and also how math education might help create a more just, democratic, and sustainable future (D'Ambrosio, 1999; Gutiérrez, 2002). Many ask whether democratic ideals can survive in an environment where mathematically and technologically

[1] Gutiérrez argues that diversity among those who make curriculum decisions, those who influence *what counts* as success in school mathematics, and those who practice mathematics, keeps the discipline both vibrant and relevant



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advanced experts make policy decisions for the public (Moses & Cobb, 2001; Skovsmose, 2004; Skovsmose & Valero, 2001, 2002). Some have the conviction that the mathematics classroom should be a place where students can learn to use math to analyze their world as a precursor to changing the world so it is more equitable (Frankenstein, 1997; Gutstein, 2003, 2006; Mukhopadyah & Greer, 2001). While these arguments call for a broader vision of equitable mathematics practice. Researchers have much to understand about what such broadened notions of equity look like at the classroom level. Examining sites where work in this direction occurs may provide insight into the tensions and challenges teachers face as they work to prioritize and define a more critical equity mathematics practice.

## Mathematics Equity Practice from a Critical Perspective

Since the 1980s, critical educators, largely outside of mathematics education, have proffered a definition of quality education as an emancipatory and democratizing project aimed at empowering students—particularly marginalized and disenfranchised students—to recognize inequitable power relations, not as inevitable, but as the products of human-created social and economic structures (Darder, Baltodano, & Torres, 2003). Critical education emphasizes “the centrality of human agency and struggle while simultaneously revealing the gap between society as it presently exists and society as it might be” (Giroux, 2003, p.51). Grounded in the Freirean constructs of *critical consciousness*, *dialogue*, and education as means for *reading the world*, critical pedagogy examines asymmetrical power relations in the classroom and beyond (Freire, 2002). Critical educators challenge the assumption that public education as it exists offers equal access and opportunity for all (Anyon, 1997; Brantlinger, 2003; Darder,

Torres, & Gutiérrez, 1997; McLaren, 2003). Through iterative cycles of (a) question posing (b) historical, social, and political analysis, and (c) principled action, critical educators seek to connect theory and practice, thereby emboldening themselves and their students to contribute voice and energy to the ongoing process of creating equity and transforming society. Examining their own teaching and the teaching of others, researchers outside of math education have begun to set parameters for critical, equitable, classroom practice (e.g. Darder, 2002; Greene, 1993; hooks, 1994, 2003). Within mathematics education equity advocates have examined teacher practice from multiple perspectives in a variety of classroom contexts (e.g. Boaler, 2002; Gutiérrez, 1999; Ladson-Billings, 1997; Lubienski, 2000; Martin, 2006; Moschkovich, 1999a, 1999b; Nasir, 2002; Tate & Rousseau, 2002; Zevenbergen, 2003). However, with notable exceptions (Frankenstein, 1990, 1995; Gutstein, 2003,2006; Lubienski, 2000; Mukhopadhyah & Greer, 2001), little empirical research has been done on equity practice in mathematics classrooms from a critical perspective. Existing research has focused heavily on curriculum and its implementation in the practice of an individual teacher working in relative isolation, as opposed to a teacher working in a mathematics department or school with an officially sanctioned commitment to critical practice and social justice. It may be that individual efforts toward math equity practice and solutions based solely on the implementation of social justice curricula, while a valuable beginning, are not likely to have broad or lasting impact on societal inequity. Therefore, we should seek to understand the multiple and nuanced factors of mathematics equity practice, grounded in the work teachers perform in contexts where colleagues share a critical vision. Toward that end, this paper provides a preliminary report on a small part

of a larger case study of mathematics teaching practice in a public, open-enrollment, secondary school dedicated to college preparation, community connection, and social justice.

*Theoretical Framework*

The theoretical framework for both the larger case study and the smaller slice of research reported here centers on a philosophy of mathematics as a dynamic, social, and cultural activity with applications that can both support or inhibit progressive change (Skovsmose, 2004; Skovsmose & Valero, 2001) and a related conviction that in a truly democratic society, mathematics, science, and technology experts should be representative of the people. The framework builds upon knowledge gained from the research literatures on teacher practice, mathematics teacher practice, and critical mathematics education. We know from the evolving practice literature that teaching well involves complex and messy social processes. As teachers engage in practice they draw from multiple knowledge bases: content knowledge, knowledge of pedagogy, pedagogical content knowledge, their own experiences, personal and cultural knowledge of students, etcetera. We know that as teachers practice, they not only use technical knowledges, which can be learned, but that they also employ elements of wise practice that cannot be learned. Though teachers carry their knowledge and experience with them, the practical wisdom required for on-the-spot, situation-specific, classroom decisions is not something that can be taught. Thus, much of teachers' practice must be negotiated in social interaction. We know from the mathematics equity practice literature that changes in curriculum and its implementation a) can affect identifiable groups of students differently than other students, b) may result in gains in student achievement

by standardized measures, but have not closed achievement gaps between identifiable groups of students, and c) do not address fully the complexity of issues of identity and community that researchers have found to relevant for achieving mathematics equity in specific contexts. Drawing on tenets of critical pedagogy, the critical mathematics education literature broadens our understanding of mathematics equity beyond the goal of helping all students to compete for a limited number of privileged lives and toward one of helping students confront mathematics and make use of mathematics in ways that allow them and others access to possible lives that are more equitable. Moreover, examination of the work critical educators are doing around implementing social justice curricula or curricula for critical citizenship helps us understand the limits of structural or curricular changes alone in the effort to develop critical mathematics equity practice in particular schools. Other factors may be involved including, teacher attention to students' needs and interests; social and political relations between the various stakeholders; and department, school, or community priorities.

With relatively few empirical examples of mathematics equity practice from a critical perspective, and a recognition that my initial parameters would shift as research progressed, I began the study with six focal points that cut across the aforementioned literatures. Related to these focal points was a set of preliminary assumptions I made about the practice of mathematics teachers committed to equity in contexts where critical education was strongly supported. My focal points include (a) mathematical content, (b) pedagogical practices, (c) identity, (d) power, (e) collectivity, and (f) agency. In critical mathematics equity practice I would expect teachers to focus on each of these areas, keeping in mind that they will overlap, shift, and evolve over time. Moreover,

different foci will have different priorities at a given time. For example, at a given moment, priority might be given to mathematical content. Space limitations prevent me from providing a more in depth discussion of each of these focal points here, but I provide brief explanations.

*Mathematical content*. In critical math equity practice teachers must understand the dominant, existing mathematics content and be prepared to negotiate a balance between dominant or mainstream, and more critical content and processes.[2] I would expect teachers to recognize that students need strong math preparation in ways that are recognized and sanctioned by the dominant mathematics community and that will allow them access to postsecondary education in careers requiring significant math and science. In addition, I would expect teachers to look for ways to push the limits of the dominant content in more critical directions by, for example, critiquing the ways mathematics is applied or helping students to use mathematics as a tool for critically analyzing their world.

*Pedagogical processes*. In critical equity practice teachers must consider how their pedagogical practices influence math equity. Here, pedagogical practices are generally limited to educational practices in the classroom, but may, when relevant, include interaction between teachers and students outside of the classroom. This focus covers a broad area, but as an example, I would expect to see teachers positioning themselves as knowledgeable, yet continually seeking new understandings. I would expect their pedagogical content processes to provide for all students strong intellectual support and an environment conducive to classroom discourse that focuses on creating or

[2] See Gutiérrez 2002 for a distinction between dominant and critical mathematics. Under her criteria, reform-oriented mathematics falls within the dominant domain.

negotiating shared mathematical understandings that are deep and involve a significant amount of mathematical analysis (Kitchen, 2006).

*Identity*. In critical math equity practice, teachers must consider how their identities and the identities of students affect both the learning environment and equity. In this framework, identity refers to students' and teachers' in-school and out-of-school cultures and selves, including identities that might be imposed from outside by others. I would expect teachers to be attuned to the ways in which educational curricula and approaches may have unexpected effects for certain students (e.g. English Language Learners, working class students etc.). Teachers should be prepare to seek alternate ways to address the desired learning goals by building on particular students' strengths. I would also expect the them support an atmosphere where students can see themselves as doers of mathematic.

*Power*. A goal of critical math equity practice is to help students recognize and analyze power relations behind seemingly common sense social relations, structures, practices, and institutions. A linked goal is to help students develop strategies of resistance to inequitable power relations. This may involve challenging the ways mathematics itself is used to support inequity, or helping students make use of mathematics as a tool for analyzing inequity in various contexts. I would expect teachers, for example, to structure opportunities for mathematical analysis, dialogue, and action around serious issues affecting students or their communities. I might also expect dialogue around issues directly related to mathematics education such as the gate-keeping function of mathematics, or the benefits that an ability to do advanced mathematics might bring.

*Agency*. In critical math equity practice, student agency would be supported. In this framework, agency means the will and the power to speak and act for one's self and for the good of others. I would expect to see teachers structuring lessons to provide multiple entry points from which students might take ownership of their learning. I would expect that students' identities and voice be a noticeable presence in the classroom and that teachers would take time to get to know each student developing familiarity with the communities where students live and understandings of students' lives outside of the classroom.

*Collectivity*. Finally, in critical math equity practice, stakeholders would work together in various combinations toward collectively established goals. In this framework, collectivity refers to collaborations and common activities involving various combinations to stakeholders. For instance, depending on the goals at different junctures, a focus on collectivity may involve collaborations between students and students, teachers and teachers, students and teachers, or collective action involving various combinations of students, teachers, administrators, parents or community members.

*Relationship amongst the focal points.* Three of the focal points—mathematical content, pedagogical practices, and identity have been addressed to varying degrees in both critical and non-critical efforts toward equitable mathematics practice to date. However, given that the conditions of mathematical inequity in the United States involve not only social and cultural factors, but deeply rooted political factors supported by artificial constructs like race and meritocracy, these three areas of focus are necessary but insufficient for achieving equity, even over the long term. A critical equity practice must include a focus on power, agency, and collectivity. Moreover, it is important to note

that all of the foci included in critical math equity practice are interrelated and unlikely to manifest themselves in a teachers' practice as separate entities. Teachers strategically and pragmatically navigate the terrain of their practice. A central aim of this study is to understand the choices and tensions teachers face as they negotiate an equity practice amidst this complexity and to document the phenomenon of math teacher practice in this unique locale.

*Research Questions*

As context, the research question that frames the larger case study asks: In what ways does belonging to a school culture and community that views the goals of public education as transformative, support math teachers to define an equity practice? Components of this question include (a) what does math teacher practice—including curriculum, instruction, assessment, and social relations—look like in this setting? (b) what is the influence of students' lived experiences, in and out of school, on this practice? (c) how do local perspectives and neighborhood history relate to this practice? And (d) what is the influence of colleagues and other education professionals?

Here, I am specifically interested in the perspectives and practice of a mathematics teacher with years of experience in community organizing, who was instrumental in the design and creation of the school. Questions guiding my preliminary work with this focal teacher include (a) what decisions went into the creation of the Beals mathematics program and how do they relate to the school's mission? (b) How does Ms. Myles perceive mathematics and its relationship to the goals she has for Beals students? (c) What tensions and difficulties does Ms. Myles articulate in describing her practice in a school committed to college preparation, community connection, and social justice?

## Context, Participants, Methods, Data, and Analysis

Beals Community School is the primary site for the larger case study. Beals is located in the Hampton Park neighborhood of a large midwestern city. Opened in 2005, Beals operates under the auspices of a district program that allows designated public schools some flexibility in regard to district requirements. In a competitive process, the district accepted a proposal submitted by a grassroots group of community teacher-activists for the creation of a college preparatory secondary school with a social justice philosophy. The school absorbed many of the students and some of the staff of an underperforming local middle school that was closed. Educational emphasis, as described in the proposal for the establishment of Beals School, is on reading, math, use of technology, research, and writing. Beals Community School was chosen for this study because it is public and has open enrollment—meaning that neighborhood students must be allowed to enroll, though others may apply—and serves students typically marginalized in dominant U.S. society. In the 2005-2006 school year, Beals served grades 6-9 with an enrollment of about 310 students, 97% of whom were considered low-income, and 10% of whom qualified for bilingual programs. The mobility rate was 19%. The majority, 64%, of Beals's students were African American. Of the remaining students 24% were Latina/o, 6% were Asian American, 3% were multiracial/ethnic, and 3% were white. In the 2006-2007 school year 10$^{th}$ grade was added and enrollment grew by about 60 students. Eleventh and twelfth grade will be added in subsequent years. Other criteria for selecting Beals as a research site are a long history of progressive commmunity activism in the Hampton Park neighborhood, school leaders' deep roots in the community, and Beals' publically-stated, school board-

approved focus on social justice. Additionally, the 9-12 structure allows for considering math equity practice at both the middle and high school levels within the same community school. Because the mission and goals of the school appear to align with the goals of critical mathematics educators in many ways, Beals Community School provides a unique and fertile location[3] for both study of and action with mathematics teachers working for change.

Beals has one mathematics teacher per grade. Classes are small, between 15 and 25 students. The mathematics teachers loop, remaining with one group of students as they progress through the grades. Differences in certification requirements between middle and high school dictate two loops. In the middle grades, where teachers work on teams, critical integrated units on issues such as the building of America, civil rights, or violence and the criminalization of youth are a regular part of instruction, though not necessarily in mathematics classes. Both the middle and high school mathematics classes use reform-oriented, NSF-funded, expemplary curricula selected by the mathematics teachers[4]. The middle school uses *Mathematics in Context* (*MiC*), and the high school uses the *Interactive Mathematics Program* (*IMP*). Math classes are not tracked, although 8th graders may self-select to begin the 9th grade curriculum in 8th grade, with the specific goal of completing calculus in grade 12. Mechanisms that would allow calculus to be taken by students who do not begin the high school sequence early

[3] Conducting this research at a site where the stakeholders appear from the outset to value critical approaches to education, provides more fertile ground for exploration of critical mathematics than would a site where the value of critical approaches in general was not understood or was discounted.

[4] The high school curriculum was selected by the middle school teachers to align with the middle school curriculum. At the time of the Beals proposal, high school teacher had yet to be hired.

are under consideration. Initially the school year was extended by about a month. However, due to budget constraints, the school now follows the district calendar. In the middle school, math and non-math teachers direct 10 minutes of morning math each day. Math classes are 53 minutes long and there is an extra period dedicated to problem-solving worked into the shedule at least one per week. After school assistance is provided on most days.

In this early stage of research, I focus on the practice of one teacher, Ms. Myles who is currently teaching 8th grade. I chose Ms. Myles for early focus because of her great experience with community organizing in the Hampton Park neighborhood, her intense involvement in the design and creation of the school, her commitment to the schools' mission, and her leadership role among the mathematics teachers. Ms. Myles is a white woman. She has lived and participated in community organizing in the Hampton Park neighborhood for at least 25 years. Her children attended neighborhood schools and prior to becoming a teacher, she was involved with schools as both parent and advocate. She was part of a team of teachers at the previously mentioned underperforming school who, through collaborative effort, were able to significantly improve student achievement on standardized exams.

I began informal observation and volunteering in Ms. Myles' class in the Fall 2006. Formal data collection is in progress and will last through the late Fall 2007. Data include extensive field notes from over 100 hours of classroom observation over a period of 6th months[5]. I later refer to these as Field Notes (FN). I visited Ms. Myles' class

[5] It is important to note that approximately 70 observation hours occurred in the months immediately preceding standardized testing. During that time, Ms. Myles made less use

2-3 days per week and accompanied her and the 8th grade team on several fieldtrips. I recorded observations of classroom events, paraphrased classroom dialogue, described mathematics activities and made notes on informal hallway or lunchroom conversations with students and Ms. Myles. Another data source was an 80-page proposal for the school's creation submitted to school district and written by Ms. Myles in collaboration with other early planners of the school. I refer to this in later sections as Beals Proposal (BP). The primary data source for the findings reported below was the transcript of a one-hour audiotaped preliminary interview with Ms. Myles intended to serves as a baseline for understanding the motivations of this teacher, what she believes the school is accomplishing, and how she defines mathematics equity practice in a context supportive of teaching for change. I refer to this data source as Focal Teacher Interview (FTI).

After each observation week, I created processed field notes where I reflected upon my research questions and my observations. I also documented questions that arose. Field notes and the Beals Proposal were used as reference during preparation of the interview protocol. The interview was transcribed and was initially coded with codes developed from my research questions and the focal points of my theoretical framework for critical mathematics equity practice (Appendix A). I used the coded interview data to identify themes related to critical math equity practice that emerged in the interview. I then re-examined my field notes for observations that supported, added complexity, or were at odds with these themes. I revised the themes in light of my field notes and selected the most compelling themes for reporting below.

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of the NSF-supported reform curricula. Teacher-created lessons geared toward preparation were a major focus of instruction during that period.

## Findings and Discussion

Beals Community School originated from the efforts of a group of educators whose identities—as both teachers and activists—are firmly rooted in the Hampton Park neighborhood. The school's origins parallel critical pedagogy's cycle of questioning, analysis, and principled action, and reflect the power of "organized efforts of regular people" (Ms. Myles, FN) to improve their circumstances. Recognizing problems with the educational choices available to students in Hampton Park, teachers at the neighborhood's existing middle school created a new non-selective secondary school aimed at college preparation "so that just that kid who you know has a good heart and is willing to put in some effort can get enough help and enough support that they can really get ready" (FTI, p. 26). Early planners made a commitment to draw on the educational resources of the community to assist in both preparing students for college and in helping students develop the skills and dispositions to be agents of change (BP). Just as plans for the entire school were carefully considered and crafted, my interview with Ms. Myles made it clear that the vision and design of Beals's mathematics program was likewise carefully thought out. Moreover, interview data document fertile ground for critical mathematics equity practice in Ms. Myles' perceptions of mathematics and her understanding of the critical issues faced by her students. Ms. Myles articulates a number of tensions and difficulties she faces as she considers how to teach math in a school with a social justice mission. Central is a tension between whether her efforts are "mathy enough" (FTW, p. 3) and whether her practice is critical enough. Finally, data document Ms. Myles' commitment to the critical pedagogy goal of bridging the gap between what exists and what might be.

*Consciously on a Path*

Ms. Myles describes Beals students who are on track to take AP calculus in the 12th grade as "consciously on that path" (FTI, p. 21). Interview data indicate that Beals' mathematics program has likewise been thoughtfully and consciously planned to prepare students for both college and problem solving in everyday life. According to Ms. Myles, decisions about the Beals mathematics program structure and content were based on teacher observations and on information gained from educational research literature. Ms. Myles provides the following examples of factors that went into planning the math program including: a commitment to high expectations for students (pp. 27, 29), research touting benefits of AP calculus for college success (p. 10), insights gained from math equity educators Bob Moses (pp. 9, 31) and Rico Gutstein (pp. 2-5, 17, 20-23), a need to consciously motivate students for mathematics study (pp. 28, 29), the importance of students making sense of mathematics for themselves and being able to apply it on their own (p. 27), the desire that mathematics not be divorced from reading and writing (p. 18), the benefits of studying math within a narrative or practical context (p. 16), and the belief that at least in "broad strokes," students benefit from working together, since "discussion and debate is educational in and of itself" (p. 19).

Ms. Myles highlighted a number of structural components built into the program to address these factors. For example, because teachers loop with their students, they develop first-hand knowledge of the math topics students have engaged. Teachers are literally on the same path as that of their students. The reform curricula are used in each grade, however, in this model, teachers have flexibility to veer in different directions at different times depending on their goals and the needs of their students. Math teachers

know that missed or under-covered topics can be revisited in later semesters. Other structural decisions built into the program include limiting the number of course options, while at the same time, making sure that offered courses are of high quality; and incorporating additional time for mathematics into the team structure in the middle school. One reform-oriented course is offered at each grade (MIC or IMP). Eighth grade students who are motivated may move into the high school curriculum a year earlier than their peers. This year, 13 of approximately 75 students followed that option. Eight graders who move into IMP a year early continue to participate in morning math and problem solving activities with other students in their grade. Middle school math teachers work in concert with their grade level teams to a greater degree than they work with other math teachers[6]. All team teachers do some math with students everyday in an effort to provide students with additional time on task for math and to emphasize the importance of mathematics across the subject areas.

In addition to structural considerations, curricula for the Beals mathematics program were also carefully considered. Ms. Myles notes that prior to the creation of Beals, her team at the now defunct neighborhood school, had success in raising students' standardized test scores using MiC. According to Ms. Myles, other middle school teachers at Beals had some experience with, and were supportive of, the decision to use MiC and IMP. Describing the mathematics teachers' well-researched and deliberate decision to use reform curricula, Ms. Myles said:

> Everything is solving a problem in *Mathematics in Context*. It's bringing different math to bear on that problem like it would be in the real world, and then going

[6] The middle school structure is typical of models recommended by the national Middle School Association. At Beals, thematic units, a characteristic of many middle schools, are focused to align with the school's mission.

> through the process of an answer. Whether you got the answer right or not, you have to write up every step of your thinking. Granted, a bunch of Beals students are not going to go on to be scientists or engineers, I'm sure the majority. But if they can have four years of a strong math curriculum that teaches them how to think mathematically, how to solve problems just because they have so much background in problem solving, then we've accomplished our job because those are the kind of problems that math literacy addresses (FTI, p. 20).

> The reform curricula lend themselves to a social justice math framework because they are already in that problem-solving mode. So if you just change up the context or bring in some new contexts you can be social justice problem solving….the idea of those curricula…fits in. (FTI, p. 23)

So, while the original Beals Proposal only provided details for how social justice curricula would be incorporated into reading, writing, and social studies, decisions about mathematics curricula also took into account the potential for alignment with the school's social justice mission.

The mathematics program is designed to provide a framework that aligns with the Beals goals while allowing individual teachers flexibility in their practice. A number of questions about how the program as planned is working out in practice are yet to be addressed. For example, how does the high mobility rate at Beals affect teacher practice within this program? Are math teachers with different levels of experience using *MiC* and *IMP* effectively? And, how and to what degree are teachers able to collaborate across grades?

*Fertile Ground*

Ms. Myles' perceptions of mathematics exemplify the careful thought she puts into her practice and condition her goal of expanding the social justice focus of her mathematics pedagogy. Talking about why mathematics is an important she says:

> [M]ath and science are important tools in decision making that aren't used. So, decisions get made in a more charged atmosphere where you are just trying to play on peoples' emotions or prejudices or whatever and you are not appealing to real

> information or facts. That is not to say that math and science aren't culture laden because clearly they are, but, certainly they're a different way of looking at things. (FTI, p.13)

While Ms. Myles occasionally provides utilitarian rationales for mathematics study such as the need to prepare students for high school mathematics, this example communicates the importance she places on mathematics as a tool of analysis and the role of mathematical sophistication in countering unfounded or fallacious arguments. A further example of her beliefs about the benefits of mathematics is found in her concern with unfair treatment of her students and her desire to see them use mathematics to counter unsupportable claims against them.

> I think it would be good to help the kids understand how misunderstanding data is used against them. Like the whole broken windows theory of crime: that if you get a kid for breaking windows, you are stopping him, because he is going to be a criminal later on. That's not a valid use of correlation, or causation, or whatever. You can't make that judgment. But the people who move into these condos here, make those judgments publicly. It's like the big lie where you say it enough times and then it becomes true. (FTI, p. 4-5)

Ms. Myles shows here an understanding not only of the ways math may be used in making technical decisions, but also of how mathematics may be used or misused in political or ideological ways. This understanding, coupled with both her understanding of the serious problems faced by students in the Hampton Park neighborhood and her organizing experience, thoroughly ground Ms. Myles' goal of implementing social justice curriculum projects with her math students. It could be argued that her activist background, community experience, and sophisticated understanding of the learning process, shape her exploration of the possibilities and limits of social justice curriculum in an untracked classroom with marginalized students.

Ms. Myles has clearly thought about the possibilities for conducting social justice

projects using mathematics and has conducted projects around questions in the social justice realm, such as a living wage project[7], in the past. In our relatively short interview, she provided detailed examples of possible topics with a more critical edge—where students might use mathematics to understand a problem and work toward solutions including an analysis of police harassment of Beals students, and an investigation into the affects of "one strike[8]" legislation on Beals students and their families. She says:

> [T]he thing I am thinking about doing beginning next week, if I can figure out how to make it mathy enough, [is] trying to do this project about the police, because the police keep stopping our students. As young as they are, I am not going to say that they are all innocent. But, a lot of them are being stopped doing innocent activities. I feel like if we gathered data from the all students within the school and kind of analyzed their interactions with the police, and if we could gather some police data about stops, contact cards, or whatever, that we might be able to show something about youth being stopped unfairly. I am not sure that we actually could. I mean that's often the pitfall of a project like this is that you, you kind of find out wow, this is more complex than I thought! Or, the data isn't really there. Or, well the data shows something, but not exactly what we need it to. But, stuff like that right, right. Like there's a lot of stuff we could do in this community. (FTI, p. 2-3).

As Ms. Myles herself notes, a project like this involves risk. However, as an idea, it is clearly in line with the examples of critical mathematics projects reported on in the literature. Its emphasis not only on identifying and analyzing what may be an unjust phenomenon, but also on organized action to address the problem collectively, aligns with the tenets of critical pedagogy. It remains to be seen whether enacting such a unit is possible in this context, or in the context of the U.S. public school system.

*Mathy Enough?*

[7] In this project students collected and analyzed data about the costs of daily living in their community. By coincidence, this coincided with a citywide campaign to pass living wage legislation for workers in large, corporate-owed retail stores.

[8] Such legislation allows entire families to be evicted from subsidized housing if someone on the lease is accused—not necessarily convicted—of even a minor criminal offense committed anywhere.

Of clear concern to Ms. Myles as she problematizes what it would take to complete a social justice project like the police project described in the last section, is whether significant mathematics would be used, created, or explored within the project. She describes her concerns thus.

> I am anxious about what I am going to do in terms of these projects…because you have to gather data—and I don't have that kind of time—and then figure out how to make the data something that the kids can handle, how to do the math around it. (FTI, p.2)

Ms. Myles identifies a number of factors that may affect the mathematical value of the project. For example, there are pragmatic problems like how to find the time to create a unit from scratch or where to find information related to a project that is very specific to a location. Also, as Ms. Myles notes, the nature of authentic problem solving is messy and involves risk. As a problem is explored, unexpected complexity may complicate or negate the mathematical focus and direction. Teachers must have the mathematical background and pedagogical skills to bring out the potential mathematics in a given aspect of a project and students must have the mathematical background for meaningful mathematical analysis. Not mentioned by Ms. Myles may be the tension between her goals for helping students gain access to the dominant mathematics and her desire for students to learn to organize to confront meaningful problems by whatever means necessary, mathematical or not.

In work to implement a pedagogy of questioning using social justice projects with middle school students, Gutstein identified many of the same concerns (2003, 2006). Ms. Myles is aware of that work and mentioned differences between that project and her situation. Gutstein's students were upper track and 100% Latina/o. Unlike Gutstein, Ms. Myles works with students not only in mathematics class, but also in daily reading and

advisory periods. What affect such differences may have is unclear. Gutstein noted tension around trying to do social justice math projects while at the same time adequately covering the dominant curriculum. It is possible that the social justice focus in other curricular areas at Beals eases the urgency to do social justice projects in mathematics class. At Beals math can be incorporated into time allotted for existing social justice projects while students still receive 50 minutes or more of math-only instruction each day.

*Critical Enough?*

Along with questions about the mathiness of Ms. Myles's projects are questions about whether her current mathematics practice is critical enough. Her commitment to a pedagogy of social justice that makes the world a better place is clear. The strength of that conviction is reflected in her team's conscious decision not to include mathematics and science in the carefully planned integrated units around social justice issues to date. That decision was made in effect to keep the thematic power of the units concentrated. Forcing mathematics or science into units artificially, the team argued, might distract students from broader social justice themes (FN). Nonetheless, Ms. Myles' statements indicate that she is interested in finding ways to integrate more ties to social justice into her mathematics classes (FN, FTW).

Interestingly enough, Ms. Myles believes that the process of helping marginalized students feel an affinity for, and gain competence in, dominant mathematics is an act of social justice in itself. Talking about what she sees as the purpose of school mathematics, she says:

> Bob Moses said that algebra is this gatekeeper that keeps children of color and girls out of further math and therefore all the careers that are open to you. I guess I

> always feel that, and feel like that is part of my responsibility. And *it is social justice to open that gate for them*. Not only in the sense that, okay, you can pass Freshman math so you won't be in demo and you'll actually graduate, whatever, but I want them to believe math is beautiful on some level. Right? Like to appreciate that it's powerful and they need to know it even if they don't actually love it, although that would be even better. (FTI, p. 9; emphasis mine)

Critical education is an ongoing process. Ms. Myles sees her efforts to help students gain access to the dominant curriculum as a critical endeavor. At the same time, she has witnessed the ways that social norms can play out unfairly for marginalized people. Her students' need for the kinds of critical skills that more privileged students may not themselves need is registered in her intent to consistently focus on social justice in mathematics classes. The process of defining what that might look like continues.

*Between What Exists and What Might Be.*

Continuing to hope and plan for what might be possible, even against conditions that may make that hope seem impossible, is a tenet of critical pedagogy. Thus far, this study documents examples of that stance in Ms. Myles' comments. For instance, in talking about her concern that *Mathematics in Context* lacks creativity and may not be relevant for Beals' students she says, "[m]aybe that's something we would try and do in the future is to change some of the contexts to be a little more relevant or do some supplemental work in contexts that are a little more relevant" (FTI, p. 18). In another instance, after expressing concern that some of her students are a "step further away from the work ethic we'll need" (FTI, p.27), compared to students in the past, and that this may negatively affect her ability to implement the police project as she would like, she says, "I don't know if it will get there and if it doesn't with these kids that's not to say it couldn't, like it couldn't go on into the high school later and may be something different" (p. 24). This willingness to continuing trying and trying again, without giving

up on students or lowering expectations for what they can eventually accomplish, has been a repeating notation in my field observations. The aforementioned comments provide reinforcing evidence of the spirit of hope in Ms. Myles' math equity practice.

## Implications

Ms. Myles description of the history, philosophy, and action that went into creation of both Beals school, and the Beals mathematics program may be of interest to other educators hoping to develop educational environments, grounded in communities, that are conducive to equity and geared toward preparing students to be agents of social change. Moreover, this study provides a window into the thinking and practice of one experienced teacher-activist whose vision for mathematics equity aligns with the tenets of critical pedagogy. Ms. Myles's efforts demonstrate that work toward mathematics equity from a critical perspective is happening from the ground up in an existing school. That is, work in this area is not only being taken up by researchers or outside experts attempting to implement critical approaches or curriculum in a few mathematics classrooms, but by fulltime secondary educators intimately connected with school-wide efforts at equity, social justice, and social change[9].

The tensions and difficulties articulated by Ms. Myles provide a picture of the complexity of such work, even in a context with very favorable conditions for critical approaches to mathematics equity practice. Ms. Myles's experience raises questions about whether it is realistic for classroom teachers to develop curriculum that is both mathematically rich and critical. Though Ms. Myles has implemented a few social justice

[9] A number of teachers and schools are working in this area as evidenced by for example, participation in the *Creating Balance in an Unjust World Conference on Mathematics Education and Social Justice*, http://www.radicalmath.org/conference/. However, examples of this work in the research literature are as yet limited.

math projects and talks with her students about mathematic as a tool for analyzing and changing the world, in the struggle for equity, Ms. Myles currently places greatest emphasis on implementing reform mathematics curriculum and providing students with extended support to engage that curriculum. However, working to link mathematics with critical issues is for her an ongoing project. As this study continues, it will provide a more detailed view of the tasks facing critical educators working toward mathematics education that contributes to reducing inequity.

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Appendix A- Focal Teacher Preliminary Interview Codes- Spring 2007

Decisions that went into the creation of the schools' mathematics program

DR Rationale for those decisions —pragmatic, access to dominant mathematics, research literature, SJ & community connection philosophy.

Students

SP Teacher perceptions of students
SG Teacher goals for students
SU Teacher understanding of students' backgrounds, communities, and issues of justice.
SA Teacher as advocate for students

Perceptions about /Philosophy of teaching mathematics

PD Perceptions about /philosophy of teaching dominant mathematics
PCM Perceptions about /philosophy of teaching critical mathematics —issues that can be analyzed and better understood with mathematics, mathematics or communicating mathematically is used in action to address problems. PCM-Example#
PMC Perceptions about /Philosophy of teaching mathematics critically— challenging curricular priorities, challenging dominant notions about what is best for all students, challenging what counts as mathematics. PMC-Example#

Tensions/ Difficulties

TM Is it mathy enough?
TA Student preparedness for accountability measures and literacy
TP Pragmatic considerations (time, timing, resources, consistency)
TR Risk (cost/benefit, diluting a powerful unit)
TD Definition of social justice math that is fluid
TP Political nature of the work in general