Equity in Education:

The Relationship Between Race, Class, and Gender in Mathematics for Diverse Learners

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The goal of achieving equity in mathematics education is an impressive and important vision. The National Council of Teachers of Mathematics has adopted the first Principle of the *Principles and Standards for School Mathematics* highlighting the importance of strong support and high expectations for all students in order to attain equity in mathematics. (NCTM, 2000). National and international assessments show performance differences among students from diverse racial, cultural, and socioeconomic backgrounds. This challenge of seeking equity for all students requires increased efforts from teachers, schools, administrators, students, parents, communities, researchers, and different levels of government and mathematics organizations. Gutiérrez (2010) found the following:

> Alongside this heightened interest in equity is a parallel trend of wanting to understand the social nature of teaching and learning. Sociocultural theories, once seen on the fringe of a mainly cognitive field, now take their place squarely within mainstream mathematics journals like *JRME*. (p. 2)

These sociocultural perspectives allows for new possibilities in the relationships among mathematics, people, and the world.

The purpose of this paper is to examine the issues of equity in relation to race, class, and gender through the social theories of Critical Race Theory, feminist theory, and post-structuralism. First, is a brief literature review pertaining to issues of achieving equity in mathematics education. Next, a theoretical framework of social theories will be analyzed and discussed. Thirdly, a discussion will utilize the theories to the significant topic of equity in relation to race, class, and gender. The article will conclude with final thoughts on the topic including recommendations and prescriptions to aid in future research endeavors.

LITERATURE REVIEW

A definition for equity does not mean that every student receives identical instruction, but that appropriate and reasonable accommodations should be made to promote access and achievement for all students. By examining students' race, gender, or class, does not denote that certain outcomes are predictable in an equitable world. Gustein, et al. (2005)

argue "that equity does not mean equality, and that equity requires that public institutions, recognizing present and past inequities, contribute to rectifying the economic and social inequalities and injustices of today" (p. 94). Different researchers may use alternate definitions for equity, but the central idea is how research in mathematics education can be used to help in understanding the causes for the inequities, as well as strategies to reduce the disparities and effects of these inequalities.

On a worldwide scale, mathematics holds a special position in society with mathematically skilled individuals being able to achieve significant economic status (Bishop & Forgasz, 2007). A student's level of mathematical attainment has been used as a selective filter for various professions, which highlights the importance of an equitable mathematics education for all students. Ever since the launch of Sputnik, mathematics has held a special position in the world since it also influences the sciences and holds a global significance. Mathematics has also entered the realm of social sciences, including economics and the uneven distribution of wealth. There is a need to create a society in which all members are given a fair chance to succeed in mathematics. Tirosch & Graeber (2003) reveal the following:

> A senior vice president at the Amoco Corporation argued that all students must lean mathematics and that teachers' practice must change to allow them to adapt instruction to a wider range of students. In fact, organizations and business leaders not only argue for a more mathematically literate public, but also for specific changes in teaching practice that they view as more closely aligned with the abilities and attitudes needed by workers in the immediate and foreseeable future. (p. 646)

Business and industry leaders argue that their future employees need to have greater adaptability, communication skills, problem-solving skills, cooperation, and technology skills. This leads to a major concern that traditional classrooms practice individual work instead of collaborative and cooperative work such as found at job sites. Consequently, there is a need for teaching practices that utilize cooperative problem-solving situations.

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Mathematics education in school should prepare students for their future careers, as well as prepare all students to be mathematically functioning citizens of their society (Bishop & Forgasz, 2007). In order to attain equity in the mathematics classroom, a socially just pedagogy should be used to celebrate the diversity of all students in the classroom. This diversity among students may include race, class, gender, special needs, as well as a range of mathematical achievement levels. The function of this review of the literature will focus on the first three aspects; race, class, and gender.

Race and Mathematics

National and international assessments show performance differences among students from diverse racial, cultural, and socioeconomic backgrounds (U.S. Department of Education, 2011). The National Assessment of Educational Progress (NAEP) mathematics scores for the last twenty years show scale scores for 4th, 8th, and 12th graders with dramatic differences between White, African American, Hispanic, and Asian/Pacific Islanders. For the last twenty years, African American students in 4th, 8th, and 12th grade have scored 30 points lower than White students (U.S. Department of Education). Hispanic students have scored between 20 and 30 points lower than White students, while Asian/Pacific Islanders have scored about 5 points higher than White students (U.S. Department of Education).

These mathematics achievement gaps between White students and African American and Hispanic students have been a pervasive focus of mathematics equity research (Ladson-Billings, 1997).

Students' identities are partially constructed through discourses in the mathematics classroom, which also may lead to a socially constructed view of ability. According to Gutiérrez (2010):

> Regardless of whether one operates in a setting that explicitly articulates an achievement focus, it is the gaze along with the power of repeating this focus that gives authority to a particular discourse about equity, thereby allowing for only certain "truths" to arise–that African American and Latina students are inferior to Whites. (p. 18)

By using labels or categories, it may shut down possible practices and discourses within the school. There is a "White Male Myth" that permeates Western culture of boys, White and/or Asian, being naturally skilled at mathematics (Stinson, 2010). This is a myth, since not all White and Asian boys are mathematically skilled. Issues of female mathematical skills will be discussed later in this report. Using a sociohistorical perspective, practices of racism and discrimination have prevented African Americans from becoming equal participants in mathematics, as well as in other areas of society. African American students' beliefs about mathematics and their view as mathematics learners are influenced by expectations of parents, community members, and school personnel.

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The work of Moses and his colleagues on the Algebra Project highlights the need for mathematical literacy in today's society with the need for registered Black voters in Mississippi in 1961. The Diversity in Mathematics Education Center for Learning and Teaching (DiME) Group (2007) emphasize, "that differential access to algebra, which disproportionately excludes African Americans, Latinos, and poor White students from college preparatory mathematics classes, is serving as a form of structural discrimination resembling the use of literacy tests in the '60s" (p. 417). Algebra is needed to learn the technological symbolism needed in today's high-tech job market. Thus mathematics literacy is needed not just to gain access into college, but also to participate in a meaningful and economically viable society.

Class and Mathematics

All students should have access to a high quality education regardless of where they live or what school they attend. Equity does not mean that all students should receive an identical education, but an education that is most beneficial to their needs. According to Lipman (2004), in her study of struggling schools, the schools that were more urban with a lower SES just taught to the test. Prestigious public schools usually have teachers that have had more education and are more culturally responsive to their students, since they have been trained on the best ways to teach their students. The biggest determinate of how well students achieve is the education of the teachers and the economic status of their parents (Rebell & Wolf, 2008). According to Secada (1992), "among White children living in single-parent, female-headed households, 47.5% are poor" (p. 634), with African American and Hispanics having 68.5% and 70.5% respectively. Non-poor children have less than 20% of their mothers failing to complete high school and 50% of poor children have mothers that failed to complete high school.

Secada (1992) found, "There is evidence to suggest that many poor children enter school at an academic disadvantage to their middle class peers" (p. 633), which explains the origins of the Head Start program. A child's introduction to the concept of learning begins at home with their parents and involves their learning how to communicate from their surroundings and their parents (Cazden, 2001). Parents are the main source of information and they talk to their babies and answer their own questions. In the beginning, there is mostly visual attention, instead of oral attention. The parents guide their children with a multitude of tasks and the babies and children learn by scaffolding, as they become active instead of passive learners. In this hectic time with both parents working and possibly at multiple jobs, children may be missing bonding and learning time with their parent or parents. Many children see less and less of their parents and spend little quality time with the most important role models in their life. Many times children come home to an empty house and watch television and play videogames for hours on end. Consequently many students, especially lower SES, are missing the formation of the important scaffolding foundation created at home, which will help prepare them for their future schooling years.

As Kozol (2005) points out, students in urban schools are often blamed for their own failure, while the system of mathematics education also fails them. Even if material conditions in their school were equitable, other aspects of schooling would still be a construct for failure among minority students. The DiME Group (2007) found, "The literature on access and opportunity to learn mathematics documents how experiences differ along racial lines. Overall, segregated minority schools offer less access to upper-level math and science courses, many not offering courses beyond Algebra II" (p. 421). Based on a student's race, they can expect to experience mathematics education differently. Conclusively students of color tend to experience a lesser form of education, such as less qualified teachers, less course offerings, less culturally responsive teaching, and less teacher expectations.

Gender and Mathematics

According to Tyack & Hansot (1988), "No one has denied the existence of gender as a social dividing line, but in most periods people have not talked much about gender when they have discussed schools" (p. 33). The idea of educating blacks by comparison caused a great deal of alarm in society. Southern legislatures made it a crime to teach blacks to read and many Southern whites thought it foolish or dangerous to educate free blacks (Tyack &Hansot, 1988).

When debates did occur over gender issues they often had little impact in the everyday classroom. In the late 19th century, critics did create a controversy by stating that girls' attendance in high school and college caused damage to their reproductive system and nerves, but this had little effect on blocking girls into public education. The value of education was seen as an investment into the future generations of Americans and the patrons of rural school believed coeducational schools to be natural and practical. There was some debate in urban schools regarding the mixture of classes and different ethnic groups, but common schools were determined to be open to sexes as well as all nationalities, classes, and religions. Both sexes would learn the same subjects, even though their life destinies would diverge. Some institutions created a separate feminine curriculum alongside a distinctively male course of study. The equality of girls at this time was seen as an opportunity to be fully themselves, or feminine.

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Gender differences in mathematics education was attributed to differences in innate abilities and differences in males' and females' interests and perceptions of usefulness of the subject in the future. Solutions included modifying the curriculum and segregated education, but the latter idea proved too costly in public schooling. Tertiary education was limited to a small group of privileged males and was considerably delayed in granting equal rights to women.

> In the 1870s, a psychologist at Harvard, Dr. Edward H. Clarke, admitted that young women *could* learn rigorous subjects but argued that they *should* not…a young woman might lean algebra, but when the limited sum of energy flowed to the overwrought brain, it harmed the natural growth of the ovaries. (Tyack & Hansot, 1988, p. 37)

Consequently there was clear evidence of institutional discriminatory practices in the society in which mathematics leaning took place (Leder, 1992) along with a gradual shift from segregated to coeducational college education.

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It would be interesting for Dr. Clarke to be able to examine the current research on biological gender differences, such as found by Leder (1992):

> Gender differences in cognitive functioning is relatively small, and certainly too small to account for the differences in mathematics learning reported in the literature. Differences attributed to biological factors have less impact than the far greater pressures imposed by social and cultural stereotypes about cognitive skills, appropriate behaviors, and educational and life patterns. (p. 607)

There are differences in participation rates of males and females in mathematics and the sciences, whereas the performance of males in secondary frequently outperforms females in standardized tests. The reasons for this performance differences has been a cause of much debate and question in recent years. These differences may be in ways that males in females look at themselves, how they are regarded by others, and as learners of mathematics. These differences perpetuate and reinforce inequities, such as when students are fully capable of continuing in mathematics, but they believe the subject is inappropriate for them. Females may be more likely to self-select themselves out of certain mathematics courses than students who are more comfortable in taking upper-level mathematics courses. A large number of explanations and theoretical models have been created to explain the observed inequities in mathematics education.

THEORETICAL FRAMEWORK

A recent shift in the views to include sociocultural theories in mathematics education involves social beings and interactions and the consequences for addressing hegemony in society. Some mathematical educators are comfortable with including social and cultural aspects into their work, but most are not so willing to acknowledge that learning and teaching mathematics are not politically neutral. According to Gutiérrez (2010), "The sociopolitical turn signals the shift in theoretical perspectives that see knowledge, power, and identity as interwoven and arising from (and constituted within) social discourses" (p. 4). Educators that have taken such a stance seek not just a better understanding of mathematics education in all of its social forms, but also to transform mathematics education in behaviors that privilege more socially just practices. A variety of theories will be used to examine the issues of equity in relation to race, class, and gender through the social theories of Critical Race Theory, feminist theory, and post-structuralism.

Critical Race Theory

Critical Race Theory is examines different ways race and racism influence processes, structures, and discourses in education, such as the dynamics of school curriculum, tracking, discipline, standardized testing, intelligence testing, and other educational issues (Berry, 2005). According to Ladson-Billings & Tate (1995), applying Critical Race Theory to education consists of the themes of understanding race and understanding property. The mathematics curriculum can be considered as a form of intellectual property. The quantity and quality of the mathematics curriculum varies with the property values of the school, such as access to computers, the internet, graphing calculators, and qualified teachers (Snipes & Waters, 2005.) A goal of Critical Race theorists is to develop a curriculum and pedagogy that accounts for the role of race and racism in education with the goal to eliminate racism. Gutiérrez (2010) emphasizes the following:

> In mathematics this has translated into learners being able to make sense of the data in ways that help them see the humanity behind the numbers and to use mathematics as a tool for exposing and analyzing injustices in society and as a means for convincing others of a particular (often nondominant) point of view. (p. 5)

Through the use of dialogue learners as active inquirers are given opportunities to express themselves and act on their newfound knowledge. Critical Race Theory recognizes that the experiences and knowledge of people of color is genuine and critical to their understanding. The Critical Race Theory of education will be applied in order to study school inequity in the United States.

Feminism

The social theory of feminism involves a range or a continuum of political and theoretical feminist positions. Feminism is both a political statement and a theory of women's position in society focused on gaining equal rights and opportunities for women and changing power relations between women and men. Feminism means social action and the roots of feminist thinking date back centuries to individual and groups of men and women who worked to free women from the oppressive conditions of patriarchy. How people understand feminism depends on their view of the larger society. For instance a socialist feminist position views family as historically constructed and believes social class, race, and gender oppression to be intertwining consequences of a capitalist, patriarchal system. Social feminists desire a total transformation of the patriarchal social system found at home, work, and in schools. They want a total transformation of the school systems concerning the structures, practices, and policies, for both men and women.

Feminist theories have a common goal of being concerned for the equal rights of women and to transform the ways both men and women experience and live their lives. These social transformative theories differ in their emphasis, but they accept the premise that reality is comprised of the sum of the individual realities interacting in a given place. Great importance is given to the voices of all participants, especially women, members of minority groups, and students.

Post-structuralism

The preceding two theories will be examined in the discussion through the more modern post-structural theoretical perspective. Aligned with the previous sociocultural theories, a post-structural view considers the individual not as a source of their own meaning, knowledge, and action, but rather as a product of their combined discourses. The meaning people make of themselves are a result of their political struggles as they negotiate discourses, such as institutions, words, actions, and ways of operating and interacting. The importance of understanding

discourses reflects the natural order of the world; rather they structure the world (Gutiérrez, 2010).

Post-structuralism assigns more agency to individuals in shifting or recreating meanings of discourse. Old ideas are liberated with society and texts being viewed as contested knowledge. Power and knowledge are inextricably linked with the production of knowledge being a reflection of the society in which it is created. How people gain knowledge and come to "know" things, in addition to who is privileged in the process are all issues of power. Power is not a possession, but it is interwoven through discourses. Gutiérrez (2010) states, "Foucault claimed that discourses systematically form the objects of which they speak, their lack of uniformity and stability make discourse vulnerable to resistance, providing for the development of different (and at times opposing) discourses–and in turn different knowledges" (p. 5).

DISCUSSION

Within post-structural theory the concept of discourses being understood is not just as structures and languages, but also as a complex web of signs and practices that order and maintain sociohistorical and sociocultural constructions of social existence. Meta- or grand-narratives make possible the utterances of discourses, such as discourses involving the importance of equity issues in relation to race, class, and gender. These issues will be examined through the lenses of post-structuralism, Critical Race Theory, and feminism.

In democratic societies, the notion of a democratic education means that all students should have access to universal mathematics knowledge to prepare students to be competent citizens. Keeping with the idea that individuals identities are partly constructed through discourses in mathematics education, educators should begin to see how ability is socially constructed. It is important to pay attention to the views and ideas of the subordinated, since they show what has been considered normal in school. In this way it opens the possibilities not to just teach mathematics in more equitable ways, but also for a revolution in mathematics. The idea of post-structuralism has been faulted for an overemphasis on deconstruction, such as breaking something down into smaller parts if necessary in order to reconstruct it into something more equitable. An overemphasis on reconstruction can reduce social interactions into where justice becomes a moving target depending on the point of view. In focusing on the issue of race, educators and researchers must work to connect the analysis with how people are gendered, how the ideas of language operate, and other areas related to the concept of identity. So the danger then becomes in thinking that teachers and students are sophisticated and capable of negotiating power relationships, that they are never victims of institutional structures and practices, and that mathematical practices in school should never change (Gutiérrez, 2010). In deconstructing the rules and modes of operation in making the familiar seem strange, this is an intellectual exercise that opens up new possibilities, strength, and insights into schooling practices such as mathematics education.

Race and Class in Mathematics

The constructs of ethnicity and race are socially negotiated as shown by how students reject or accept artifacts of their group and construct or reconstruct their membership accordingly. For instance academically successful African American students may cope with the perception that they are acting "White" by hiding their abilities from others in school; actively rejecting characteristics typically considered to be of the African American culture, such as music; or by being successful in high-prestige nonacademic programs, such as sports.

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Some may even go to the extreme and adopt a race-less persona. Mathematics is viewed as a White field, due to the underrepresentation of African Americans in mathematics. African Americans are sometimes perceived as acting "White" in order to fit into the mathematics classroom (Snipes & Waters, 2005). There are complex ways in which membership in ethnic groups is maintained and negotiated, such as a combination of historical and current social contexts. Some successful male African American students see success not as Black or White, but as success, period (Stinson, 2010). They argue that mathematics is the same regardless of whether somebody is Black, White, Asian, young, or old and are emphatic that success in mathematics does not reside in a White male construct. This discourse is an example of post-structural critical theory breaking down the barrier of who is considered successful in mathematics. Stinson (2010) brought up a thought provoking question related to this discourse as follows:

> What might the schooling, academic, and mathematics outcomes of African American male students be if they did not have to expend so much energy–intellectually and physically–on negotiating a plethora of sociocultural discourses that attempt to unjustly construct them as being somewhat of "a problem"? (p.24)

This is a sad but true problem in our schools and society. So much brain power and energy is wasted playing the blame game on why certain students do not perform well in school, instead of finding solutions to empower diverse groups of learners.

Socioeconomic status refers to a combination of a family's income, education, and employment. Social class also concerns shared group values including a range of social issues, social roles, situations of oppression, and power struggles among different social classes (Secada, 1992). Members of diverse groups interpret their belonging into a certain group in ways that differ from the interpretation of individuals who reside outside those groups. Mathematical achievement of such groups should be interpreted as a social issue, instead of a matter of individual differences. The idea of a class-based society is an example of Critical Race Theory and the function of schooling. On a macro structural level, schools are viewed as places with a class-based society, which are reproduced through the use of cultural, economic, and hegemonic capital of the dominant social class. The purpose of schooling is to serve the interests of the dominant class, but the power of the individual can restructure their own destiny and transform the oppressive nature of the institution.

Gender and Mathematics

Feminist post-structuralists examine ways competing language patterns produce a notion of gender and rather than having just one way of understanding ourselves in the world, individuals constantly engage in restructuring, interpreting, and reinterpreting the world through language. Educators deconstruct the competing principals found in schools, such as practices, policies, and interactions. A feminist post-structuralist attempts to look at schools through a cultural, social, and historical lens to analyze relations of power and knowledge.

Equality of educational opportunity refers to providing the same educational opportunities, expectations and, support regardless of gender. It does not look at the unique aspects of boys and girls with the intention of providing programs that are geared toward the differing needs of both genders. There are gender issues pertaining to equality of educational opportunities, gender equity, and differential outcomes in economic opportunities and academic achievement for women and men. Sexist practices are still evident in both the formal and hidden curriculum in schools. Even though there have been decades of feminist activism, research pertaining to discriminatory practices, and legislation created to provide equality of treatment, females in society do not have equal access to educational and economic

opportunities due to their status of being a woman. Feminist theories can be used as a way to understand schooling and as way to achieve equality and break down patriarchal domination in schools.

The consequences of different participation rates of females and males in mathematics and science are devastating, since students who prematurely opt out of mathematics face more limited educational opportunities in the future. Mathematical performance tends to favor males on higher cognitive level questions, which leads to fewer females in upper-level mathematics classes. These differences further reinforce the inequities found in the school environment. Different theoretical models have been proposed to account for the observed gender differences in mathematics learning. The various models share a common feature of placing an emphasis on the social environment, which includes the influence of other people in the environment, students' reaction to the culture and context of learning, the personal and cultural values placed on learning, and various learner affective and cognitive variables (Leder, 1992). Gender differences in mathematics learning may be influenced by a range of environmental variables, such as school, teachers, peer group, parents, and society. Learner-related variables may also be a factor in mathematics learning and such variables include the following: intelligence, spatial abilities, confidence, fear of success, and persistence. All of these factors and variables testify to the wealth of information and continued attention that is needed to achieve equity and understand gender differences in mathematics learning.

Interventions and Prescriptions

Single-sex schooling has also been used as an intervention to address gender inequalities in mathematics learning outcomes. There are beliefs that females would benefit most from this program, but there are findings that males may also benefit from a single-sex setting (Yates, 1997). The concept of gender issues usually focuses on developing feminist theories to investigate women, but there has been a growing interest and need for research about boys. For feminist researchers, the current interest in understanding boys is a source of investigation ready for new insights and finding, especially concerning post-structural, Critical Race Theory, and feminist thoughts of equity.

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An example of current research examining prescriptions in mathematics education, Berry (2005) conducted his dissertation on two African American male middle school students and their success in mathematics. The focus was through the lens of Critical Race Theory and how the students perceived their mathematical experiences and what factors contributed to the boys succeeding in mathematics. Berry (2005) emphatically states the following:

> In order for more African American males to achieve success academically, it is critical to focus on the success stories of those African American men and boys who are successful to identify the strengths, skills, and other significant factors it takes to foster success. (p.47)

The boys highlighted in this study were fortunate to have parents that advocated, supported, and defended their sons in order to motivate and help them succeed in mathematics. Both families placed high value on education and the importance of succeeding academically. Doing well in mathematics was considered important to their future education plans and career goals. The two boys in this study were atypical of the average African American male,

since they were in advanced high tracked mathematics courses and were fortunate to have high parental involvement and strong role models. Unfortunately, the average African American male is in lower tracked mathematics courses with low expectations and a deficient support system. In our present educational system, there are many African American males and females that are not reaching their full academic potential in mathematics.

CONCLUSION

The aim of this paper was to examine the issues of equity in relation to race, class, and gender through the social theories of critical race theory, feminist theory, and post-structuralism. As has been shown the goal of attaining equity in education is a complex and multi-faceted notion. New lines of research are needed in mathematics education that focuses on the sociocultural and sociopolitical aspects of learning that address the realities of global citizens. There are various theoretical tools that may be used in analyzing teaching in learning in relation to the connection of power and knowledge. As DuBois so profoundly stated in *The Souls of Black Folks*, the color-line was a problem in the 20th century and reprehensibly it still is in the 21st century. Mathematics educators need to become knowledgeable in ways to reduce, not reproduce the problems of the color-line. This initiative should not only be used with Black students, but with all students in providing a humanizing high-quality education. More work and research needs to be done to explain "what works" in educating Black boys, as well as other races and ethnicities. Gutiérrez (2010) so appropriately states, "If, as a field, we are not willing to recognize the political nature of mathematics education or the fact that teaching and learning are negotiated practices that implicate out identities, we might as well give up on all this "talk" about equity" (p. 27).

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