

USING COGENERATIVE DIALOGUE TO TRANSFORM THE TEACHING
AND LEARNING OF MATHEMATICS IN URBAN HIGH SCHOOL

By

Samuel E. Jackson

A dissertation submitted to the Graduate Faculty in Urban Education in partial
fulfillment of the requirements for the degree of Doctor of Philosophy,
The City University of New York
2010

© 2010
SAMUEL E. JACKSON
All Rights Reserved

This manuscript has been read and accepted for the
Graduate Faculty in Urban Education in satisfaction of the
Dissertation requirements for the degree of Doctor of Philosophy

Kenneth Tobin

January 12, 2010
Date

Chair of Examining Committee

Anthony Picciano

January 12, 2010
Date

Executive Officer

Karen Phillips

Konstantinos Alexakos

Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

Abstract

Using Cogenerative Dialogue To Transform The Teaching And Learning Of Mathematics In Urban High School

By

Samuel E. Jackson

Adviser: Professor Kenneth Tobin

This dissertation focuses on improving the teaching and learning of mathematics in urban schools for African-American and minority students. My students played important roles as co-researchers in this two years ethnographic study conducted in a Queens, New York high school in which I employed cogenerative dialogue and coteaching as the two central research methods for connecting with students socially, culturally, and academically as I believe in a polyphonic and polysemic characterization of our classroom experiences. This is central in understanding how African-American and minority students interact, construct knowledge, and experience learning in urban schools. As such, different theories were utilized at different times to make sense of our practices and understandings as new outcomes are produced, as the study progressed. At the same time, my identity along with students' identities was constantly being transformed by our experiences in the classroom. At different stages of the research, our

changing focus, ontology and epistemology dictated the theoretical method that was employed.

Dedication

To my mother, family, friends and all African-American and other minority youths:

Thank you for being my inspiration. I love you all.

Acknowledgements

First and most importantly, I would like to give thanks to God, the source of my strength, for what was a very difficult journey for me, through many and various trials. I would like to express my deepest appreciation to Dr. Ken Tobin who provided me with solid support, insights, and guidance. This dissertation would not have been possible without his guidance. Thank you Ken, you have been a true friend and mentor. My deepest appreciation to my students/co-researchers at the Queens-Brooklyn High School, especially Cece and Bebe, and to everyone who have played different roles and supported me during this study.

To my colleagues at The Graduate Center, especially Dr. Kenneth Tobin's "Research Squad", who provided me with support and encouragement, thank you all. I feel very lucky to have been a part of a very caring community, namely, the research squad, and to have colleagues who are ever so willing to share insights into theory and good educational research practices.

A special thanks to my family and friends for being a source of comfort and strength, and for holding me up in those times when I feel like giving up. Thank you all for believing in me and supporting me in a number of ways. I love you all.

TABLE OF CONTENTS

Abstract	iv
Acknowledgments	vii
CHAPTER 1: Contextualizing The Problem	1
Teachers' Attitude And Perceptions Of African-American And Minority Students	2
Cece: A Case Study Of One African-American Student	2
African-American And Minority Students In Urban Schools	3
Statistical Information	3
Poverty	4
African-American Students' Drop-Out Rate	5
Community In The Classroom	6
Teacher Preparedness	7
Building Caring Teacher-Student Relationship	8
Trust And Safety	9
Teachers As Authority Figures Not Authoritarians	10
Characteristics Of Urban Schools	11
Teaching And Learning In Urban Schools	12
Students' Identity	13
Cogenerative Dialogue	14
What Is Cogenerative Dialogue	16
Coteaching	17
Structure Of Coteaching	18
Purpose Of Study	19
Research Questions	20
Context Of Study	21
Participants	22
Characteristics Of The Main Characters' Background	23
Chapters In The Dissertation	25
Chapter 2	26
Chapter 3	27
Chapter 4	27
Chapter 5	28
Chapter 6	28
Chapter 7	28
CHAPTER 2: Autobiography-My Story, The Making Of A Mathematics Educator	30
Growing Up In Jamaica	30
My Early Inspiration And Motivation: Bob Marley's Music	32
The Power Of Music	34
Music: A Voice For The Oppressed	35
Growing Up Poor: Agency, Determination, And Perception Of Self	39
Expectations: Family, Teacher, Church, And Community	41
My Early Educational Experiences: Basic And Primary Schools	43
What Can Happen When Your Teacher Believes In You: Mrs. Brown-My Algebra Teacher	46

A Scholar's Dream Deffered	49
Coming To America	49
How I Experienced Life As A New Comer In The US: Working Three Jobs And Going To College	51
Life For The Youths In My Brooklyn Community: High On Ambition, Low On Resources	51
A Strategy To Beat The Odds	52
The Turning Point In My Professional Career: Touched By Gratitude	53
Making A Difference For More Minority Students In My Community	53
Teaching In New York City: Urban High School, Minority Students	54
What Happens When Your Teaching Philosophy Does Not Fit With The School's Policies?	56
Understanding And Meeting The Learning Needs Of Students	58
Research Squad	59
My View Of Teaching	61
A Sociocultural Approach To Teaching That Transforms My Identity As A Teacher	63
CHAPTER 3: Examining Research Methods: Perspectives On Doing Mathematics Research In Urban Schools For African-American And Other Minority Students	
	70
The Research Approach	73
Critical Ethnography As A Social Justice Approach To Research	74
Valuing Students' Voices And Equal Benefits For Research Participants	76
Collaborative And Transformative Research	77
Bricolage	78
Looking In The Mirror	81
Conducting Authentic Research	83
Hermeneutic Phenomenology	86
Design Experiment	88
Data Collection, Analysis And Interpretation	89
Videotaping	90
Using Vignettes To Explore What's Happening	91
Using Videotape To Track Individual Progress	93
More Detailed Discussion Of Video Analysis	95
Using Videotape To Investigate Students'	96
Cogenerative Dialogue: New Way Of Mediating Teaching And Learning	97
Cogenerative Dialogue: What Is It? Why Is It So Important?	97
Cogenerative Dialogue: Reducing Power Differential And Giving Students A Voice	98
Cogenerative Dialogue: Students Sharing Responsibility	99
Coteaching As A Research Approach	100
Students As Coteachers	101
CHAPTER 4: Developing Tools To Impact Teaching And Learning Practices: Student Voice, Lived Experience, And Pedagogical Shift	103

The Power Of Cogenerative Dialogue	106
Valuing Student Voice In The Mathematics Classroom	108
Understanding Minority Students' Ethnomethodological Perspectives	110
Connecting With Students' Culture	112
Bebe And Cece's Voice	115
How Do You Think Students' Mathematical Knowledge Can Be Improved?	115
What Should Government, Schools, And Math Teachers Do? What Should Students Do?	116
Gaining Authentic Classroom Knowledge	118
The Genesis Of Coteaching In My Pedagogy	121
Understanding And Using Outcomes Of Coteaching	123
Effects Of Cogenerative Dialogue And Coteaching On My Teaching	126
Promising Equitable Outcomes For Students' Mathematics Education	128
CHAPTER 5: Promoting Students' Engagement In Mathematics: Agency And Collaboration Vs Control Over	132
Developing Students' Agency	137
Charles: Unlikely Student Displaying Agency Much To Class Appreciation	139
Students As Active Agents Of Change In The Urban Mathematics Classroom	141
What Counts As Student Agency?	144
Investigating Students' Mathematics Agency And Interactions In The Classroom	147
Agency, Conduct, And Interactional Order	151
Student Appropriating Culture Learned In One Field To Other Fields	155
Cece Using Her Agency To Gain A Better Understanding	157
Action-Based Phenomenology	157
Movement And Verve	157
Mathematics Experiment: Paper-Balls And A Trash Can	159
Mike And JJ's Basketball Experiment	161
Cece's Bold Move To Strengthen Her Mathematics Tool-Kit	163
Highlights From Students' Discussions In Cogens: Valuing Everyday Activities	166
-A Rattlesnake And Mongoose	
Neoliberalism And Globalization As Educational Rattlesnakes	168
Cogens: Helping Students Cope With Family Crisis-An Agentic Approach	170
CHAPTER 6: Collaboration, Cogenerative Dialogue Coteaching In An Urban High School Mathematics Classroom	171
Why Is It That African-American And Other Minority Students Remain Underrepresented And Continue To Perform Below Their Potential In Mathematics?	171
Cogenerative Dialogue: Examining Patterns Of Coherence And Contradictions	172
Why Some Students Are Turned-Off By Mathematics	175
Cogenerative Dialogue And Groups: A Transformative Tool	175
Deconstructing Student Roles In Cogenerative Dialogue	177
Using Cogenerative Dialogue And Coteaching To Meet The National Teaching And Learning Standards For High School Mathematics	179

Cogenerating Changes In Classroom Culture To Improve The Teaching And Learning Of Mathematics	181
Teaching And Learning In My Mathematics Classroom: Vignettes, Student As Resource, Teamwork, And Cogenerative Dialogue	183
The Interior/Exterior Angle Problem: Moving Towards Success	186
CHAPTER 7: In Closing: Highlights And Lessons Learnt From The Study	198
REFERENCES	207

Chapter 1

Contextualizing The Problem

Herein, I will explore the complexities of African-American students' successes and challenges in learning mathematics in urban high schools. Regardless of how one measures achievement in mathematics, African-Americans fall behind their peers. While there are many instances of success, there is a disproportionately large failure rate. This continues to be the norm in spite of numerous mathematics reform efforts, some of which are based on the advancements in mathematics education research.

As a teacher-researcher, this study is very personal to me as I try to understand and uncover reasons for the mathematics failures and successes among African-American and minority students in urban schools. My main focus will be on teaching, learning and classroom interactions. Although I consider these issues to be very salient to the mathematics education of African-American and minority students in urban high school, there are numerous out-of-school factors that directly affect the education of these students. While I will not be able to address all of these issues, of major concern to me are poverty, sociocultural disparities, and the lived experience of these students.

According to Shaw, "teaching from a cultural perspective also pays attention to the developed knowledge structures, perceptual patterns, and the preferred processes of learning within that culture" (Shaw, 1993, p. 68). I will examine the limited opportunities that structure the high school mathematics experience of African-American students and explore some of the boundaries that deprive them of hope for academic success. In the end, I hope that my work and the work of others in this field can lead to an optimistic future through education.

Teachers' Attitudes And Perceptions Of African-American And Minority Students

Finding common ground and ways to bridge cultural and learning gaps is not easy in urban schools that are severely lacking in resources. According to Nieto, "A considerable measure of academic peril for students is created by teachers' diverse cultural ineptness, improper attitudes, and differential behaviors towards African-American students" (Nieto, 1992, p. 124). Ford and others urge that in order to improve the schooling of African-American students, teacher education programs must excel in preparing teachers and administrators who have an elevated authentic knowledge of African-American culture. There is the need for a deeper understanding of the impact African-American culture has on behavior, learning styles, and preferred teaching styles, as well as a genuine appreciation for the valuable repertoire of experiences that African-American students bring to school (Ford, Obiakor, and Patton, [1995]). Too often we get complaints from African-American students that their teachers are very biased, unfair, and simply do not understand them. Chris Siry also substantiated this claim in her research and wrote, "Many pre-service teachers have entered my course with extremely deficit views of children who are different from their backgrounds" (Siry, 2008, p. 10.)

Cece: A Case Study Of One African-American Student

In this dissertation, I will focus on the experiences of a low-income African-American student whom I will call Cece (not her real name). Cece will be the main character, but I will also discuss the support she received from another minority student whom I will call Bebe (not her real name) in her mathematics class. I will tell the story of how Bebe supported and helped to transform Cece's low-achieving status and mathematical identity to being that of a high achiever. Cece had been struggling in the New York City public

school system from elementary school through high school. In spite of her struggles, Cece had expressed her desire to persevere and achieve her goal of becoming a social worker. However, she has always remained cognizant of the fact that factors such as race, class, gender, and poverty can function to mediate and subjugate the ambition of people fitting her biographical profile.

African-American And Minority Students In Urban Schools

While the overarching goal of this study is to gain a better understanding of classroom interactions, and how the use of cogenerative dialogue and coteaching as pedagogical strategies can best support student learning in diverse classroom settings, a major sociocultural issue that must be addressed is disparity in educational opportunities between African-Americans and their peers in urban schools. Inequities in schools and mathematics education, provide unfair advantages to White students over minorities in the real world. In New York urban high schools, the majority of students are African-American and minorities, thus inequities in school supplies, teacher quality, and other forms of capital serve to widen the achievement gap between Whites and minorities.

Statistical Information

According to the U.S. Census Bureau 2006 report, the United States urban cities and urban public schools are experiencing historically unprecedented levels of overcrowding due to an overwhelming influx of minority populations. At the macro level, in the United States, the total number of students in public schools during the 2006-2007 school year was 48,504,876. Whites (non-Hispanics) accounted for 27,394,435; Blacks (non-Hispanics) 8,288,264; Hispanics 9,950,245; and other minorities 2,871,932. In New York, the total student population for 2006—2007 was 2,781,785 of, which 546,918

students were Black, with the vast majority of Black students enrolled in urban schools (NCES, 2006-07, Version 1a). For example, a 2007 Report from NCES shows that in 1996, the percentage distribution of the 12th-grade SAT test-taking population, by race/ethnicity was: White – 69% and Total minority – 31%. In 2006, the SAT-taking population was Whites (62%) as compared to Total minority (38%). These data show a 7% increase in the minority SAT-taking populations over a 10-year period. These and other statistics are important as they reflect not only the trend in urban education, but provide information that can be used to better understand what is happening in urban schools. In my mathematics classroom, ethnic and cultural identities play a critical role in the way students come together and affect the learning process.

Poverty

Those who drop out of school are more likely to be poor, and the poor are more likely to drop out of school. This is the cycle that a high student drop out rate is likely to perpetuate, according to the 2004 Report on Illinois Poverty entitled “Breaking the Cycle of Poverty for Illinois Teens.” I am very familiar with this vicious cycle of poverty, and have seen its effect on African-American and minority students in both the developing countries of the Caribbean, as well as in New York City. In addition to basic needs such as sanitation, shelter, and safe water, children in impoverished circumstances often are deprived of the basic right to exercise their social and developmental rights (e.g., participation in social life and education) (UNICEF, 2005). It is this deprivation and inadequacies of urban schools that ensure the continuation of the poverty cycle.

It is a well-established fact in the United States that certain minority groups are viewed by mainstream culture as underclass, and are treated as such. Rowhea Elmesky

argued in her dissertation that apparent connections have been found between the societal perception of a particular group of individuals by the dominant culture and the economic and social positioning of subcultures. In urban classrooms where there are numerous subcultures, there is also rivalry and struggle for control of the learning environment, which often result in students losing focus of the main reason they are in school, which is to learn. Teachers who are mostly White and middle class sometimes fail to develop meaningful teaching and learning relationships with minority students due to the many and varied complex social and cultural differences and expectations each has of the other. According to Ogbu (as cited in Elmesky's Dissertation, 2001), African-Americans represent one of the minority groups who experiences dramatic educational consequences from urban dilemmas. One such consequence is the high drop out rate of among African-Americans and minority students as compared to White students.

African-American Students' Drop-Out Rate

“Until many more...minority students...are very successful educationally, it will be virtually impossible to integrate our society's institutions completely, especially at leadership levels. Without such progress, the United States also will continue to be unable to draw on the full range of talents in our population during an era when the value of an educated citizenry has never been greater.”

—“Reaching the Top,” The College Board (1999)

At a March 2001 education conference in Washington D.C., an audience member posed two questions to a representative of President George Bush:

Why is so little attention paid to the high dropout rate among the nation's African-American children?

Why does the U.S. Department of Education (DOE) annually report incomplete and sometimes inaccurate dropout statistics to the general public?

The President's aide responded: "The truth hurts, and few people want to share the truth about under-performing students these days."

The above informal exchange is a profound example of the thoughtless manner in, which some politicians and policy makers view and explain the seriousness of the African-American dropout rate. According to an April 2002 analysis report of high school graduation rates in the United States by Jay P. Greene, the national graduation rate for the class of 1998 was 71% overall. For White students the rate was 78%, while it was 56% for African-American students and 54% for Latino students. Wisconsin had the lowest graduation rate among African-American students with 40%, followed by Minnesota, Georgia, and Tennessee. Georgia had the lowest graduation rate among Latino students with 32%, followed by Alabama, Tennessee, and North Carolina. Fewer than 50% of African-American students graduated in seven states and less than 50% of Latino students graduated in eight states for, which data were available (Greene, 2001). These data are evidence of a wide gap in graduation and achievement rates, which indicate that African-American and minority students in urban schools have distinctly different teaching and learning experiences from their White peers.

Community In The Classroom

My research emphasizes the importance of building a safe (i.e., emotionally and physically) mathematics learning environment where students feel secure and want to learn. Learning mathematics is a hands-on process that requires a multitude of proactive methods such as guessing and checking, explicitly solving equations, deductive

reasoning, inductive proof, and so on. In order for students to learn mathematics, classroom structures must be provided so that they can get involved, seek the solutions, and engage in the process of learning. Students of mathematics must feel safe and secure in their classroom; they cannot be nervous to raise their hands and guess the answer and be wrong, they cannot be afraid to test solutions or different ways of solving problems. Students must have self-assurance and the support of the teacher that they can do the math. For a successful mathematics learning environment, one must start by creating a positive community in the classroom. To this end, I have instituted cogenerative dialogues and coteaching in my mathematics classroom so that students can confront their differences, and learn to work together across these differences. In Chapter 3, I explore the role of cogenerative dialogue and coteaching in greater detail.

Teacher Preparedness

One of the biggest challenges in preparing teachers to be successful in urban classrooms is making them aware of their classroom environments and cultures and subcultures contained therein. Creating a secure and nonjudgmental classroom environment begins with the teacher. Teachers must realize that in most urban classrooms the majority of students are of diverse cultures and ethnicity. In their article, “Preparing Culturally Responsive Teachers: Rethinking the Curriculum,” Ann Maria Villegas and Tamara Lucas explain that teachers need to expand their “sociocultural consciousness,” i.e., their understanding that people’s ways of thinking, behaving, and being are deeply influenced by such factors as race/ethnicity, social class, and language (2002, p. 22). It is crucial that teachers understand that individual confidence in mathematics may be shaped by different factors, whether it is the notorious assumption that boys are better at

mathematics than girls, or, all Asians are good at mathematics. These stereotypes create pressure on some high school students while discouraging others from participating. In considering the serious implications these assumptions can have on the mathematical achievement of African-American students, I contend that teachers must resist the temptation to stereotype, and create a classroom community of acceptance. Joe Kincheloe argues that “teachers must be capable of creating an environment in, which scholarship can thrive and analytic thinking can develop” (2001, p. 196).

Building Caring Teacher-Student Relationships

In addition to creating an environment where all are accepted, students need to feel that teachers care about them as individuals as well as their success in mathematics.

Jonathan C. Erwin explains that by giving students the essential needs of human relationships, the students will behave positively. Erwin suggest:

Appealing to students’ need for survival, love and belonging, power, freedom, and fun will not only help us build and maintain these essential relationships, but will dramatically increase the likelihood that students will behave responsibly and want to learn what we want to teach. By giving students what they need, we will get what we want.(Erwin, 2003, p. 20).

My research examines my own use of positive and caring relationships that have been built to ascertain whether or not this facilitates learning in the mathematics classroom. As part of the relationship building process undertaken during this study, I established relationships with my students by showing interest in their hobbies and lives outside of school, such as attending basketball, football, and softball games, and relating them to mathematics. For example, students and I constructed authentic algebraic word problems

pertaining to their interests, such as connecting throwing a basketball and parabolas. Students sense when a teacher is aloof, and may not feel inclined to listen to a teacher who does not care about them. When teachers are open and compassionate towards students, students open up and become interested in the subject matter. Caring and compassion can be as simple as asking students about their weekend when they enter the classroom

The classroom setting plays an important role in how African-American minority students participate in mathematics classes. African-American students must feel comfortable with each other as a group, and with their teacher in the classroom. Alfie Kohn states in *Beyond Discipline*, “As a general rule, it’s important for students to trust their teacher, to know she respects them and to feel safe speaking their minds with her” (Kohn, 2006, p. 122). Siry also informs us that research on field-based experiences focuses on individual experiences, and neglects the importance of acknowledging collective goals and the importance of group membership for learning (Siry, p. 22). This research examines the dynamics of group membership and how it contributes to collaboration and solidarity for the success and improved achievement of the collective.

In considering the claim that minority students enjoy working together and achieve more when they do, this study examines the level of engagement and actual collaboration on mathematics problem solving that takes place as students are allowed to engage in conversation as they work.

Trust And Safety

The comfort level in the classroom can range from not being afraid to speak one’s mind to feeling physically safe. One observed indicator that students do not feel safe in

the classroom is when they keep their backpacks on while sitting at their desks. They may not trust the teacher or other students enough to leave their personal belongings unattended. Students cannot learn until their primitive instincts are at ease. Sousa explains that students must feel completely safe in order for students to focus on learning. In *How the Brain Learns*, Sousa explains, “The brain’s main job is to help its owner survive. Thus, data interpreted as posing a threat to the survival of the individual, such as burning odor, a snarling dog, or someone threatening a bodily injury, are processed immediately ... students must feel physically safe and emotionally secure before they can focus on the curriculum” (Sousa, 2006, p. 44).

Safety may be an issue of concern inside or outside the classroom. In urban schools, there are multitudes of potential threats to students’ safety. The threats and concerns outside the school may affect learning in the classroom, but it is the responsibility of the teacher to make the students feel at ease in the classroom.

Teachers As Authority Figures Not Authoritarians

One of the goals of this study is to uncover teaching practices and strategies that will help teachers of African-American students become more effective in the mathematics classroom by building good student-teacher relationships. Acknowledgement that a teacher can be the authority figure in the classroom without being the authoritarian is important. According to Daniels and Zemelman, “Surveys of students show that giving [the student] choices, even in small things, helps students feel respected and viewed as people who are maturing and worthy of trust” (Daniels & Zemelman, 2004, p. 168). A teacher can give choices about, which homework exercises to complete, or topic choices for a unit project. Research indicates that it is important for students, especially minority

students, to feel a sense of autonomy over their lives and schoolwork, because this leads to intrinsic motivation.

Minority students may not be able to control many, if any, decisions at home, such as immigrating to the USA, living in their neighborhood, or getting a job to help support their families. According to Daniels and Zemelman, “School needs to be a place where kids feel some ownership and control.”(p. 168). Daniels and Zemelman also support the idea that, “some might think [giving students choices] means a loose or disorganized classroom it is really quite the opposite.”(p. 168). This argues positively for mathematics classroom where student inquiry and discovery of mathematical knowledge is promoted.

Characteristics Of Urban Schools

Urban schools are characterized by an absence of adequate resources (Tobin, Roth & Zimmerman, 2001), a lack of qualified teachers (Darling-Hammond, 1994), and a presence of low-level, non-connected curricula (Haberman, 1991). According to Pat Russo, coordinator of the center for urban schools, an urban school is one that has the following characteristics:

- a) The school is located in an urban area rather than a rural, small town, or suburban area.
- b) The school has a relatively high rate of poverty (as measured by Free and Reduced Lunch data provided by the NYSED).
- c) The school has a relatively high proportion of students of color (as reported by NYSED).
- d) The school has a relative high proportion of students who are Limited English Proficient (as reported by NYSED).

e) The school has been designated as “High Need” by NYSED

Not all schools will meet all five of these characteristics. (Russo, February 2004).

The characteristics of urban schools are very important to both students and teachers. Teachers are confronted with the challenges that race, cultural diversity, poverty, and language barriers present. These factors make it difficult to achieve successful teaching in this diverse student population. This sensitive issue will be addressed in chapter 3. The student population also suffers because of the associated social problems (e.g., drugs, dysfunctional families, gangs, poverty, and violence), but also because these school do not attract the best teachers.

There are many other characteristics that have been identified, which make urban schooling a challenge. These include low socioeconomic status of students’ families, high immigration, lack of parental involvement within the schools, students craving emotional attention, and violence in the neighborhood and families. The impact on students’ education is profound as these characteristics hinder students from receiving the quality education they deserve. More and more, we see teachers having to play many roles such as social worker and guidance counselor while they meet their academic obligations. The traditional image and role of a teacher is no longer applicable, and teachers need to be prepared to handle all the characteristics of urban schooling. (These issues will be addressed in chapter 3).

Teaching And Learning In Urban Schools

Even though there has been an overall increase in the number of minority students entering urban high schools, there are limiting factors and mediating circumstances that have prevented African-American and minority students from succeeding individually

and as a collective. Some of these circumstances include the quality and nature of teaching used by the vast majority of pre-service teachers employed in these schools and the poorly equipped classrooms, as well as the pressure to teach to standardized tests. In these situations, students struggle to learn and to transcend boundaries created by multiple levels of inequities in the public school system that favor only a passing score on standardized tests, and not on educating students to become thinkers and problem solvers equipped to function on their own in the real world.

Being a minority myself, and one who has received all my education in urban public schools, I can relate to the experiences of my students. I know from personal experience that it is very difficult sometimes, and you have to struggle very hard to achieve academic success by overcoming the many subjugating forces that constrain achievement potentials for African-American and minority students.

Through their beliefs and desire to beat the odds, combined with their involvement in cogenerative dialogues, coteaching, and collaboration in the mathematics classroom students have gained experiences and acquired skills essential for their success as African-American and minority students. Bebe and Cece have proven to all that when teachers take action to transform and support students' learning by providing opportunities for them to change their thinking and perception of who they are, students can become motivated. Students can use this agency to create opportunities for social and educational change, which defy and contradict the status quo.

Students' Identity

A large part of minority students' identity is inscribed upon them, and this will be described in much detail through the agency | structure and agency | passivity dialectics

when students' individual and collective identity formation and transformation are explored in chapter 3. The agency | passivity and agency | structure dialectics are very powerful lenses through, which we can gain a better understanding of students' standpoint and the culture they produce and reproduce. It also helps teachers to connect with them in the classroom, as we seek to gain access and provide opportunities for educating students, especially those from the African Diaspora. Boykin (1986) stated that African-American students, more than anyone else, confront numerous hurdles in schools and have to deal with issues such as negative stereotyping, poor expectations from teachers, and are challenged to deal with cultural diversity and different beliefs. These challenges can be exacerbated by cultural differences between urban minority students and their teachers, many of whom are White and middle class and may base their teaching practices on deficit views of urban minority students (Nieto, 2000).

The interaction between ones' personal, cultural, and educational identities is not easily understood, and often hinders good student-teacher relationship and successful classroom interactions. One African-American student told me that his former White mathematics teacher told him that, "mathematics is too complicated for you to understand, why don't you focus more on art?" This is one example of the deficit view that Nieto wrote about, and an example of the challenges that minority students have to overcome as they struggle to succeed in urban public schools and construct their educational identity, where the majority of their teachers are White middle class.

Cogenerative Dialogue

It was at the end of my 4th form year in high school when my algebra teacher Mrs. Brown called me into the teachers' room. I thought I was in trouble, so I asked my best

friend Paul to come with me. “Samuel, I need to let you know that when you return to school in September to begin 5th form, you will be taking calculus with the 6th formers. I made the recommendation to the Principal and the calculus teacher, Mr. Arnoff, and they have agreed. How do you feel about that?” At first, I didn’t know what to say, but I can still remember my best friend Paul poking me in my back with his finger, and telling me to say yes. “That’s awesome!” was all I could say at the time. Mrs. Brown put her hand on my shoulder and said, “Tell your mommy when you go home, and if she agrees, come and see me tomorrow evening in the staff room after school.”

That took place in the 1970s. As I look back on that event, I view it in several different contextual frameworks. First, it was significant because I was the only black male in the calculus class, as it was an advanced math class that is usually occupied by White and Chinese students who were preparing to do medicine or engineering at the university. I also did not realize the path that my life was being placed on because of the decision my teacher had made for me.

Second, and most important, was what followed for many months after, while I was doing the calculus course. In trying to put it all in context now, I remember having to rely heavily on Mrs. Brown for help as there was no other Black student in the class, and I found it very difficult to cope, at times. We would meet mostly after school for about half an hour or so, and she would ask me how I was doing, and assisted me with understanding the mathematics. In employing cogen as one of my teaching strategies to meet the goal of supporting student learning, and to give them a voice in the construction of their own mathematics development, I realize that, in essence, I am providing the same invaluable structure for them as Mrs. Brown provided for me almost 30 years ago. This is

not the everyday practice of teachers in urban schools, and so students in urban schools do not share in this kind of experience. With Mrs. Brown, I was able to talk about what I understood and what I did not understand. On occasion, I also discussed other non-mathematics difficulties I was having in the class or issues that were affecting my personal and academic life. In my cogen class, students also share their difficulties in learning mathematics, and together we talk about these in our cogens. Looking back at the conversations I had with Mrs. Brown, I see how important they were to my personal, academic, and mathematical development as I was provided the opportunity to make my voice heard, and have it valued and contributing to my learning experience. By the same token, it is crucial for students' mathematics success that they become reflective contributors to their own classroom learning experience. Cogen is one tool that can be used to accomplish this ideal.

What Is Cogenerative Dialogue?

Cogenerative dialogues (hereafter cogens) are part of a theoretical framework that provides students with opportunities to make their voices heard. Cogens afford structures that allow students and teacher(s) to discuss what is working and what is not working in relation to teaching and learning in the classroom. More importantly, they also provide solutions to the problems that are partly cogenerated by the students themselves. Kenneth Tobin (2005) described cogen as a conversation participants have about a shared (educational) experience. In my mathematics classroom, cogens are student-student and student-teacher discourses about what is working and what is not working, designed to aid students' understandings of mathematics. A cogen creates a social space to talk across ethnic, cultural, social, and educational differences as well as addressing contradictions as

we try to build solidarity for the good of the collective.

Cogens have been used successfully in New York City's urban public schools, especially in science classrooms (Bayne, 2007). Cogens have also been used in a few instances in special education. Only recently have cogens been applied and studied in mathematics classes in urban schools (See, for example, the work by Woodburn 2009, and Wharton 2009).

Coteaching

For the past 25 years, I have taught mathematics at all grade levels. My teaching experiences as a mathematics teacher cut across race, class, and socioeconomic status. I have taught White high schools and middle schools, Catholic and other private schools, as well as in New York City urban public high schools. In my present observation, I have noticed the same pattern that I saw 25 years ago: most African-American and other minority students are enrolled in the lower level mathematics classes and they are the main population occupying the remedial rooms. As you go up to higher levels of mathematics in high school and college, fewer and fewer African-American students are registered for classes, and many who do, drop out before the end of the semester.

As a teacher-researcher, I want to answer the question: Why do African-American and minority students continue to perform poorly in mathematics in general and are under-represented at the higher levels? One of the goals of this research is to empower students to take actions and develop learning skills that will increase their chances of success in mathematics at all levels. One action decided upon by students is to coteach lessons with me, and with each other.

Coteaching allows students to make both vertical connections (i.e., have more

discourse with the teacher, and develop a deeper understanding of mathematics content matter, and a horizontal connection) by working and collaborating with peers and becoming more involved with classroom activities. Coteaching also allows students to become more acquainted with the teaching and learning process, as this role requires them to first learn the content material very well and to plan a lesson's presentation for their peers. By teaching, the teacher learns more. In preparing to coteach, students work collaboratively with their chosen partner(s), and spend many hours together discussing the material and how best to present the content so that their peers will find the lesson interesting, enjoy participating in the activities, and learn.

Structure Of Coteaching

Two to three different groups of students coteach each week. During Wednesdays' cogen, students choose from a list of topics for the coming week that they would like to coteach. This format was proposed and agreed upon by students so that each individual could work on what they are interested in, and good at. Although students are free to change groups, students develop strong bonds, affiliations, and working styles within groups that keeps groups together. Students also learn the working and teaching style of their partners and this transcends into an unspoken language as they anticipate each others' action during the coteaching process. Coteachers also develop unique nonverbal communication, understanding, and "cover each others' backs." Partners learn how to exchange the baton (i.e., when to step forward, and when to step back), so that there can be smooth transitions and uninterrupted flow in their presentations. This will be discussed more in chapter 3. There is also a strong, friendly competition between groups, which serves to motivate students and improve the quality of presentations as individual and

group reputations are at stake. Groups are structured to ensure that each member gets a chance to play different roles in each coteaching presentation. Group structures are very important and will also be discussed further in chapter 3.

Purpose Of Study

This study focuses on the teaching and learning experiences of African-American and minority students in urban high school mathematics classrooms, and sociocultural inequities that significantly retard their achievement. In this study, teaching and learning are framed as forms of culture (Sewell, 1992; Tobin, 2005). As such, this study will seek to identify patterns of coherence and contradictions in my examination of social life within the classroom and other constructed fields such as cogenerative dialogues. Using the methodological framework of critical ethnography, this study provides some evidence that the corporate perception of the ways students learn within inner city schools is misinformed. As I engaged in conversations with students about their experiences in schools, they echoed the sentiment that they know what to do to make their mathematics classes better, but their opinions are never heard or valued. Students create opportunities for moving mathematics teaching and learning towards more culturally aligned and student-centered path. These cut across racial, gender, language, and ethnic boundaries to create a social and intellectual space that structures and supports the teaching and learning of mathematics in poor urban high schools as students engage social and cultural capital for the good of the collective.

Students can co-teach lessons in the classroom that enabled us to learn about ways to teach students from diverse backgrounds and different levels of abilities. Through conversations with students that did not explicitly revolve around mathematics,

invaluable information regarding other personal and socioeconomic issues affecting their mathematics achievement was discovered. As a result, this study explores the complexities of African-American and minority students' lived experiences and their approach to the production and reproduction of their sociocultural worldview. Using pre-existing data from other research, I will examine how this knowledge is represented in minority students' expanding roles as urban high school students, and its impact on their understanding and ability to transcend boundaries created by multiple levels of inequities in New York City's public education system.

Another primary focus of this research is to discover how to improve the teaching and learning of mathematics specifically to African-American and minority students in urban schools, and to build on the canonical works of other research squad members of the Urban Education Sciences Mathematics and Technology (SMT) Ph.D. Program, at The CUNY Graduate Center. This study will seek to examine, interpret, analyze, and understand (i.e., to make sense of) the socially constructed learning environment, and the value-laden relationships that developed between teacher-students and student-student in my urban mathematics classroom. This study also seeks to afford students increased agency in the classroom, which will improve interactions and behavior management resulting in improved learning opportunities. Perhaps the greatest gain that will accrue from this research is that students will feel valued, and that the capital they bring to the classroom will be used in a positive way to enhance their own academic achievement.

Research Questions

As I conduct ethnographic research in a New York urban high school that I will call Brooklyn-Queens high School with a predominantly African-American student

population, and interacted with students during this research as a teacher-researcher between January 2007 and April 2009, two overarching questions guided my research:

- a) What is happening with regards to African-American and minority students' learning of mathematics?
- b) What are the root causes behind my observations?

To help me focus more closely on issues of classroom interactions, collaboration, poverty, social and cultural capital, the following questions were addressed:

- a) How do urban African-Americans and minority high school students use their stock of knowledge to learn mathematics from experiences in a variety of fields that are salient to their life-worlds?
- b) How is success in attaining individual and collective goals mediated by categories such as poverty, ethnicity, race, culture, and urban identity?
- c) How does participation in cogens and coteaching afford transformation and reproduction of mathematics education, expansion of agency and multiple-identities, and produce cultural adaptation, synchrony, and solidarity?

By searching for answers to the above questions, this study will provide a deeper understanding about the structured everyday lived experiences of African-American students, their social and cultural resources for learning mathematics, and their ability to change their educational destiny by transforming their educational identity.

Context Of The Study

This study was situated within the Brooklyn-Queen High School, a high school serving very poor marginalized youths. The school is a new, small high school with approximately 420 students. 98% of the student population is African-American and the

other 2% is Asian and Hispanic. The school is situated in Southeastern Queens, and its students are from very poor neighboring communities. This school is one of four high schools situated in a building that once housed a very large high school categorized as a “School Under Registration Review” (SURR) school, that was closed and phased out two years ago due to violence, gang activities, and low performance. Approximately 98.5% of the students also qualify for free lunch.

This site was chosen because I teach mathematics at this school and as a teacher-researcher I have access to a large population of African-American and minority mathematics students who are the participants for this study. Additionally, I have been very concerned about the very low mathematics achievement of these students, and have previously conducted action research with these students. These students have been working with me for two years, and we have developed mutual respect for each other. I have access to students’ personal academic and mathematics records, which helps to eliminate access issues to school data, which can be very difficult in urban schools.

Participants

The participants in this study are high school students to whom I have taught mathematics in the 9th grade, and continue to teach in the 10th grade. While all four of my mathematics classes participated in this study, only one class (the lowest performing class) was taught and studied using cogens and coteaching for the purpose of this study.

The two main characters, Bebe and Cece, discussed in this study belong to my lowest performing class, which has 20 students. 50% of the students in this class have an “Individualized Education Plan” (IEP). Of the other 50%, only four passed mathematics in middle school. Bebe was one of the four who has been successful in mathematics.

Cece has not scored higher than 45% on any mathematics test since elementary school. Since she came to high school, she has missed most of the mathematics quizzes and almost all major tests because of fear of the subject, lack of content knowledge, and embarrassment. Brooklyn-Queens high school can be described as a typical model of a poor urban high school (Seiler, Tobin, & Sokolic, 2001). However, it is a new school that is focused on building a community atmosphere where students can develop and practice successful habits of learning, and engage in various career-oriented programs.

Characteristics Of The Main Characters' Background

Cece (African-American, Low- performer, 10th Grade, 15years-old)

My parents are high school dropouts and I don't even live with my mother.

To tell the truth, she is a drug addict and my father left her. Now I live with my stepmother who I don't speak to, cause she get what I'm suppose to got from my father. He is never able to help me with my schoolwork... he's never at home anyway. He is too busy hustling (selling drugs). Many days I cut school and go hangout at my boyfriend's crib (house). My boyfriend is 21, and takes care of everything I need. He dropped out of high school and become a mechanic working at his uncle garage in Brooklyn. He wants me to stop going to school, and just go get a job from now.

Sometimes I ask myself, "Why waste time going to school?" I feel like when I'm finish I'm only going to get work in Macy's or McDonald anyway. Sometimes I be thinking about what he said to me. The way I see things, black ghetto youth like me, without the big education like White people, have to struggle too hard in this country. I see all of my family struggling everyday. None of them have a good job, only my aunt who takes care of an old man. Beside, the system is never fair, as I see many

Black college students in my neighborhood still can't find any job with their degree. Only the White people get work even if they are not half as qualified as you, from the project, or the Korean and Chinese go work in their parents' store. Sometimes I feel like giving up, but then my aunt always keep telling me that school and education is best. I really want to do good in school and go to college to become a social worker, but too many other things keep messing me up. I don't know what to do. Most times I'm confused, that's why I don't do well in school.

CECE (Guyanese-American, High-Performer, 10th Grade, 15-Years-Old)

My goal is to become a pediatrician, but sometimes I wonder if my mother will be able to afford send me to medical school. She doesn't make a lot of money as a store-helper. My father doesn't take care of my brother and me. He left my mother and married some other woman who doesn't like us. She has three children who don't belong to my father, and that's why we can't get anything. I also worry about the quality of education I'm getting in the public school as I have friends who go to schools in Long Island and they know a lot more than me. I like most of my teachers except my English teacher. She thinks that because we don't talk like her, we are illiterate or something. Sometime we can't even understand her either. Just because we talk differently and write differently, that doesn't mean we have no sense. Another thing, she is always putting us down, and calling us names like "below average" or "6th graders." I don't have a boyfriend because of my religion. My mother is very strict, and warned me not to have any boyfriend until I finish school. I think this is a good thing because of my friends not doing well in school because of boyfriend drama and stuff. I really like my school but I believe some of my friends won't

graduate with me because some teachers don't care, and so lots of students are failing, and they don't care either. Some students need extra help, especially in mathematics and science. Those are the toughest subjects. Sometimes I try to help some students, but most of the time they don't even know how to do simple things. This is kind of hard for them, and they get frustrated and just give up. Even though I can't get all the things I want for school, like a graphing calculator, I don't let that stop me from learning. I want to go to college so that I can help my mother and my little brother.

These students are also typical inner city high school students with the usual characteristics associated with urban students. Placing the learning of mathematics at the center of this study, and making it the responsibility of students themselves, has introduced students to playing new roles that they are unaccustomed to, but ones that will build relationships and character, expand student agency, and move students to higher levels of achievement in mathematics, and school in general.

Chapters In The Dissertation

This dissertation is a manuscript-style document in that each chapter is written to stand on its own. The chapters of this dissertation cover different periods of the collection of data, analysis, and application of theory. I will not write a separate theoretical section for this dissertation, as I have systematically utilized previously gained information and different theoretical perspectives along with design experiment criteria, as I progressed from earlier stages of this study. Consequently, different theoretical frameworks are introduced and embedded throughout the chapters as I present, analyze, and contextualize data on particular issues. The chapters are sequenced to give the progression and development of perspectives, and the evolution of successful practices. In this way, I am

able to build on the research by using the previous results and experiences to select the most useful approaches and theoretical frames to produce the best answers to the research questions being examined.

The theoretical frameworks that have been useful include the agency | structure dialectic (Sewell, 1992; Tobin, 2005), social, cultural and symbolic capital in social life (Bourdieu, 1986), interaction ritual (Goffman, 1967; Collins, 2004), and socially situated learning (Lave & Wenger, 1991). I used cogens and coteaching as methods and methodologies. Several theoretical perspectives impact all the chapters as I try to analyze and make sense of the teaching and learning practices that evolved during this study.

Chapter 2: Reflective Autobiography: My Story- The Making Of A Mathematics

Educator

Chapter 2 is primarily a reflective autobiography where I outline the motivation for this research. I present the major turning points in my life that led me back to college in 2000 to become a mathematic educator. I examine the impact that poverty and being marginalized as a minority has had on my standpoint as an urban educator.

This chapter also serves as an introduction to the main characters, and their experiences in New York City urban schools that set the stage for the research and development of the remaining chapters. I have utilized the metaphors of “The Rubik’s Cube” to describe the twists and turns of my life. My main purpose for writing this autobiography is to shed light on the struggles of minority students in urban cities, and for me to constantly reflect and improve my teaching practice.

***Chapter 3: Examining Research Methods: Perspectives On Doing Mathematics
Research In Urban Schools For African-American And Minority Students***

Chapter 3 presents my research approach, which is largely influenced by the improved authenticity criteria developed by Tobin (2006), which includes the development of sociocultural perspectives of all participants, an emphasis on cogen about shared experiences and mutual understanding, and collaboration in social spaces. This chapter explores coteaching and cogen as pedagogical methods of teaching and learning. Authentic ethnography, hermeneutic phenomenology and design experiment are presented as research methods and methodologies.

Since I consider teaching and learning as forms of culture, it became absolutely important for me to examine how culture is enacted and reproduced in social classrooms. Thus the collection, analysis, and discussion of data, which includes field notes, audio and videotapes, classroom artifacts, students' work and teacher's records used in this study was done at multiple levels and across different fields to capture what was happening at the meso- and micro-level within the learning environments.

Chapter 4: Developing Tools To Impact Teaching And Learning Practices: Student Voice, Lived Experience, And Pedagogical Shift

Chapter 4 describes the genesis, development and use of cogens and coteaching in my mathematics class to build solidarity and encourage collaborative peer tutoring. Through the structure | agency dialectic, I examine and analyze the way cogens facilitated the enactment and reproduction of structures that empower African-American and minority students to meet their mathematical goals in urban mathematics classrooms. I use these theoretical frames along with Bourdieu's and Tobin's sociocultural theory to further

analyze my own mathematics teaching and identity transformation.

Chapter 5: Promoting Student Engagement In Mathematics: Agency And

Collaboration With Vs Control Over

This chapter discusses students as active agents of change when classroom structures allow for students' engagement and discovery using their prior knowledge and sociocultural resources. It also examines how student agency and discourse play an important role in achieving success in urban mathematics classrooms. In addition, I examine the evidence provided through video analysis in two contexts — Firstly, student will enact agency to deal with inappropriate conduct of peers that prevents others from learning. Secondly, students will use agency to mobilize the class to collaborate and solve a difficult mathematics problem.

Chapter 6: Collaboration, Cogenerative Dialogue And Coteaching In Urban High

School Mathematics Classroom

In this chapter, I discuss how Cece used the strategies, skills and agency she developed by participating in cogens and coteaching with Bebe to transform her mathematical identity and learning habits so that she progressed from being a low-achiever to becoming a high-achiever. I invite both Bebe and Cece to share their own text, and I also discuss and analyze these to show the possible effects that involving students in research can produce.

Chapter 7: In Closing: Highlights And Lessons Learnt From The Study

Chapter 7 ties together the analyses presented in the earlier chapters. My discussion also returns to my original research questions, the themes described in chapter 1 and highlights relationships between the themes outlined in each chapter. I make conclusions

and discuss the implications of the study. I emphasize the importance of teachers valuing students' social and cultural capital and the need to use this valuable resource to build productive teaching and learning relationships in urban schools.

Chapter 2

Autobiography: My Story – The Making Of A Mathematics Educator

An autobiography is a useful tool for sharing and reflecting on one's personal and professional life. The purpose of this autobiography is to provide a background for readers to better understand what led me to become a mathematics educator. It also provides insights as to who I am: as a person, a student, an urban mathematics teacher, an educational researcher and the interconnection between these four lenses.

Looking back over the years, there are practices, principles, events, and forces such as hard work, discipline, morality, and music, that have stayed with me and have helped mold me into the person I have become. These structures not only contribute to the building of my character and the shaping of my identity, but have provided inspiration, motivation, strength, and determination in some of the most difficult times of my life. They have also become reservoirs of knowledge for dealing with, and overcoming life's many struggles. While I may not remember all of the details of each event, I do remember enough about them because they have been the turning points and sustaining forces in my life.

Growing Up In Jamaica

I was born in a very rural agricultural district in the eastern end of the island of Jamaica. My parents were sugar cane and dairy farmers and from an early age I learned what hard work and discipline meant. I had to wake up at 5:00 AM every morning and help with the milking of the cows, and the delivery of milk to several homes in my community before going to school. Even though I would have preferred to sleep until it was time to get ready for school, I was aware that it was my responsibility to help my

family earn a living, and I really did not have any choice in the matter anyway. Looking back now, I can see how this early discipline instilled in me the value of hard work, what it means to work as part of a team, and that success requires doing the uncomfortable sometimes.

These values have contributed enormously to my academic successes to date, and my understanding of what is required of economically less fortunate people, if they are to emancipate themselves from poverty. This early conditioning provided a frame of reference for me when I was confronted with apathy towards my work. I have, at times, become frustrated and have felt like giving up because of the lack of financial resources to accomplish all that I would like to achieve in life. However, what I lack in economic capital, I try to make up in social and cultural capital as these are important structures in defining my epistemological and ontological positioning as I set goals for my academic future.

Growing up poor in Jamaica means different things to many different people. To some it means that they will spend the rest of their lives at the lowest level of society, depending on Government assistance and always complaining about their situation. To others, this provides an opportunity to acquire agency, and find support structures that can change their worldview and develop a different standpoint from, which they can change their lives for the better. I made a conscious decision very early in life to choose the latter. I have come to realize that culturally and socially, minority people have all the ingredients necessary to succeed, and the biggest problem is putting it all together to construct meaningful opportunities for success. Sometimes, this requires the help of others such as a motivational speaker, a mentor, or someone you look up to as a role

model.

My Early Inspiration And Motivation: Bob Marley's Music

Music is an important part of the soul of African-American and minority students' lived experiences. As a child growing up in a country that is considered to be the home of reggae music, it was every little boy's dream to become a reggae artist and to become like Bob Marley. I remember how my friends and I would sing songs and perform as we made our two-mile walk home in the evenings from primary (elementary) school, playing on our home-made guitars constructed from scraps of wood and fishing line. Friendship and solidarity across different ages and abilities grew quickly between us. We learned to collaborate, share, cheer, and applaud each other's effort. However, we were much too young to understand all the sociocultural implications of our actions, but we did know that everyone would benefit and we had more fun when we looked out for each other. These important structures that came so naturally to us in my early development and socialization with my peers as primary school kids became valuable resources in my mathematics research classroom as I enacted cogens and coteaching to improve urban high school students' learning experiences.

I take the view that learning is socially constructed by participants in a given culture, such as students in my mathematics classroom. As young primary school children, we shared a common culture of walking home together every evening. However, we had to agree upon certain codes of conduct in this informal setting, in order to play fairly, learn new games from each other, and basically just to have fun and enjoy each other as we interacted together. Similarly, the enactment of cogen and coteaching in my classroom, created a new culture for students and they had to agree collectively, to adopt certain

codes of conduct, and play new roles, so as to facilitate improved learning conditions that would benefit the entire class. As children, we would practice, sing the same songs, and play the same games over and over again, but from time to time we would switch roles. We became so good at what we did, until we could anticipate and predict each others' actions and know instinctively when to join in with others during an activity. This also became a useful resource in my research classroom, as students were taught how to play different roles in the teaching and learning process. In coteaching for example, student coteachers learned how to anticipate each others' actions, so as to increase the fluency in, which they exchanged the teaching role between themselves. Today, as when I was a child, students seem to be able to learn much faster from each other when they are allowed to interact freely and comfortably. I remember how easy it was for me to learn the words of a new song if I joined in, and sang with my friends. Today, music is a part of every young person's life and they do some of the same things we used to do. They also learn in much the same ways as we did. However, we may have to change the tools we use to motivate them, and so, even though the concept of youths learning from each other is not a new one, the enactment of cogen and coteaching in the classroom provides different kinds of opportunities for students to develop meaningful and supportive academic relationships with each other.

Reflecting now as a mathematics educator on such simple, natural behaviors among us little Black boys, I realize how powerful a lens music is, and how an understanding of its sociocultural nature can help me to gain a better understanding of students' lives. Music also allows me to connect with students in the classroom, as I seek to gain access and provide opportunities for educating urban youth, especially students from the African

diaspora.

The Power Of Music

The incorporation of music training from preschool to secondary education and even beyond is common in most countries. Involvement in music is thought to teach basic skills such as concentration, counting, listening, and cooperation. As a ten-year-old, I began learning to play the flute. My grandfather made it for me from bamboo, as my parents believed that it would improve my concentration. I don't know if it did, but my teachers said I was more focused in class. It is also believed that learning music helps in promoting understanding of language and improving the ability to recall information.

In elementary and middle schools, children often learn to play instruments such as the recorder, and sing in the school's choirs. In high schools, they learn to sing in choirs, perform in marching bands, concert bands, or even in orchestras. The exposures to music education at an early age build structure and instill discipline in the life of a young person. My ability to listen and coordinate movements of different parts of my body was only fully-developed after I joined the police youth club marching band during my high school years. This helped me greatly with my swimming lessons, and with conducting certain experiments in my physics and chemistry labs. Music training helped me to develop confidence and important characteristics and values such as good listening skills, collaboration and concentration, that were necessary to cope with rigorous academic challenges in later years.

One profound, and perhaps the most universal characteristic of music, is its ability to affect the emotions of all people. Since the emotional state of mind is critical to students' attitudes and learning, then it makes sense to use any available tool that can produce

positive emotional energy and increase the learning potential for students. Thus, I advocate for the use of music as a pedagogical tool to aid the structuring and improvement of teaching and learning environments.

Music: A Voice For The Oppressed

Music has always played an important role in the lives of people world-wide, but perhaps music has played an even more significant role in the lives of the oppressed and underprivileged. Many great musicians have risen up from the ghettos and inner-cities of third world countries and other poor nations of the world, as voices of: social consciousness, resistance to cultural hegemony, and social injustice on behalf of the poor and oppressed. Musicians such as Bob Marley (Reggae), Eminem (Hip Hop), Bruce Springsteen (Rock), The Rolling Stones (Pop), and many others from different genres have used music to provide social commentaries and create awareness among youths. Music and other forms of popular culture are ideal tools for social efficacy teaching, both as a possibility for liberation and to address social issues (Steinberg & Kincheloe, 1997).

Growing up in Jamaica, I was great influenced by the music of the king of reggae music, the late Robert Nesta Marley (Bob Marley).



(February 6, 1945-May 11, 1981)

“Reggae's most transcendent and iconic figure, Bob Marley was the first Jamaican artist to

achieve international superstardom, in the process introducing the music of his native island nation to the far-flung corners of the globe. Marley's music gave voice to the day-to-day struggles of the Jamaican experience, vividly capturing not only the plight of the country's impoverished and oppressed but also the devout spirituality that remains their source of strength. His songs of faith, devotion, and revolution created a legacy that continues to live on not only through the music of his extended family but also through generations of artists the world over touched by his genius." (Jason, 2009,

<http://music.aol.com/artist/Bob%20Marley/biography/1002416?flv=1>)

The period from the 1960s to the 1980s was a particularly difficult time for the Island of Jamaica. The Island got its independence from Great Britain on August 6, 1962. Following this was the struggle for political power, which led to civil unrest and political warfare. The small nation with approximately 2.2 million people, of diverse ethnic and cultural practices, was divided into two main political parties, "The Peoples National Party" and "The Jamaica Labor Party." During this period, rival political party supporters were constantly at war with each other, and so the nation was experiencing its worst ever economic crisis as its major source of income, "Tourism", was severely affected. Inflation rose sharply, and poverty and violence were increasing at an alarming rate.

The effects on the masses as a result of the struggle for, and control of power, had sensitized me to the notions of injustice, greed, and political victimization. I witnessed many forms of discrimination of the poor by those in power, and even though I did not fully understand all of the implications at the time, I was nevertheless stirred to make my voice heard by writing letters to the local political officials (Members of Parliament and Mayors) representing my community, when I was only 15-years-old. Even though I could not explain it, there was something about seeing my people (Black and poor) suffer that

ignited a passion in me to take action, and reach out to assist them in whatever way I could. Maybe it is because I was taught in church that I am my brother's keeper; or, maybe it was because I was abandoned by my father when I was two-years-old (he left us and went to England and we never heard from him again) that I was passionate about being the voice of the unspoken I thank my stepfather, the only father I ever knew, for his love and care, which allowed me to become the person I am today. I can remember very clearly the conversations I had with my mother about what I should study in high school so that I could become a mayor, and then a Member of Parliament, so that I could fix things for all the poor folks in my community, like grandma and us. It was at this time that Bob Marley's music of social consciousness began to provide comfort, hope and strength for thousands of other poor people and me.

I attended my first Bob Marley concerts when I was 15 years of age. It was at this same time that I began to seriously question who am I? What was my purpose in life? And what can I do to improve the lives of poor people? I did not get the answers to any of these questions, but they helped to direct my attention to consider becoming a teacher. I had a lot of really nice teachers, and I really admired the scholarly way they spoke, especially my English teacher Mrs. White. She spoke and acted properly and everyone seemed to admire her. I hoped that one day I would be able to speak just like her. However, I do not think I have or will ever be able to.

Looking back and reminiscing about the first Bob Marley concert I attended, I would compare it to attending one of Martin Luther King's civil rights rallies, based on the size of the crowd. While the charisma of Marley was mesmerizing and his ability to stir the emotions of his audience was phenomenal, two things capture my attention from that

night: First, the way the large crowd of people from diverse ethnic groups, race, gender, socioeconomic status, and political affiliations showed their respect to him when he came on stage, and immediately requested their silence. At that moment, with thousands of people in an overcrowded national stadium, if you had dropped a pin, you could hear it strike the ground. That taught me the power of respect. His first words to us were to stop killing each other with guns, and not to be “puppets” for power hungry politicians. This suggestion was met with thunderous applause. For many of us, Marley was our role model. Even though his rise to fame and success was not through education, his involvement and financial contribution to numerous schools and individuals in poor communities across the Island helped thousands of young people. The ability to command respect was something I knew would play an important role in my life if I became a teacher.

I admired Marley because, even though he grew up poor and was not formally educated, he was extremely socially and politically conscious, and did not let poverty prevent him from achieving his goals. He grew up in one of Kingston’s most politically divided and volatile areas, Trench Town, yet he refused to let his environment determine his destiny. One of his earliest songs was “Can any good come out of Trench town?” This greatly inspired and motivated me to work hard in school, believing that I too could succeed in spite of my situation. This has become one of my standpoints as an urban educator who was greatly concerned about the educational achievement of all minority students, especially those living in poverty. My grandmother used to tell us, “Where there is a will, there is a way.” This means that if you really want to achieve success, you will not stop trying until you find a way to do so.

Second, I was greatly motivated by the content of the lyrics of Marley's music, and the seriousness with which he delivered his message in songs and actions, yet he managed to entertain his audience as he educated and raised their social consciousness. Sometimes, I was not sure if I was at a reggae concert or if I was in church, because he was just dealing with the realities of life. This touched everyone present. I had a great time at the concert, but for days my friends and I kept talking about how "cool" Bob was, and how his music was so real. While it is true that the experience was not life-changing for me at that moment, it was an experience that planted the seeds of social consciousness, political awareness, and a stronger desire to succeed and help the poor.

It was not only what I heard that was touching, what I saw was perhaps even more inspiring. I saw White and Black people smoking from the same marijuana joint. I heard Christians and non-Christians singing along together with Bob, songs like "Get up, stand up, don't give up the fight..." and "Emancipate yourselves from mental slavery, none but ourselves can free our minds..." The unity and solidarity across economic, social and political boundaries displayed that night were carried by the media for weeks, and it was something that would inspire and motivate the people for a long time to come. In reflecting on events that have helped to chart the course of my life, the Bob Marley concert ranks close to number one. It reminded me that it is possible for individuals to affect the lives of the collective in meaningful ways. This also became one of my standpoints when I became a teacher, not just for myself, but for the impact I believe individual students can have on their peers.

Growing Up Poor: Agency, Determination, And Perception Of Self

I went to high school in Jamaica, and even though I was inspired, motivated and had

the support of my family encouraging me to perform well in school, I still had to contend with the effects of being poor. I learned the value of hard work, but I also learned that it required more than hard work to achieve at your full potential in school. Having access to textbooks and other supplies makes a big difference in the level of success that is possible. Not being able to attend school on Fridays because I had to assist my parents in getting their farm produce ready and packed into cardboard boxes to be transported to the village market meant that I would be missing a lot of instruction. Similarly, being limited in the number of hours I could spend at the library after school because I had to get home by a certain time to help with the feeding and care of the animals, also deprived me of time for learning outside of school.

Although having to do all these chores put me at a disadvantage, they also helped to develop in me a strong determination to succeed. I became familiar with the concept of struggle, and I developed a strong sense of agency that facilitated my academic motivation. The motivations that arose from my negative experiences have always contributed to my ability to rise above my circumstances. I did not see my situation as a setback, rather, I considered myself very fortunate to be one of the four students from my district to be attending the only high school in the parish. (Jamaica is divided into fourteen parishes much the same way the US is divided into fifty states. Each parish is divided into smaller districts just like New York is divided into five boroughs). Because of this belief, I used whatever resources were available to me at school, and I learned how to develop relationships and share with others. Through discourses, collaborations, and friendships, I discovered that one way to have access to the resources of the more economically privileged students was to equip myself with a deeper understanding of the

subject areas. I would trade my knowledge by assisting them with their homework and other assignments, in exchange for overnight or weekend loans of their textbooks and other workbooks that my parents could not afford to purchase.

Being poor helped me to develop a deeper understanding of some of the diverse ways in, which marginalized people think, interpret, and respond to their subjugation. Despite all of the negative effects of poverty on my life, I believe that it is my perception of who I am, and could become, that has propelled me to be an educator. I want to join in the effort to help marginalized students develop positive self-esteem, and high expectations about their potential for academic success in urban schools. Being poor does not mean that students have to become powerless and pessimistic about their futures. While it is probable that African-American and minority students will experience unfair treatment by the existing education system, my experiences and observations indicate that with individual and collective agency, determination, and hard work, minorities can change their positions in social space.

Expectations: Family, Teacher, Church, And Community

One of the significant things about growing up poor is that it helped me to be appreciative of what others have done, and continue to do for me. Many people have played important roles in my life at critical times during my development as a person, a student, and as an educator. I am the first person from my family to attend high school. At first I felt very happy, but soon the family expectations began to be a heavy burden. As soon as my mother was finished telling all my relatives that I would be going to high school because I had passed the Common Entrance Examination, she sat me down, and with my hands in hers, she let me know of the financial sacrifice the family would have

to make in order for me to attend. Not only that, she explained to me what this would mean to my younger brothers and sisters, and the entire family. I am not sure if I understood all that she was trying to communicate to me, but I knew then that my life was progressing on a different path. While I was very happy, I was also scared. I was afraid that I might not be able to live up to my family's high expectations of me.

Totally convinced that it was only because God wanted me to be of use in the church, my pastor made the announcement of my success to the congregation during the Sunday morning service. Then, he requested that I wait and speak with him and the youths' director immediately after church was dismissed. Without asking if I could, he told me that, following a month of training, and Bible studies, I would begin to teach Sunday school classes for children in the 6-12 years age bracket. At first I did not want to, but as with most other things, when my mother made a major decision on my behalf, I had to obey. After teaching a few classes, I found out that it was really cool teaching and spending time with children. I received a lot of advice, but the piece I still remember was offered by the youth director. He suggested that I contact the office of the Jamaica Movement for the Advancement of Literacy (JAMAL) program, and volunteer to be a literacy teacher. He explained to me that he had been observing my Sunday school classes, and that he was very impressed with my teaching and interpersonal skills. He told me that he was sure that I would make a great teacher. He also let me know that JAMAL would train and employ me during the summer if I worked as a volunteer one evening per week while school was in session. I took his advice and volunteered. My involvement in the JAMAL program continued all through high school and for several years after. On reflection, I consider both my early years as a Sunday school teacher, and my success as a

literacy teacher in the JAMAL program, to be the central factors contributing to my decision to become an educator.

My church had membership in all age groups, because most of the 600 or so people living in the community, attended one of our two churches every Sunday. Getting a chance to go to high school turned the attention of the entire district on me. Everyone was giving me some kind of advice. The older folks were particularly generous with their advice, but it was the high expectations that they all had for me that motivated and scared me at the same time. Suddenly, I realized that I was not just going to high school for myself, but for my whole family, church, and community. It was not until I became an adult that I fully understood how much my success meant to my family and community.

Growing up in this community prepared me for the real world as it provided me with opportunities to understand self-efficacy and the struggles experienced by marginalized people to obtain a good education. I also learned to live by good moral principles, to value hard work, to embrace constructive criticisms, to work with others to achieve individual and collective goals, to value the voices of others, and to have high expectations of myself. Now, when I talk to students in my classes, I find myself trying to find out about the education level of their parents and extended family, and I seek to motivate them to use education to uplift not just themselves, but their family and community.

My Early Educational Experiences: Basic And Primary School

In Jamaica, my first experience with formal education took place in a Basic (Kindergarten) school. I cannot remember a lot about what happened during my basic school years. However, as I grew up, I realized that most of these schools were owned

and operated by the churches. Most of the teachers had no formal training in any teacher preparation institutions. They were usually Sunday school teachers, and the person in charge was probably the pastor's wife. However, these schools taught basic reading and mathematics skills. The teachers were strict disciplinarians, and children were instructed in good morals. Daily activities typically included morning devotion, prayers before and after lunch, and evening prayers. There were also lots of outdoor activities and sporting events.

After Basic school, I went to Primary (Elementary) school. This institution provided both elementary and middle school education, as there were no separations between the two. After graduating from primary school, one either went to high school if they were very lucky, to a trade school, or home. My primary school was about five miles away from home, and I had to walk to and from school. At school, my teachers were very strict. One actually began preparation for the real world from the first day one entered grade one. The morning routine before academic instruction included a personal inspection of all students by the teacher, and sometimes by the Principal. It was as if you were in the military. Your clothes, shoes, hair, fingernails, and so on, were all inspected for cleanliness and neatness. Any irregularities and you would feel the teacher's leather belt across your back. The same was true for academic work. Students' work had to be done and presented exactly as the teacher described, or you would have to do it over until you got it done perfectly.

Reflecting now on my years in primary school, I believe that all my teachers played significant roles at different times in my life. As I remember it, students learn and understood what was required in terms of discipline and academics. There was no room

for resistance, and misconduct was not tolerated. In the same context, students were allowed very few opportunities, if any at all, to think and discover new ways of doing things in classes. You had to accept what the teacher said (as the gospel), and do things accordingly. For me, the years went by more or less the same until my final year when I was being prepared to take the Common Entrance Examination for admission to high school. The preparation of students to take the high school examination is a major event on every Primary school's calendar. Only the brightest students from every class at that grade level got selected to be prepared for the examination. There were weeks of screening tests followed by a final selection test to decide, which students would take the examination. Taking that examination was like representing your school at a major competition.

After all the students were selected, we were assigned to individual teachers in small groups of about six. My teacher/coach was Mr. Thomas. He was the most senior teacher at the school, having been there for over twenty years. He was feared by all students, and I was petrified when I was selected to be in his group. I never had him as a teacher before, but I had heard some of the most fearful stories about him. We started our preparation for the examination about three months in advance, and met every evening after school for two hours of coaching. During this time, I experienced a completely different Mr. Thomas from the images I had formed of him in my mind. He was very strict, but he was also one of the most patient teachers I have ever encountered. He showed us many shorter and simpler ways of solving mathematics problems. This was the first time I was experiencing this in school. All along, we had to do things the long way. When we timidly asked him why we had to always do things the long way in our

regular classes, he said that is how teachers are supposed to build character and sound knowledge in students. I have not forgotten those words.

As the lesson classes continued, Mr. Thomas became very likable. He inspired and motivated us. He was always saying something positive to us, even when we felt otherwise. Our interactions became less rigid and students' perceptions of him changed. Even though he gave us an incredibly large amount of work each night, he had given us good strategies that enabled us to get most of the work done before our next class. Of the four groups that were prepared for the examination, Mr. Thomas's group had the highest passing rates, three out of the six students in his group passed the Common Entrance Examination that year, and a total of eight students out of twenty-four passed from the school. Looking back at that particular event, and the teaching characteristics Mr. Thomas displayed, I feel as though I have adopted some of his ways with my own students, especially having patience and providing positive motivations to the predominantly minority high school students to whom I teach mathematics.

What Can Happen When Your Teacher Believes In You: Mrs. Brown-My Algebra Teacher

Many teachers played significant roles in my life, but my high school algebra teacher, Mrs. Brown, is the one I remember the most because she believed in me. I met Mrs. Brown in 1st form (9th grade). At the end of the very first class, she gave me a note to take home to my mother. Although I cannot recall her exact words, the message stated that she was very happy to have me in her class. She also told my mother not to worry about me learning mathematics, as she has a nephew who looks just like me, and so she would be taking good care of me. I have no idea if she really had a nephew, but she was a very

caring teacher who communicated with my mother constantly about my progress in her class.

As I moved through high school, Mrs. Brown became more than just a teacher to me. She became more like a friend and a mentor. Realizing that my parents were poor, she helped me by giving me used textbooks and other materials. She also gave up her lunch time on several occasions to help me when I had difficulty understanding something, even when I was no longer in her class. I developed a great respect for her, and for teachers because of Mrs. Brown. I remember telling my mother on several occasions that if I become a teacher, I hoped to be as caring as Mrs. Brown. Because of her, I excelled beyond my grade level in mathematics. In 3rd and 4th form I entered several mathematics competitions and won, and so in 4th form my mathematics teacher asked me if I would like to become a mathematics monitor. In this role, I would assist the mathematics teacher in the lower forms by helping students who were having difficulty learning. I would also assist the teachers by collecting and returning class supplies to and from the mathematics office. I gladly agreed as this was a nice feather in my cap. The position came with responsibilities, but the benefits were significant also. One great benefit was that I did not have to join the extremely long lunch line anymore. All I had to do now was to show my monitor badge to the lunch servers and collect my lunch. This gave me 30 minutes more at lunch time to play chess in the chess club, something I really loved to do.

After passing my General Certificate Examination (GCE) mathematics and physics examinations a year ahead of time, in the 4th form, I was promoted from being a monitor to being a prefect. This new title carried with it greater privileges and responsibilities, and

one of those was the grading of 1st and 2nd form students' homework assignments, and you could also become a teacher-assistant during instruction time. I chose to assist students in Mrs. Brown's class. By then, more and more students of color were being admitted each year to the high school. In Mrs. Brown's class, there were about fifteen Black students in a class of forty students, if my memory serves me correctly. This was a big difference from four years prior when I was one of only three Black students in her class of forty-two students. The other thirty-nine students were Chinese, Indians, and mostly Whites. From day to day, I would help any student who needed help, but one of the surprising things to me was that some of the White and Chinese students would refuse my help, even when they did not know how to solve the problems. I discussed this with Mrs. Brown, but she advised me to let her help those students. I did not understand why.

On reflection now, another significant thing I can remember is that in the evenings, the majority of students who were actually doing constructive work in the library were the Indians and Chinese. Immediately after school was dismissed, most of the White students were picked up by their parents in motor vehicles (only the wealthy upper class had motor vehicles at that time). The Black students who remained were training for some kind of sports, or just hanging out. Furthermore, as I continue to reflect on some of my high school experiences, I realized that things have not changed much over the decades, as far as the academic agency of different racial groups in poor urban high schools communities is concerned. The same patterns seem to exist today.

I served my high school community in many different capacities, and by the time I graduated, I had made up my mind that I wanted to become a teacher, just like Mrs. Brown. My personal motivations for choosing to become a teacher were built upon my

experiences of working as: a Sunday school teacher in my local church, a JAMAL volunteer assisting mostly youths who had dropped out of schools for one reason or another, and were seeking a second chance at learning to read and write, and as a teacher-assistant in high school. I worked as a teacher in Jamaica for many years across different educational levels, ranging from elementary to high schools, and in private as well as public schools. While I enjoyed teaching science and mathematics, as time progressed, I began thinking about becoming a mathematics educator and researcher.

A Scholar's Dream Deferred

After careful consideration, I decided to attend the University of The West Indies to study mathematics at the graduate level. I left my rural community and went to live in the capital city of Jamaica, Kingston. My course of study was interrupted during my second year because of the high cost of tuition. The frequent gang and political warfare in the community of South East Kingston, where I was living at the time, made it difficult for me to do any part time job to support myself, as I had to get home before it was too late in the night. Robberies and hold-ups of passengers and bus conductors, at knife and gunpoint, were a daily occurrence on the public buses I used for transportation. Most bus drivers simply refused to work once it got past 10:00 PM. As things got more difficult, I decided to take a leave of absence for a year, with the intention of resuming as soon as I had saved up enough money. This never happened, and so I went into establishing my own transportation (minivan) business. Even though it was financially rewarding, it proved unfulfilling for me, as I had a deep longing to be an academic scholar.

Coming To America

As the standard of living declined in Jamaica in the 1980s and 1990s due to low

wages, unemployment, increased criminal activities and high economic inflation, more people emigrated to the United States in search of a better life. The rising cost of post-secondary education made it impossible for me to attend the University of the West Indies. More than anything else, I wanted to be successful and to help my family get out of poverty in Jamaica. After doing some basic research on the success of Jamaican immigrants to the United States, and believing that education was my only hope of a successful life, I came to America in the 1990s with the dream of obtaining a graduate education. I believed that I could develop my true potential by moving to the U. S. where educational opportunities were more readily available for those willing to work hard and to seize the opportunities.

I also wanted to live in a community where I could keep my old customs, where I could slowly acquire knowledge of the U. S. culture. I also knew I was going to be a teacher, and so I wanted to live among Jamaican and Caribbean immigrants as that would give me a chance to help make the educational dreams of other immigrants' children a reality. I was told that the life-style of immigrants living in New York was very fast-paced and that people become very self-centered, leaving very little time for meaningful relationships with their family that so many children rely on, and that these people looked to schools to provide them with a nurturing environment. Over the years, I adopted a goal oriented approach to life, and used my earlier unfortunate experiences as motivations to move forward and to assist others, especially students, to become better and more successful individuals.

How I Experienced Life As A Newcomer In The US: Working Three Jobs And Going To College

In the 1990s I made a decision to come to the United State to pursue my dream of obtaining a PhD in mathematics. Upon arrival in the US, I found it very difficult to secure permanent employment above the minimum wage, because I did not have the required legal documentation to compete for higher paying jobs. Quickly, I realized that if I were to go back to school, I would have to work two or three jobs to be able to afford the high cost of tuition charged by the CUNY colleges to foreign students. I managed to get a full-time position at a daycare facility in Queens, working from 6:00AM until 3:00PM. After leaving work at the daycare, I did private tutoring in the afternoon until 7:00 or 8:00 PM. After that, I went to my part-time job working as a table and storeroom helper at a sports bar from 10:00 PM to 2:00 AM. After saving up enough money, I enrolled in the mathematics and computer science program at York College in the fall of 2000 as Hunter College refused to accept my teaching credentials from Jamaica for admission to the Master's program in mathematics.

Life For The Youths In My Brooklyn Community: High On Ambition, Low On Resource

I was living in Flatlands in Brooklyn at the time, when I found out by interacting with some of the young people in my community, that only a few of the African-American youths had any interest in going to college. When we would talk at the park or on the street corners on weekends, I also discovered that most of the young men had not even graduated high school. What was even more troubling to me was the fact that, of the few who had any desire to get a college degree, they were just simply too poor to afford it.

Many would not get in anyway, since they didn't have the required skills or qualifications to be admitted even to community colleges.

This brought back memories of my homeland, especially the community I grew up in. I was deeply touched by the plight of these marginalized youths, and felt compelled to do something to give them a second chance at gaining an education. From observations and reading of the current literature, I recognize that there were external and institutional barriers to their mobility. Most of these young people were simply stuck in their situation, and had no legitimate means of escaping the tight grip of poverty on their lives, unless someone helped them.

A Strategy To Beat The Odds

The more I thought about the future of the youths I played basketball with on Saturday evenings, the more it bothered me. I kept asking myself, "What can I do to help some of these youths?" I discussed the situation with a friend at York College, and we decided to help three of the youths, two males and one female, who seemed very serious about going to college. These three young people had graduated high school, but would need help in preparing for the college entrance examinations. I discussed the possibility of them getting into college if we tutored them. They were just so excited that I even thought about helping them in this way. We met on Sunday mornings for 2-3 hours in my small basement apartment, or outside in the backyard when the weather permitted. My friend and I tutored them by going over several practice entrance examination questions together in preparation for application to CUNY colleges. In the fall of 2001, all three got into colleges, one in Brooklyn College and the other two into Queensborough Community College.

The Turning Point In My Professional Career: Touched By Gratitude

This was one of the greatest turning points of my life. Never before was I so touched by human gratitude, as when these young people and their families expressed their thankfulness to my friend and I for helping these three young people to change their lives. What was even more touching, was the fact that one of the young men had joined a gang out of frustration, and told us that he had started selling drugs, and would sometimes carry a firearm when conducting his business. I was so shocked to hear that. He stated that he felt that there was nothing else he could do “to eat food” as everywhere he went to get a job he was turned away.

I also shared a very special moment with the young lady at her graduation. She handed me a post-card in, which she wrote “Thank you for helping me to get to college.” She then explained how her life had been changed by the words of her favorite author Maya Angelou, after reading “I Know Why the Caged Bird Sings.” She told me how she identified with the life of the main character who was a Black girl who lifted herself above poverty, sexism, and racism, and achieved her dreams. For me, helping these three youths find a better life, stands as one of my greatest accomplishments thus far. I have absolutely no doubt in my mind that the most rewarding career for me is to be an urban educator. I want to be able to help create opportunities that will empower young people to take actions, and engage in practices that will improve the social and economic conditions of their lives.

Making A Difference For More Minority Students In My Community

After helping the three youths from Brooklyn and seeing how their lives were transformed, I went on to form AlphaSJ Tutoring Company. This is a non-profit tutoring

company that helps poor students in Queens and Brooklyn who are unable to pay for quality one-on-one tutoring to prepare for State examinations and for college entrance tests. The success and transformation of the lives of the three young people who were helped to obtain a college education, and improve their lives, also changed my focus from wanting to be a mathematics scholar, to become a mathematics educator, thus my switching from a PhD in mathematics to a PhD in Urban Education.

My increased awareness of the struggles of African-Americans and minority students to achieve academic success in urban cities also helped me to become more aware and sympathetic to the needs of urban youths. I observed that they experience schooling in a social setting that prevents many of them from achieving educational success, and also favors the reproduction of this failure. It has also become apparent to me that it is very difficult for them to hold on to their African-American identity, and be understood and treated with respect in schools that are staffed with mostly middle class White teachers, many of whom do not understand minority students lived experiences. As I thought about the problem, I thought that teacher preparation programs might have failed to adequately prepare teachers to deal with ethnic and cultural differences that exist in urban schools. Dealing with diversity was not a big part of my teacher preparation curriculum.

Teaching In New York City: Urban High School, Minority Students

My first experience as a New York City urban high school mathematics teacher was full of surprises for me. I was at one of Brooklyn's failing high schools, where students were considered "at-risk" because of the high failure rate at the school. The school population was predominantly African-American with a few Hispanics. I began as a 9th grade algebra teacher. While students in my 9th grade algebra class were far below grade

level, most seemed unconcerned with this reality. In the first two weeks of classes, I offered extra help for an hour after school each day, and only about three students out of thirty five showed up. I was very puzzled by this. I spoke to the Principal about this problem, and I was even more puzzled when he advised me not to worry myself, and to just continue doing my job. Suddenly, I realized why so many urban high school students were doing so poorly in school, and in mathematics. I came to a hasty conclusion that the schools do not really care about the success of minority students.

I also tried talking to some of the senior teachers in the school about the situation, and again, to my surprise, nobody to whom I spoke seemed to really care very much. The other mathematics teachers were White, and they advised me to “take it easy.” I was told that it was hopeless for these students to do well in mathematics. These teachers told me that they had been in the system for a long time, and that was just the way things were. One teacher said to me, “Forget it, Jackson, you are new. You will soon find out how things work in public schools.” I asked him, “What does that mean?” He did not reply. Instead, he just patted me on the shoulder and walked away. I realized how different things were for minority students in some of these schools, compared to my high school mathematics experience.

As the weeks turned into months, I became more and more concerned about the class’s progress. The Assistant Principal (AP) began to ask me how many students I thought would be ready for the State exam. I wanted to ask him if he was out of his crazy mind, but somehow I managed to contain myself. I told him that most students had a long way to go before they would be good enough to do well on the State examination. He advised me to make a list of the names of students I thought would be ready for the test,

and to let him have it the next morning. I did not know what to do. At lunch, I told one of the other senior mathematics teachers about the AP's request. He told me to just make up a list. Any list will do, he said laughingly. I went back to my room totally confused. I prepared a list of names and gave it to the AP the next morning. He seemed rather pleased.

What Happens When Your Teaching Philosophy Does Not Fit With The School's Policies?

I did the best I could for the students in helping them to learn mathematics in the school environment. I was not allowed to deviate from the strict school policy regarding teaching styles, and seating arrangements –, which had students sitting in vertical rows, the strict use of the prescribed text and work sheets, and so on. All of my ideas about students working in groups, and doing projects and discovering mathematical knowledge went out the window. I also had to stick to a ridiculous pace of content coverage, even though most of the students were completely lost. Each day I became more and more frustrated, and was dying for the school year to end so that I could get out of that school.

The students were very respectful to me, and I could tell that some of them wanted to learn, but I got absolutely no support from the administration that would enable me to use different teaching strategies that could have changed things for these students. Even though it was obvious that things needed to change in many ways to support students' learning, the Principal and his administration turned a blind eye. Sometimes I wondered if things were allowed to remain the same because the students were poor Blacks from the ghetto. If the student population was predominantly White, would the blatant disregard for their academic achievement and future lives be allowed to continue? I do

not know the answer to this question, but I intend to examine whatever research literature there is on this subject.

I never had an opportunity to really show my students that there were many other ways in which the teaching and learning of mathematics could be constructed, and perhaps many of them would have found something that was engaging to them, and afforded them learning the subject. This first experience at teaching in the inner city school provided me with another perspective and insight into possible reasons why African-American and minority students do so poorly in some urban school settings in general, and particularly in mathematics. Personally I found the perceptions and beliefs about the academic abilities of Black students by some of the White teachers and administrators to indicate a total lack of understanding of the cultures of the students they educated. This spurred me to consider Principal preparation for urban schools.

The school policy was in favor of a content-driven curriculum, focusing on standards and high-stakes testing. It severely undermined any rational attempt I could make to develop and implement teaching strategies, which would promote understanding over test outcomes. This was against my own teaching philosophy in, which I sought to understand what cultural and mathematical understandings my students brought to the classroom from their prior knowledge and lived experiences. I tried to use these experiences to create and expand learning opportunities for students in my classroom by allowing them to work collaboratively. Maxine Greene (1997) states, "Learning to look through multiple perspectives, young people may be helped to build bridges among themselves: attending to a range of human stories, they may provoke to heal and transform." (p. 519).

Within two months of doing the State's mathematics examination, I was given

instructions to stop teaching more new material and start preparing students for the examination. This meant that I should start drilling students by giving only practice test and reviews every day. I was also told to get students to discuss their answers with each other. Since my students were accustomed to working alone, and accustomed to being fed an algorithm and hundreds of problems to be solved, I was challenged to find ways to motivate them to begin to discuss their work with each other. Rarely, was I able to achieve this, and so most of the students sat the State mathematics examination unprepared. As I expected, the pass rate was very disappointing. I felt very upset and decided that I would leave the school at the end of the school year, which I did. Even though I was not able to help those students to learn much mathematics, or to pass their mathematics examination, I left with a wealth of knowledge that I planned to use to help other students.

Understanding And Meeting The Learning Needs Of Students

The following school year I got a new job at another New York public high school in Queens. Again, I was assigned to teach algebra in the 9th grade. However, during the interview, I asked the Principal what the school's philosophy concerning the teaching and learning of mathematics in the school was. I knew I was at the right place, not only because of the close alignment between our philosophies, but because he had promised that I would be in total control of my classroom. This gave me unlimited power to design the kind of learning environment that would best meet the needs of all my students.

The student population of this school was almost identical to the school in Brooklyn. Apart from the difference in management style, this school also received additional funding from a private organization, which meant that there were more resources for the

different departments. I got just about everything I requested for my mathematics classroom. After doing a pretest, I decided to meet with parents in a general meeting along with the principal and the student coordinator, to outline the teaching plan I had put together for the year based on the performance on the pretest and students' 8th grade State mathematics results. The meeting was an overwhelming success, and we began what was to be a very successful and rewarding 9th grade experience for the students, the school, parents, and me.

I had developed my curriculum and teaching and learning practices with one goal in mind, to improve the mathematics achievement of African-American and minority students. After three years of teaching in that school, and studying at the Graduate Center, I have learned a lot about teaching students of diverse cultures and abilities, in urban schools. I strive to create a learning environment where students feel safe and valued, and to incorporate their voices and perspectives in the everyday learning activities in the classroom. Through discussions and reflections on classroom experiences, students and I have developed an understanding of what is required for improved mathematics learning. Equally important, we have eliminated most of the disruptive behaviors and characteristics that undermine the success of students from different cultural backgrounds as they share a common learning space. I strive to create structures and learning activities that build bridges across social and cultural divides in the classroom, and enable students to be engaged in academically successful interactions.

Research Squad

My educational identity, ontological stance, and epistemology have been wonderfully transformed and restructured by being a member of Kenneth Tobin's research squad for

the past three years. I joined the research squad in my first semester at the Graduate Center, when I was referred to Dr. Tobin because I needed a mentor for a research project I was doing that was funded by the Louis Stokes Alliances for Minority Participation (LSAMP). Tobin was very gracious and agreed to be my mentor. He also invited me to visit, with the option to join the research squad if I was interested, at the next squad meeting. Squad meetings were held on Thursday evenings from 4:15-6:30 PM.

After the first meeting, I felt intimidated and stupid. I remembered saying to myself that I did not belong in such a setting, because I could not understand half of what everyone was talking about. The conversation was loaded with sociocultural and educational jargon that I did not know existed. For example, one of the words I remembered was “fields.” I have always known and used that word. However I was thinking, why are they wasting time talking about such a little word like that? If you are in graduate school, then for heaven’s sake, you should know the different meanings of a simple word such as fields. To my astonishment, I learned so much that evening about things like: porous boundaries between fields (which was later reconceptualized as: no boundaries between fields); being in a field without being there physically; being in more than one field at the same time; and so on. At the end of the meeting, I said to myself. “Woh! This is awesome. This must be how people with a PhD think and talk.” I could not wait for the next meeting.

As I reflect on my experiences as a squad member, I realize that the thorough examination of critical educational issues through different sociocultural theoretical frameworks, not only provided me with a deeper understanding of the problems we face in urban education, but also equipped me with strategies and better ways of thinking

about solutions. As I do my research for my dissertation, the squad provides me with an intellectual space where I can examine important findings and issues as they arise. One of the main focuses of the squad is for its members to engage in ongoing scholarly writing, and presentations at educational conferences. Our peer-review process between squad members has helped me to improve my academic writing skills, which are still being enhanced.

The weekly sharing of what is happening in our individual research and personal lives has provided me with a wealth of ideas, and showed the care and concern that squad members have for each others' personal and academic well being. Each squad member gets a chance to have his/her voice heard, and to share what is going well and what is not going well in his work, and receive applause or assistance from other squad members. This kind of reciprocal roles that get enacted make me think of the squad as an intellectual and socially constructed field where squad members interact together, and over time, certain modes of conduct become habits and parts of the unique culture of our squad. In this field, as we focus on shared research interests, the collective experiences of researchers become objects for discussion, and new meaning and understandings are produced, which are then incorporated into our different individualized research context. Because of this, I see the squad as a role model that exemplifies what a good education-researcher should be. This positive institution, more than anything else, has impacted my epistemological and ontological stances, and transformed my educational identity in ways that have greatly improved my teaching and learning practices.

My View Of Teaching

My experiences teaching in both formal and informal settings make me believe that

the impact on students' understandings of subject matter greatly increases when students are allowed to interact and share ideas. As the years went by, I encountered more and more people teaching whose practices lacked the essential components of understanding and care for students' education. I believe that teaching requires that teachers be reflective of their teaching and learning practices, and recognize when adjustments are needed in their everyday routines, so that students can receive the best possible learning opportunities.

I also believe that the roles of students in the classroom need to change. Students possess a wealth of knowledge that can be utilized by teachers in making changes in the ways instruction and classroom activities get enacted. In doing my research for this dissertation, I have allowed students to become coteachers with me. By allowing students to be active participants in their own learning, they are in control of the class. I have observed remarkable increases in student agency, learning, and self-esteem especially among student groups that previously hated mathematics. Allowing students to work together more in roles that require greater cooperation and support from each other, increases responsibility, and builds trust, friendships, and solidarity. These are classroom structures that have been identified in other squad members' research that have greatly improved students' learning. How, why, and where these structures get produced and enacted is discussed in chapter 3 of my dissertation.

It is my view that the most successful teachers are those who develop strong student-teacher relationships. Understanding students' lived experiences is central to being able to connect with them, and to shift and re-focus students' attention to learning objectives. As I create opportunities and incorporate students' perspectives into their classroom

learning experiences, they feel valued and this expands their agency. The expansion of students' agency promotes attitudinal changes towards classroom activities and discourse because students realize that the knowledge and abilities they bring to the class are valuable as they are being used to contribute to their learning.

As I interact with students and learn how best to structure my teaching and to embrace their diverse sociocultural perspectives, my educational identity is also transformed. The information gained from the analysis of some of the fields that were created and instituted during my research (e.g., cogens) has helped to transform my teaching identity. I share the view of Joe Kincheloe when he remarked, "teachers must understand the sociopolitical construction of their own selfhood, their own class location, and the ways such a class placement shapes their view of the world, the purpose of school, and their students" (Kincheloe & Steinberg, 2007, p. 21).

A Sociocultural Approach To Teaching That Transforms My Identity As A Teacher

The enactment of cogen and coteaching as pedagogical strategies in my classroom not only transformed my students' mathematical identities, but my own identity as a teacher. Applying cogen as a sociocultural theoretical lens through, which I could examine what was happening in my own classroom, I discovered that there was a dynamic interplay between my agency and identity, in the context of my ability to teach students more successfully. In this social context, as my students experienced improvements in their learning, these also shaped and reshaped my identity, and produced increased agency that gave me a deeper sense of purpose as a teacher.

In my earlier years of teaching, and even up to the point where I decided to enact cogen and coteaching in my classroom, I experienced a disconnect between the ways in

which I experienced teaching, and how it affected my classroom practice. As I conducted my classroom study for this dissertation, one of my goals was to understand and make sense of the ways in, which participants' conduct, agency, belief, and identity change as a result of being involved in the research. I also reviewed the salient literature on agency and identity transformation. Bourdieu says that agency starts with the belief that human beings have the ability to influence their lives and environment while they are also shaped by social and individual factors (Bourdieu, 1977). Bourdieu helped me to understand how and why my own identity had changed.

As I examined my own individual actions in the social context of the classroom, it became apparent to me that the cultural tools of cogen and coteaching were shaping my actions and affording the production of new beliefs, about the ways I should practice my teaching. I also realized that it was impossible for me as an individual (teacher) to affect the lives of the collective (students) without me being impacted also. Thus the individual | collective dialectic provides a way for me to understand my own identity transformation, as I observe the changes in my students' mathematical identities. It guarantees that my identity as a teacher, as well as that of each student belonging to my class (the collective), must also be experiencing a change of identity, since the identities of the collective and the individual are shaped by social and cultural structures, such as cogens and coteaching.

Three years ago, when I enacted cogen as a teaching and learning tool in my mathematics classroom, students were desperate for an approach that would not only help them to learn mathematics, but would also create a learning environment that met the diverse cultural and social needs of all students. Cogen was able to do just that because it

provides a safe space where each student's voice is respected and valued. This benefited me as a teacher because the number of classroom management issues decreased significantly and more students were able to actively engage in classroom learning activities. Coteaching evolved from an increase in students' participation and motivation, as students expressed their desire to share and support each other's learning in this way. At first, this was a little difficult for me, because I was accustomed to being in total control of the mathematical instruction in my classroom. Occasionally, I would allow a few of the high achieving students to explain something, or maybe a different way of solving a problem that they may have learned outside of the class, but that was the extent to, which I allowed students to teach.

The coteaching plan was discussed in cogen, and all the mechanics and strategies were carefully worked out. The coteaching method was implemented, and students quickly showed a profound affinity for it. It has continued to evolve as students used their creativity and agency to improve upon its day-to-day success in meeting the needs of all students. As I interacted with students in their new role as coteachers, I became more aware of the vast amount of untapped resources teachers have at their disposal, if only we could learn to value the knowledge that students bring into our classroom everyday. This has changed my perceptions of students' abilities to affect their own learning and academic success in schools. I have also learned that the incorporation of students as coteachers into the everyday classroom instruction provides a much more sustaining and accessible way for other students to get answers to their problems, since they are with each other throughout the day. In this manner, student coteachers are viewed as an extension of me, thus facilitating and extending the teacher's role to their peers on the

bus, in the gym, in the cafeteria, and even on the telephone. In this context, coteaching has helped to transform students' identities, and developed better student-student relationships.

According to Hall and McGinty, each decision teachers make, each action they take, is simultaneously a consequence of action and present context and a condition shaping the context for further action (Hall & McGinty, 1997). I knew that most of the students in my algebra 1 (9th grade) class were struggling, but it was in cogen that I really began to understand the reasons why so many of them were having such grave difficulty. As students shared their earlier mathematical experiences, I was able to understand more clearly the root causes, and we began to cogenerate possible solutions that could best help most, if not all, of them. I realized that most of my past attempts and actions to help struggling students were mediated by school structures and classroom settings, such as unavailability of resources and school policies. I had to re-examine my teaching practices in light of the present context and needs of my students. I knew that my existing pedagogical strategies were not going to help my students, and that what was required was a strategy that could provide tools and ways of getting students to really help each other. I also recognized that my individual capacity, no matter how committed and willing I was, would still be insufficient to help all my students with the type of on-going and sustained help that would be required to get them to succeed at grade level. It was after going through this detailed analysis of the teaching and learning practices in my classroom, and the examination of the existing problems that students were having that my students and I decided we would start enacting student-teacher coteaching, (and later, student-student coteaching) as a teaching and learning strategy in our mathematics

classes. For me, this was one of the greatest transformations of my professional identity as a teacher.

In the beginning, I felt very vulnerable and somewhat less capable and competent as a teacher. I was experiencing mixed emotions as I interacted with my own thoughts, beliefs, identity, and competence. I remembered how all these feelings intensified as I worked with two of my students in planning the first coteaching lesson. The feelings fluctuated as I opened up myself to my students, and tried to build a different kind of teacher-student relationship. However, I was convinced that I was doing the right thing, and that most of the students in the class would benefit from the new teaching and learning approach. It became a lot easier for me, as my two student coteachers were incredibly willing and optimistic that this was going to work. I kept asking them if they believed it would make a difference for most of the class, and they were absolutely convinced that it was a great idea. I still remember the many times they told me to relax, and to let them handle things. They were so confident, much more than I was that they would be able to create activities and break things down in a way, so that their peers would definitely understand. After those reassurances, all that was left for me to do was to trust my students. I trusted them, and they delivered a wonderful lesson. Since then, coteaching has been the main teaching strategy used in the class. For me, it has been a learning experience of trust and sharing control of the class with students. I have become more willing and open to facilitate students' learning through collaborations and interactions that require me to play more of a facilitator role, and allow students to take control of their own learning. I have also learned that the more I empower students, the more they open up, and take risk. I observed some students who were very shy and

reserved, participating and asking questions that they would not normally ask for fear that others would laugh at them. Other students who never submitted a home-work assignment before, were asking for help with their homework and participating in coteaching and other classroom activities.

On reflection, over the course of the three years of enacting cogen and later, coteaching, my professional identity as a teacher has completely transformed. Though, initially, there were conflicts because of the norms and aspects of teaching that I held on to for years that were completely different from what was being tried in the present context. As a teacher who was trained and taught for many years in the Caribbean, a core part of my professional identity and beliefs was inconsistent with the radical changes that I was undertaking to assist student learning in a whole new context. From my past experiences, I found out that it was much easier to do what you are accustomed to, what is safe, and what seems to work most of the time, as long as you are doing what the school requires of you. However, after seeing the changes and improvements in students' attitudes and achievement as a result of the changes in my own teaching identity, I experienced and continue to experience, a feeling of satisfaction and a sense of positive influence on students' academic, social and emotional development.

Since then, I have been thinking about the notion of what a good teacher is, and what is expected of such a teacher as I continue to examine the various structures that played important roles in the transformation of my identity as a teacher. Among the many things that have contributed to my changing identity, I believe it was my willingness to trust, to be open, and to value students' knowledge and abilities that had blurred the boundaries between my teacher identity and the role of students, which resulted in a most successful

relationship for both my students and me. For me, the opportunity to connect and build positive relationships with many of my students while attending to their academic and social development was the key to the transformation of their learning and my shift in identity and beliefs, particularly in the areas of classroom instruction. While I believe in the legitimacy of public schooling, I now believe that teachers should use their agency, and not feel impotent and afraid to take actions that could change, improve, and make a difference in creating learning opportunities for students.

An increasing body of research suggests that the use of cogen and coteaching provides students with structures capable of helping marginalized youth succeed in urban high schools. One important area of study could be a longitudinal examination of how cogen and coteaching mediate teacher agency and identity over time.

Chapter 3

Examining Research Methods: Perspectives On Doing Mathematics Research in Urban Schools For African-American And Other Minority Students

Today, I have decided to write a list of statements/observations about things that excite me, bother me, or interest me in my mathematics classes and questions that I have been thinking about.

I am bothered by the fact that some students are unable to do simple mathematical computations without the use of the calculator.

I am excited by the fact that most of my students are doing better at problem solving since I started using real-life situations as the problems, which they need to solve.

I am excited that a few more students have told me that they are not afraid of mathematics anymore because of the fact that we do a lot of hands-on activities in class.

I am interested in helping slow learners and ESL students succeed in learning mathematics.

I am bothered by the fact that more than half of my students seem not to complete assignments on-time, nor to take their work seriously.

I am excited by the fact there are some students who are very focused and are doing very well in each class.

How can I help students remain focused and improve in mathematics?

What other teaching strategies can I use to motivate students who seem not to be succeeding at this time?

How can I get students to work at strengthening their mathematics foundation?

What are some of the best strategies to use to help ESL and slower learners?

How can I better prepare for my classes that have students who are functioning at levels that are “miles” apart, without losing any of them?

(Samuel, Personal Journal, 9/27/06).

Over the years, I have kept professional journals such as the one from, which the sample above comes in, which I have documented many of my teaching experiences. This particular journal entry was made after observing that some of my students were not succeeding and were becoming increasingly frustrated. I wrote the journal entry as a reflection on what was happening in my classroom with the intention of discussing it with my students to ascertain the reasons for students’ frustrations and to determine what we could do to get more students interested in what was happening in class. At that time I realized that I was presenting a subject far too abstract and removed from students’ daily experiences, but I didn’t have an alternative method that would allow me to meet the standards set by the school and involve students in a way that would make the class more interesting at the same time.

After I wrote the above entry, I had conversations with my students that were very enlightening. Most of my 9th grade students, who are African-American and other minorities from poor neighborhoods, shared their mathematics experiences in elementary and middle school. I became aware of the complex reasons that contributed to students being unsuccessful and frustrated in my mathematics classroom--including my teaching style. However, it was very clear to me that students’ social and cultural backgrounds played significant roles in their earlier failures. Most expressed a complete disconnection between their White mathematics teachers’ understanding of their culture and knowledge

and the ways in, which they presented mathematics to those students.

As I prepared for this study as a teacher-researcher, I reflected on the many conversations I have had with students and realized that I needed a research methodology that would embrace diversity, give students a voice, and have the potential to be transformative for all participants.

As a teacher-researcher looking for ways of educating at-risk minority students, my goal was to examine existing pedagogy and to identify and construct new ways of mediating the teaching and learning process so that students' performance would be enhanced. Research suggests that several methods have been tried in the past in urban schools serving African-American and other minority students, yet, however successful those methods may be in other subjects, dismal outcomes continued in math. I wanted to find a way to connect students' culture with mathematics.

The methodology described in this chapter unpacks and highlights some of the theoretical concepts that underpin the ways sociocultural, contextual, and institutional factors affect urban high school students' mathematics achievement, which this research addressed. It is my belief that learning is socially and culturally produced, and, as a result of this, my research approach is grounded in sociocultural theories and methods that have been used successfully to improve students' achievement and to build community in urban schools. I also believe that the learning process is iterative, and so it is expedient that I employed teaching and learning methods that would allow for an ongoing experiment in, which my class and I could learn from our mistakes and improve upon our techniques progressively.

In the sections that follow, I provide the methodological framework that draws on

critical ethnography, personal narrative, and a bricolage of theoretical frameworks and methods that combine to produce a research product that is capable of fostering ontological and epistemological transformations of my students' mathematical identities as well as my own teaching identity. I also examine the qualitative methods and tools used to access and analyze the data and provide details that make clear the connections between the methodology and the theory. These sections state how the study will be interpreted and authenticated as well.

The Research Approach

In urban schools, minority students are being educated in settings that are severely lacking in resources and in teaching practices that could support student success. In addition, students' life experiences predispose them to complex social, cultural, and emotional issues with which they must cope. Research has indicated that many classroom studies have been conducted, which fail to report students' own perspectives on issues that affect their learning. My research is different as students participated as co-researchers, and their critical voice, suggestions, and perspectives have been incorporated in the *present* study, which greatly informed the research process.

As Turner and Varley (2007) explain, critical mathematics educators argue that mathematics education should not only equip students with the skills and understanding to succeed academically but also prepare them to critically investigate, challenge and act upon issues in their lives and communities (p. 3). This is consistent with a broader critical educational paradigm that seeks to disrupt the societal and educational structures that marginalized minority youth,

The above *idea* from Turner and Varley's (2007) AERA presentation consists of

salient perspectives that I now share. For example, I realize that the direct teaching method I previously used was an attempt on my part to control power in the classroom. On reflection, I realized that my classroom structures, which did not incorporate students' perspectives, were oppressing these already-marginalized students and thus were the reason for their frustration. This was not preparing students to investigate critically and discover ways of solving problems on their own. In addition, my own observations have made me realize that any meaningful urban classroom study must embrace a research methodology that values and incorporates students' voices in a collaborative way throughout the study to produce a more equitable representation of students' classroom learning experiences.

Critical Ethnography As A Social Justice Approach To Research

There is an urgent need to help African-American and other minority students to become better agents and to take control of their learning in urban schools. Many of these schools are becoming more locally controlled by empowered principals, are politically controlled and test-driven, and as a result students' understanding of fundamental concepts is not a priority. Because of this, my research uses a critical ethnographic approach and appropriate research methodology that focuses on providing both structures that are transformative and opportunities for marginalized students to experience a more equitable learning environment.

This study is also centered on the experiences of two of my students, Bebe and Cece, as they enact agency and produce new culture both in and out of school. Cece, whose journey throughout the research gets careful study as she experiences different roles that include being a low-achieving student; taking agency and becoming a high achiever;

being a role model, an active participant in cogen, a leader, a co-researcher, and a student coteacher, is the main character.

This critical ethnography investigates students' life experiences and provides a deeper understanding of how students' cultural capital and practices in and out of school can be used to improve the teaching and learning of mathematics in urban classrooms. Since the knowledge gained from being a student-researcher and a participant in cogen can be used in different fields outside of school to improve quality of life, this ethnographic study also examines ways that students' agency helped them to deal with social issues. For example, Cece used the conversation skills she learned in the cogens field to solve problems in her home between her stepmother and herself. Chapter 4 will discuss this to illustrate how, as a result of being involved in cogens, students' evolving identities and increased agency positively affected the social life of their families and even of their community.

Since most of my students have complained about being stereotyped as incapable of succeeding in mathematics, this study employed participatory research methods of cogen and coteaching to help me understand both minority students' learning processes and how they negotiate and collaborate across cultural differences. I share the view that learning is socially and culturally constructed. This means that, as students enact culture to construct and produce (i.e., reproduce and transform) new forms of knowledge, both the coherent patterns and the contradictions that occur in their social habitus must be interrogated by the research methodology in reaching agreed-upon meanings by all participants.

Viewing the production of new culture through an ethnomethodological lens (Garfinkel, 1967), new culture gets produced during turbulent times in a cultural system.

I can make better sense of what's happening in the classroom by identifying the structures and cultural habits that mediate and afford students' success and failure, especially when the classroom environment is disruptive and the discourse reveal patterns of coherence and contradictions within the social structures that interrupt normalcy. I will seek to find ways to understand these interruptions and to construct meaning of social life in my classroom more accurately.

Valuing Students' Voices And Providing Equal Benefits For Research Participants

Traditionally, most educational researchers produce a product that reflects only the researcher's perspective, because of the power embedded in the investigator's position. Students' opinions are rarely highlighted in such work unless they have substantial congruence with the researcher's point of view. Seiler (2002) argued for a shift from such hegemonic research practices and urged an end to letting institutional practices and traditions in social research perpetuate unequal power relations between the researcher and the observed. She admonished investigators to find ways to transform the differential power relations between participants as well as those implicit within the social setting itself. Freire (1970) also shared a similar view and encouraged researchers to carry out studies in, which people become participants who know and act rather than objects who are known and acted upon. Thus, this study employs collaborative research to negate power differential and gives students equal voice in all aspects of the research process.

This study also seeks to ensure that all participants, especially students as co-researchers, receive equal benefits and are treated with fairness according to the authenticity criteria described by Guba and Lincoln (1989). A teacher-researcher could commit to helping his student co-researchers meet the requirements of applying to and

getting into college. It is the responsibility of the researcher to take appropriate actions that will help students during and after the research and to allow them to share in the success of the project. By this, I mean that the investigation must not only benefit the researcher as he successfully meets his goals. He must make some moral commitment to help others who participated in the study achieve their goals. In my research, many students had become frustrated and unable to function at grade level because they did not have the required mathematics foundation to understand the content. I organized remedial and review groups to assist those students who needed to strengthen their basic skills.

The awareness that participants must receive equal benefits in a research project must become a critical component of education research. Ways in, which participants would like to benefit must be included in the planning phase of the research. In the case of research employing cogens, this should be addressed cogeneratively in relation to the goals of cogens to arrive at consensus by considering the interests and expectations of all participants. Ethically, investigators who conduct research in classrooms where students and teachers play significant roles should give satisfactory recognition for *both students and teachers* contributions to the study's process and product.

Collaborative And Transformative Research

In our sociocultural theoretical framework, cultural systems can be viewed as fields. These have no boundaries, meaning that contradictions and patterns of thin coherence exist in a dialectical relationship (Tobin, 2006). Because of this dialectical relationship, whenever I examined my research data and found patterns of coherence, I was obligated to search for contradictions before I attempted to reach a conclusion. I was encouraged when I observed students producing new forms of positive culture within my classroom,

but, since there was a dialectic relationship between cultural production, reproduction, and transformation, I anticipated the transformation of students' identities as well as my own. As the investigation progressed and participants experienced transformation in the mathematics classroom, this study also attempted to ascertain whether or not participants were enacting agency in other fields outside of the mathematics classroom to meet their learning goals.

The collaborative approach employed in this study, during, which students participated fully in all stages of the research into shared classroom activities, guaranteed a more comprehensive analysis and interpretation of these events because all stakeholder voices and perspectives were taken into account. This is not possible in traditional ethnographic research in, which students are seen as objects to do research on but whose voices and opinions are never included in any significant way. Calabrese Barton (2001) refers to this approach as participatory pedagogy and maintains that investigation should be a fully reflexive process in, which research is done *with* participants instead of *on* or *for* participants. I have adopted this idea in this study, and so all interpretations, decisions, and recommendations are collectively produced based on participants' shared experiences and individual perspectives.

Bricolage

Studying students' learning in the classroom setting is very complex. The impact of different social, cultural and institutional forces demands that a bricolage of methods and theories be employed to better understand the complex range of issues limiting students' success. According to Kincheloe:

Central to critical bricolage is the effort to find and develop numerous strategies for

getting beyond a one-dimensional view of knowledge. In its criticality, the bricolage is profoundly concerned with developing multiple strategies for the purpose of understanding the diverse ways dominant power oppresses a wide variety of individuals and groups. With this understanding, the critical bricolage works to develop new forms of informed practice (praxis) to subvert the stranglehold of dominant power and produce new creative justice-based realities (Kincheloe, 2008, p. 1).

By using a bricolage of theoretical frames and interpretive lenses, I was able to determine that my students could benefit more if I discontinued my positivistic approach and incorporated new teaching strategies that were more closely aligned to their life experiences. Kincheloe's suggested use of the bricolage became very germane to my understanding of African-American students' resistance to the traditional methods of mathematics instruction used by their White middle class teachers, who were far removed from their students' world. In discussions with me my students have expressed the view that there is a large difference between the ways most of their teachers try to make them learn and how they actually learn. It is my interpretation of these comments that students sometimes saw this as oppressive and believed that teachers use their power unjustly to create and maintain learning environments where only a few elite students are able to succeed, while the majority gets more and more frustrated and eventually gives up. It is my belief, based upon observations over many years of teaching, that the teachers were not unsuccessful and ineffectual because they were White and middle class. They were unsuccessful because they were ill-prepared and lacked understanding of African-American and other minority students learning styles.

My students played important roles as co-researchers in this ethnographic study, in,

which I employed cogen and coteaching as the two central research methods for connecting with students socially, culturally, and academically, as I believe in a polyphonic and polysemic characterization of our classroom experiences. This is essential to understanding how African-American and minority students in general interact, construct knowledge, and experience learning in urban schools. As the study progressed, different theories were utilized at different times to make sense of our practices and understandings as new outcomes were produced. At the same time, as I anticipated, my identity along with students' identities was constantly being transformed by our experiences in the classroom.

At different stages of the research, our changing focus, ontology, and epistemology dictated the theoretical method that was employed. For example, during the analysis of cogens, I used a combination of sociocultural theory (Sewell, 1992; Tobin, 2006), the theory of emotions (Collins, 2004; Turner, 2002), and the theory of conversation and discourse analysis (Roth, 2006) and of naturally-occurring talk and actions to make sense of what was happening and why it happened in the classroom. During the analysis of coteaching, in addition to the theoretical lens used in the analysis of cogens, I included theory of coteaching (Roth & Tobin, 2002) and standpoint theory (Sandra Harding, 1998). In addition I made use of principles of and concepts such as structure | agency (Sewell, 1998), agency | passivity (Roth, 2007), dialectic intrapersonal | interpersonal agency, authenticity criteria (Tobin, 2006), and others. This all served as ways to interpret the individual and collective perspectives and to assign meaning to social life as experienced in the mathematics classroom in, which students and teacher collaborated to improve learning opportunities.

Looking In The Mirror

All the students who participated in this study have made their contribution to the research process in different ways. Students' participation in cogen was, at first, based upon my selections, but this quickly changed, as the interactions became a social phenomenon attracting more and more students to our meetings. As the student-student and student-teacher interaction evolved into a truly trusting relationship, I opened up to students, and they reciprocated. We shared and learned things about each other that would not have been possible using my traditional teaching style. This, in my view, created the most enlightening perspectives of our different life experiences, which proved invaluable in our understanding of each other in the context of teaching and learning of mathematics in this study.

My life experiences have greatly influenced my perspectives and my expectations of minority students. Likewise, I believe that students' experiences and particularly their prior school experiences also mediate the way they think about teachers. In some of their reflective journal entries, students used the opportunity to make their voices heard, and some expressed negative sentiments and little hope of succeeding in mathematics because of their previous mathematics teachers. Some students went to great lengths in describing not just who they outwardly appeared to be but also provided a deeper account of their inner struggles to succeed in school.

Derrida used the metaphor of the "Taint of the Mirror" in illustrating his work on deconstruction, to reveal a text as a play of surface against surface (Gasche, 1986). He commented that the reflection in the mirror is possible only because of the darker, hidden, reflective surface that would probably seem very unattractive and would probably be

discarded as having no useful purpose. However, without this relatively lusterless surface, beautiful images cannot be produced by the outer smooth shiny surface. The deeper meaning behind this urges investigators to get behind the mirror and question the very nature of reflection (Gasche, 1986). In applying this concept to the teaching and learning experiences of marginalized students in this study, I became aware of the necessity of probing deeply and understanding the underlying issues that prevented many of these students from achieving at their full potential. I also became more careful about making hasty judgments based on the reflected image of first impressions with students, especially of those who were not succeeding in my class.

By reading the reflections of students, some of, which extend beyond their school experiences, I became more aware of the social and cultural hurdles students have to overcome in order to succeed in school. This has convinced me that I need to change my perspective on the role I need to play as a mathematics teacher for high school minority students. I need to create dynamic structures that, when appropriated, will create strong social bonds and will produce cultural and symbolic capital that students can use to make life-changing decisions. My students were not average high school students but rather students who have complex personal, domestic, neighborhood, and even legal issues to deal with as they try to succeed in school. The critical nature of this research forced me to take all of these factors into consideration. It compelled me to develop research and teaching methods that would meet the needs of these students and create structures that will afford them agency to achieve at their optimal potential, individually and collectively.

Conducting Authentic Research

In examining the ontological, educative, catalytic, and tactical authenticities as laid down by Guba and Lincoln (1989), it became clear to me that participants' life experiences, the classroom social processes, and students' knowledge are inextricably woven together and thus not easily separated. I view the authenticity criteria as research methods that have guided my actions at every stage of the research process to ensure that all participants' rights were protected and that they received equal benefit as individuals and as a collective.

Ontological authenticity developed as participants in the research experienced a change in their ontology while learning from the study and simultaneously changed their perceptions of the events around them and in what way they were applicable to the research goals. According to Tobin (2006), an important part of the analysis of a researcher's changing ontology is an examination of the changes that occur in the theoretical underpinnings of a study and the associated changes in the methodologies employed. Thus, in my research participants were better able to understand and make sense of the nature of social life in the classroom, and throughout this process we examined different methods to meet the learning needs of the students.

Educative authenticity occurs when knowledge gained through the ontological process is shared with others to change and improve their understanding effectively. As my research progressed, participants shared and discussed ways in, which their new ontology benefited their educative process through cogens.

Similarly, students transferred the knowledge gained through their involvement in the study to students in other classes. Other teachers who were not directly participating in

the study identified social and academic changes among research participants. These non-participant teachers also remarked upon transformations among groups who participated in our cogen class. This ripple effect of improved learning and discipline that evolved in and through cogens in my mathematics class was affecting other teachers' classes, as students' changing ontology and attitudes toward their work inspired other students to do better in those classes.

Tactical authenticity has the power to elicit the interpretation of data so that "participants can be fully empowered to act" (Guba & Lincoln, 1989, p.250) and to create opportunities to modify existing structures. For example, two students in my study who were learning English as a second language (ESL) adopted some of the strategies learned in cogen to help their ESL group be more successful in learning and coping with the difficulties associated with doing their school work in a second

In our ESL group, we used to talk a lot and dodge the work. Everyone would talk aloud at the same time. Since I learn how to work in groups in cogens, I help change my ESL group so everyone does not talk at the same time anymore. Last year I failed most of my classes big time. Because of what I learn in cogen, I am more ready for work in ESL class, and I am learning plenty more stuff. Now my group finds answers quicker. I am doing much better in all my classes. If it was up to me I would do cogens in every class.

(Student's Journal – 2/14/08)

language. According to Tobin (2006), authenticity criteria are an example of parts of a whole, meaning that they are dialectically related, and as such they exist together. Each

presupposes and affords the existence of the other as social life gets enacted.

The following example further illustrates the idea of the whole being constituted of parts, and how this was illuminated through the lens of the four (i.e., ontological, educative, catalytic and tactical authenticity) dialectically-related components of the authenticity criteria. Cece, one of the students in this study, changed her belief in and perception of her ability to succeed in mathematics after engaging in a one-on-one cogen with me. She agreed to take responsibility and to change her attitudes and actions to include conduct and practices that would support her chances of learning mathematics. As soon as she was able to do this successfully, she experienced a shift in her ontology, and others noticed her changing mathematical identity, which became a resource for agency within the classroom field.

Arising from her changed ontology, Cece proceeded to share her new success and knowledge with her friends who were experiencing severe difficulties in understanding the content of the lessons. Cece's sharing initiated a new type of learning culture in the classroom. This evolved from Cece's enactment of agency to inform her friends of the new possibilities for success was an emblematic representation of educative authenticity. Using her agency and influence, Cece persuaded her friends and classmates to change the structure and dynamics of their groups (students sit in groups of four around tables in the classroom), and she challenged them to experience improvement in their learning. Even though this was not immediately fruitful, changes began to occur, and some students chose to join new groups to improve further their chances of being successful. As more students became more engaged and agentic, the classroom atmosphere began to evolve, and peer-pressure played itself out in the new groups, as students experienced a change in

ontology evidenced by new patterns in conduct and attitude. Students were educating each other as they collaborated and shared their understanding of ideas and problem-solving strategies. For example, Bebe and Cece continued to work together in other classes and encouraged other students to work collaboratively. Here we see the catalytic authenticity in dialectic relationships with educative and ontological authenticities.

However, this does not mean that 100% of the class was now on-task nor that everyone suddenly became excellent mathematics students. There were a few students who showed resistance and provided examples of contradiction to the new patterns that most students had adopted. The contradictions observed included students off-task, engagement in conversations about social life, and failing to complete classwork on time.

In cogens, we asked these non-complying students why they were unengaged and off-task and probed for ways to make them agents for improvement and change in their classroom learning. Cece was instrumental in encouraging everyone to give all the help and support they could so that the whole class could be successful. She advocated for peer tutoring in class and for others to help less-engaged students with their homework. Cece's decision to exercise her agency to encourage others to make extra effort to assist their classmates who seemed to have given up is an example of tactical authenticity. As this dissertation unfolds, I will discuss the extent to, which the authenticity criteria helped to improve my research as participants experienced better learning opportunities, which were informed by the enactment of these criteria at different stages of the research process.

Hermeneutic Phenomenology

Hermeneutics involves the interpretations of events (i.e., why events occur) and

phenomenology seeks to find out what is happening in an event. As a research strategy, hermeneutic phenomenology enabled access to participants' unique ways of knowing and of making sense of events and things.

Mathematical reasoning is a complex process that requires individuals to use both cognitive and interactive skills. Mathematics teaching and learning requires that individuals be able to communicate their understanding clearly so that others can make sense of what they are trying to share. Since meaning is oftentimes constructed based on unique life experiences and frames of reference and learning is socially and culturally constructed within those frames, it is very likely that individuals will arrive at different meanings while sharing the same experience. Thus, it is important to be able to have a polyphonic analysis in ethnographic research. A hermeneutic phenomenological approach helped this study to focus on students' interpretations and understandings, which are derived from their outside experiences. In opposition to this would be a methodology, which attempted to explain or predict students' learning capabilities based on the observers' own experiences. However, it is imperative to realize that there is no single way of making sense of any given event or learning situation.

Hermeneutic phenomenology was selected as an appropriate research methodology based on the work of Max van Manen (1997), as his work addresses both hermeneutic as well as phenomenological questions in ethnographic research. It is a "research methodology aimed at producing rich textual descriptions of the experiencing of selected phenomena in the life worlds of individuals who are able to connect with the experiences of all of us collectively" (Smith, 1997, p. 80). By allowing students to be active participants contributing to the ongoing research process, hermeneutic phenomenology

became a critical research tool for capturing and making sense of what was happening in the classroom from students' perspectives.

Design Experiment

This study employed design experiment as a research method to allow the teacher-researcher to make curricula and other changes on an as-needed basis to meet the cogenerated goals of the research as new findings emerged from the interactions between participants, the mathematics content area, and the analyses of video recordings. Ann Brown (1992) observed a dynamic relationship between design experiment and other classroom research methods. Design experiment complemented other methods and provided greater insights into implementing positive changes to benefit students while the research was in progress.

Using cogen as a strong evidence-based teaching and research method, I found design experiment to be very complementary and useful in creating opportunities for the modification of teaching and learning activities, approaches, and settings as I incorporated cogenerated solutions to problems in the classroom. Design experiment is a useful resource for analyzing and making changes during ongoing classroom interactions. During these interactions students were continuously acquiring and producing new social and cultural capital. The capital production, reproduction, and transformation dialectic relationship contributed to students' identity transformations. These transformations subsequently required adjustments in the design, implementation, and re-examination of teaching and learning strategies to determine the extent to, which teaching and learning goals were being met. The use of a bricolage of methods led to the discovery, creation, and enactment of innovative curriculum designed by students and me for students'

increased participation and improved learning of mathematics.

Data Collection, Analysis And Interpretation

To ensure an effective data collection design, I collected multiple sources of data including video and audiotapes of lessons and cogens, field notes, classroom observations, classroom artifacts (e.g., student work, student records, handouts, written reflections, and report cards), student journals, classroom interviews and questionnaires. According to Erickson (1998), good ethnographic research demands diverse data sources.

Looking and asking in a setting can produce differing sources and kinds of data. Field notes written by an observer; interview comments; machine recordings; and site documents, including demographic and historical material. An effective data collection design includes as many of these different sources as possible (p. 1158).

Data were collected over a two-year period with the main focus on students' collaboration and interactions in the classroom and in cogens. These were important to the study as I examined the production, reproduction, and transformation of classroom mathematics culture as students played different roles in the research. Students participated by providing classroom artifacts and by giving up their lunchtime and after-school activities to work on video analysis. Some of these data sources will be discussed in more detail in the rest of this chapter.

Why didn't I think of this before? I asked myself. It seems as though I wanted students to be more involved in classroom activities, but never thought of asking for their ideas and opinions about how things could be changed in the classroom. Maybe I didn't want to share that power.

During the study, students received training in videotaping, doing research, lesson planning, enacting cogen, and coteaching. Students benefited by learning new skills and playing a very active role in the research. Initially, I did all of the work by video taping the sessions, selecting students' work that I thought was appropriate for the study, analyzing video recordings, and conceptualizing activities that I wanted students to participate in during class. However, in one of our cogens, students suggested that they would like to be more involved. They believed that it would be more interesting and that more students would participate and learn, if they were allowed to make decisions regarding how the mathematics class was taught. This statement was a revelation to me. I was hindered by my pre-judgments and past experiences and had assumed that the students, as evidenced by their attitudes, were disinterested in their learning. As I became increasingly aware of the students' desire to make a difference, I embraced their suggestions enthusiastically. Agency and structures are dialectically related, so students' agency afforded the creation of improved structures as more resources became available through their active participation in classroom decision making.

Videotaping

Videotaping played a pivotal role in capturing and preserving classroom activities in the context in, which they occurred, especially in the non-verbal aspects of students' interactions. This allowed these critical factors to be re-examined and analyzed in the context of the research. Videotaping allowed me to capture multiple aspects of students' interactions, learning, and social life in the classroom. I was able to examine the videotaped data in detail to discover the true nature of students' learning experiences.

Since videotaping plays a very critical role in this research, I have devoted a

considerable amount of space in this section to its examination. My regular mathematics classes and cogens were videotaped on a weekly basis. From the beginning I sought permission from both students and their guardians to make video recordings of students' classroom interactions. Video recording soon become a standard part of my teaching practice, as it became a tool for the class to examine and reflect on what was happening in the classes as we identified and discussed patterns of thin coherence and contradictions.

Abbas (1997) extols the importance of this data source:

Through replaying a videotape, the researcher can analyze not only the actions that occur frequently, but can also re-observe and re-analyze actions. Such tapes are available to review as many times as necessary without losing discourse and actions that occurred in the classroom (p. 39).

Discussion of a lesson immediately after it occurred was not always possible due to scheduling of students' and teachers' classes. During cogens, tapes were played and replayed to provide insights into the classroom interactions and transactions. This was done in order to obtain students' perspectives on important issues related to the teaching and learning process or on anything else that they considered relevant to their mathematics achievement. In many instances students' explanations of an event differed greatly from my initial interpretations of the video data. The students' perspectives provided a deeper insight into interactions and the underpinning reasons behind these interactions that were not readily apparent to me.

Using Vignettes To Explore What's Happening

Vignettes of no more than three minutes of real-time action were selected and

prepared for analysis and discussion. I watched the tapes with my students? and sections that were of importance to the class were chosen for more in-depth analysis. Analysis at the classroom level typically took the form of discussions. We examined what individuals and groups were doing and asked why the actions we observed were either helping or hindering learning in the classroom.

In examining the videotapes, we were interested in identifying patterns of thin coherence in students' interactions, that is, what common features were observed in multiple groups. We were keen to observe any contradictions that were associated with these actions. We asked what some students were doing differently and what they were doing that was the same. These structures are of great significance to this critical ethnographic research as they epitomize the underlying concepts of my sociocultural theoretical framework. As I studied the teaching and learning activities that participants experienced, it was important for students to describe and explain from their perspectives what was happening in any selected vignette and why it happened. This polysemic and polyphonic approach rendered the research more authentic, and students felt valued knowing that their voices were playing an important role in the teaching and learning process.

I chose this approach because I wanted to:

- a) be able to compare the teaching and learning experiences of students before and after cogen and coteaching over time in order to map a trajectory of their improvements,
- b) become more aware of the conscious and unconscious structures shaping the classroom practices and discourse,

- c) find out what motivated and interested my students as I enacted the curriculum and tried to maintain the required standard without denying any student the opportunity to succeed and feel entrenched in the class, and
- d) have the ability to track individual students, not just physically, but intellectually and socially within the classroom field to make accurate and reliable qualitative analysis, interpretation, evaluation, and informed decisions based on the observed patterns and contradictions over time.

In reviewing classroom videotapes of students teaching and learning, many salient patterns of coherence and contradictions, which were both positive and negative verbal and non-verbal constructions, emerged. Some frequently observed patterns included: individuals and groups consistently on-task; students nodding their heads together in agreement or shaking their heads in disagreement; students turning their heads in the same direction towards a speaker or looking away; students bursting out in laughter at the same time or refusing to laugh; students objecting to an answer together or agreeing; individual students choosing to work with particular partners consistently or choosing to work with different partners; groups of students sitting in the same location all the time or individuals constantly changing seats; other students habitually talking or getting out of their assigned seats; certain students always responding to questions asked while others remained silent.

Using Videotape To Track Individual Progress

Using Cece as an example, I observed on several video recordings that, she was not doing any classwork for the first fifteen to twenty minutes of each class. Instead she was talking with her friends, checking her emails or texting on her cell phone, or attending to

her beauty needs. As a result, Cece was not getting her work done and was failing the class. Through videotaping and analysis this pattern was observed, and she was invited to view the evidence and to respond in a one-on-one cogen with me.

She obtained permission from her father to stay after school one afternoon so that we could watch the video clips and discuss the situation. We watched the beginning of each class as captured on the video recordings one by one. While acknowledging that she was not doing any work for the first fifteen minutes of class time, she expressed that she was not consciously trying to waste time but was merely going through a class routine that she had developed since middle school after she gave up trying to learn mathematics because of negative experiences she had with a few mathematics teachers. We watched several video clips, and, as we went along, she would stop the tape to explain what she was doing or what activities she was engaged in. She also provided background information as to why she was doing what she was doing. Most importantly, she confessed that the main reason for her off-task activities was that she had limited basic foundational mathematical knowledge and she was not able to understand the level of mathematics being taught.

The two of us cogenerated solutions and implemented them in the next class. She was reassigned to a new group where she would be helped by one of the better mathematics students in the class. Videotaping of lessons continued, and Cece was observed to be starting her work on time. Her progress did not go unnoticed by her peers. We discussed her changed identity several time in cogens, noting that she occasionally lost focus but would quickly regain control of herself and get on-task.

After Bebe and Cece got involved as coteachers together, the patterns observed on the

videotapes showed that, in addition to starting her classwork on time, Cece was not using her cell phone in class and was mostly talking about mathematics. Occasionally Cece told funny jokes, which lasted for a short time and, which did not disrupt the learning process. Consequently, the new patterns of Cece's conduct and work ethic that emerged indicated that she had become a productive and successful member of the class. She began passing most of her quizzes and completing her classwork on time. Unfortunately, I also noticed that there were some students who were still trying to influence Cece to become engaged in disruptive conduct, while they continued to fall short of becoming successful.

More Detailed Discussion Of Video Analysis

Following the rules and goals of cogens, solutions to problems were cogenerated, and these were subsequently implemented in the classroom. More detailed examination and analysis of vignettes were conducted with the help of other graduate and postgraduate students as well as that of expert faculty researchers at the CUNY Graduate Center. Video analysis entailed discourse and conversation analysis including examination of verbal and non-verbal means of communication and interpretation of phenomena such as patterns of coherence and contradictions. The main objective was to ascertain whether or not the findings at the classroom (meso-level) were supported by evidence at the micro level of analysis. This was critical for supporting or validating claims or for discovering contradictions.

The overall objective was to use video analysis to aid in the identification of negative structures mediating students' agency and success in the classroom, as well as to discover the positive structures that were facilitating improved learning. In my research, I sought to find evidence of both unsuccessful and successful habits that could help me understand

how best to assist students to improve their chances of success.

Video analysis revealed that even though Cece didn't bring a lot of mathematics content knowledge to the classroom, she brought a lot of social capital. She was fun to be around and loved to help people. She was patient, which made her a good peer tutor even before she was able to improve her content knowledge. She also used her everyday experiences to illustrate and break things down for other students. In and through the use of familiar language, she was able to convey mathematical concepts and learning to the other students in a way that made sense to them.

Using Videotape To Investigate Students' Emotions And Solidarity

In observing Cece in the videotapes working in her group and with others, I readily observed her making connections and interacting in a leadership role. She had a way of bringing life to a group, which was evidenced by regular synchronous laughter followed by head-nods, smiles, verbal discourse, and established solidarity. Observation showed times of discord, which manifested as contradiction. In these cases, for example, a student in disagreement might not have shaken her head or might have said outright that she did not agree using marked differences in the pitch, frequency, and amplitude of her voice. The ability to corroborate and find evidence at both the micro- and the meso-levels in support of certain claims made by the research cannot be over-emphasized. For example, in teaching and in my research, interpretation of students' emotions is important in understanding and making sense of classroom interactions, practices, and structures. Video analysis allows a researcher to identify, and categorize different emotions and their impact on classroom discourse when co-constructing an improved learning environment for both students and teacher.

Cogenerative Dialogue: New Way Of Mediating Teaching And Learning

Cogens are part of a theoretical framework that provides students with opportunities to make their voices heard. Most of the students characterized themselves as disadvantaged because they experienced school from a deficit perspective where teachers do not value their voices. Generally, these students were not allowed to incorporate their life experiences into classroom learning activities. In his dissertation, Emdin (2007) articulated a similar view when he wrote “in my research, where many participants have been disadvantaged socially and economically by structures within and outside of schools, the goal of completing the research comes with responsibility to create opportunities that amplify student voices” (pp. 46-47). Likewise, Bayne (2007) stated in her dissertation that, “This research addresses how urban students who have been alienated by science, embrace opportunities to share and develop forms of new culture” (p. 17). Consistent with the views expressed by Emdin and Bayne, I gave serious attention to the inclusion of students’ voices in the design of classroom instruction so as not to deny them the opportunity to use the capital, which they brought to the classroom in productive ways. As a direct consequence of this, most students were motivated and participated more in learning activities. Those who were reluctant to participate had a chance to express themselves in cogens, and they were encouraged and supported to move beyond their frustration and to become involved in what was happening during classroom activities.

Cogenerative Dialogue: What Is It? Why Is It So Important?

Kenneth Tobin (2005) described cogen as a conversation participants have about a shared experience. Cogens afford structures that allow students and teacher to discuss

what is working and what is not working in relation to teaching and learning in the classroom. More importantly, they also provide solutions to the problems that are partly cogenerated by the students themselves. In my mathematics classroom cogens were student-student and student-teacher discourses. These dialogues had the goal of aiding students and me to design a successful learning environment. Cogen creates a social space to talk across ethnic, cultural, social, and educational differences and to build solidarity for the good of the collective. Cogens have been used successfully in New York City's urban public schools, especially in science classrooms (Bayne, 2009). It has also been used in a few instances in special education. Only recently have cogens been applied and studied in mathematics classes in urban schools.

Cogenerative Dialogue: Reducing Power Differential And Giving Students A Voice

I began to conduct cogens in my mathematics classroom in response to students' need for a safe space where they could talk about the many issues that were preventing them from learning mathematics at their full potential. According to Martin (2004), cogens provide a neutral field in, which participants examine the conscious and unconscious parts of structure such as schema and practices that afford agency in the field of the school or of the classroom (p. 43). Specifically, I explored the concepts described by Martin as they are experienced in the mathematics classroom. I paid particular attention to the dialectical relationship of agency and structure. Using the analytical work of Boykin (1986) as a basis, I explored the relationships between African-American students' cultural practices, classroom structures, and the learning of mathematics in urban schools and discussed these ideas with students in cogens.

Although multiple resources of data such as field notes, videotapes, classroom artifacts, and students' journals provided a wealth of information, cogens served as one of the most useful resources. In the field of cogens, the structures allowed students to explain, support, clarify, and interrogate findings and issues that were either consciously or unconsciously helping or harming their own and others' learning of mathematics.

I never learned much in math classes before because I had lots of problems, but teachers didn't want to hear about that. In cogen group, everyone listens and helps me figure out how to deal with my issues. It makes us understand each other more, and I get a chance to learn some math for a change. When we discuss, I even receive comic relief for my math fears. Now I'm good. I even tell my dad about it.

(Student Journal- 12/7/07)

Cogenerative Dialogue: Students Sharing Responsibility

We agreed to accept shared responsibility and to have ongoing discussions about our teaching and learning experiences for the benefit and success of every member of the class. This was very important as it afforded all participants the opportunity to share their perspectives on the reasons for certain actions as events occurred. This helped in our interpretation of events and to a great extent was the guiding force behind the design experiment approach that I had adopted for this research. Furthermore, I observed the effects cogens had on students' interactions in the classroom and how students' interactions shaped the cogens in turn.

As the study progressed, we assessed whether or not our goal of creating an improved learning environment for all students was being met by examining such criteria as:

increased student participation in classroom activities, more meaningful and mathematics-related discussions, more student-student interactions and collaborations on problem solving, and more students taking agency for improving discipline. We evaluated whether or not students were prepared for class, and whether or not they were helping others to succeed. While we did not meet all of our goals, successful outcomes helped to produce student role models and coteachers, some of whom developed leadership qualities, while others became more caring and helpful toward their peers. Unfortunately, there were a few students who continued to achieve at a level below their potential because they failed to make a conscious effort to work.

Coteaching As A Research Approach

It is important to understand the ways in, which students and teachers think about teaching and learning together to discover how they consciously or unconsciously appropriate classroom structures to aid or disrupt the teaching and learning process. It is imperative to learn why teachers tend to privilege certain ways of knowing and learning. In this study I employed coteaching as both a research and a teaching method because my sociocultural theoretical framework was focused on participants' interactions in social spaces such as the classroom. This enabled me to examine and interpret what was happening in the classroom through Kenneth Tobin's perspectives on culture, agency | structure and agency | passivity dialectical relationships (Tobin, 2006). By these means I was able to access, examine, understand, and evaluate the mathematics achievement of my students more successfully.

Coteaching with students began with a conversation that is different from the normal student-teacher dialogue. I posed questions, which probed their knowledge of the topic,

which was to be cotaught. I also asked questions that sought to identify the sorts of resources students would bring to this activity. We discussed and described our ideas as a participatory process, one in, which I deliberately allowed students to take control over the design and presentation of the lesson. I found myself very interested in the way students planned to incorporate non-traditional mathematics material as resources to be used for hands-on activities. Students brought a lot of original ideas from their real-world experiences to the discussion. It was also noteworthy to observe collaboration across differences in the abilities of students as learners and coteachers as students co-planned to enact a new teaching and learning culture in the classroom.

Tobin and Roth maintain that theoretically, “Coteaching and cogens both are forms of praxis that set up and expose participants to learn and understand in and through the sharing of being in the classroom” (Tobin & Roth, 2006, p. 4). Coteaching was a big motivation for students, and student coteachers helped me to understand better how to teach students like them.

Students As Coteachers

Central to my teaching and to this study is my belief that students are valuable, underutilized resources who, when given a chance to demonstrate their abilities, can positively affect each others’ learning in profound ways. As a result of cogens students agreed to coteach with me and with each other those topics, which participants felt that they could present to their peers in ways that would encourage more students to engage and learn.

Since students already knew what was happening in the class and why it was happening in much more detail than I, they used their privileged new position as

coteachers to structure the class so that their coteaching efforts would connect with their peers and have successful outcomes. This process provided me with insights into students' preferred learning styles. As I observed students coteaching, I was able to identify changes in language use, increased student involvement in classroom activities, greater participation in discussion, and stronger support for those not normally on-task. Overall, it was a much more productive learning environment than my teacher-centered class had been.

I used videotape to capture all student coteaching activities. This will be further analyzed in Chapter 4, to identify any changes in the learning patterns of students as well as inconsistencies or contradictions when this approach is compared to prior teaching methods. My analysis will focus on selected individuals such as Cece, who had social and symbolic capital. I will also select vignettes that will help make sense of any patterns or contradictions observed. These will be qualitatively analyzed at both the micro- and meso-levels by using examples and rich descriptions as evidence to support claims or to understand contradictions better, so that I can make meaningful decisions to support and improve students' learning in the future.

Chapter 4

Developing Tools To Impact Teaching And Learning Practices: Student Voice, Lived Experience, And Pedagogical Shift

This chapter presents, examines, and interprets the achievement of minority students through the sociocultural theoretical frameworks of cogen and coteaching using students' life experiences to improve mathematics teaching and learning practices. An ethnomethodological standpoint provides the lens through which I examine and explore ways of connecting mathematics to students' everyday lives. Through a hybridized and multilayered approach using cogen within the classroom, critical discourse becomes an important structure, which affords students' agency and opportunities to interact, co-construct, and enact new cultures to improve classroom practices. The result is a transformation of the students' individual and collective identities, capital production, and the development of new approaches to the teaching and learning that aligns and takes advantage of their cultural differences to produce higher levels of success.

In this chapter I present information from a hermeneutic phenomenological standpoint. I am a minority male teacher who grew up in a poor, rural part of Jamaica. Although this was not an urban environment, it had much in common with the sociocultural and economic conditions in the homes of the minority students I teach. In many respects, my background positions me as an insider and a participant in the culture and everyday experiences of my students. My insider status has afforded me a position from which to describe and discuss the teaching and learning of mathematics in New York City's urban high schools. While there is much sameness in race, culture, and economic status between most of my students and me, there are also fundamental

differences in perceptions, attitudes, age, and expectations across gender and within-group diversity. Shared cultural resources made it easier for me to teach this population of students and to enact new cultural practices that I believe will afford students agency to transform their own mathematical success.

This chapter focuses on the mathematical experiences of two of my students, Bebe and Cece, who are typical urban, non-dominant students in my high school mathematics class. The term non-dominant is used here to denote minorities who typically lack power in relation to other dominant or mainstream groups. Bebe is a fifteen-year-old girl of South-Asian/Indian descent from Guyana, and Cece is a sixteen-year-old, second-generation (here I used the term second generation to mean the first generation of her family born here) Caribbean-American girl. These two students represent some of the complexity of ethnicity and culture that is present in the minority student populations of typical New York City high schools. They would perhaps typically be lumped together under one umbrella of race, being described as either Black or African-American. However, their worlds outside of school as well as the cultural and national origins of their families most likely have a profound impact on their relationship to the culture in, which they now coexist. These factors also doubtless influence their approaches to their own education. This necessitates specifying their ethnic classifications more precisely than merely African-American (Waters, 1999).

These two students were chosen because they are both from poor families and, while they have similar educational ambitions, they approached those goals from completely different standpoints. Thus, they represent two basic groups of students in my mathematics class. Bebe takes a very serious approach to her schoolwork. When asked

about her work ethic, she replied, “My parents are very strict, I have no other choice but to do well in school.” However, she also stated that they are very supportive and help her with her homework.

Cece, on the other hand, lives with her father and stepmother. She remarked that she and her stepmother do not get along very well. Neither of her parents can help her with mathematics, as they lack mathematical knowledge and skills beyond the elementary school level. Cece failed mathematics in most of her middle school classes and was struggling in her high school mathematics classes. Cece noted that even though she and Bebe were at different levels in their mathematical development, they shared commonality in their everyday experiences since they belonged to the same community. Both students were poor and vulnerable to the same forms of peer pressure. Both students shared similarities. They liked to talk, to help others, and were immersed in the present youth culture all of, which, from what I observed, is characteristic of most of the minority students in my classes.

In selecting a methodological framework to examine, explore, and understand accurately learning experiences of disadvantaged minority urban youths, I found cogen, coteaching, and ethnomethodology ideally suited to the task. During my twenty years of teaching minority students in various urban settings, I had tried many different teaching strategies, but none have produced the desired successful learning outcomes. It was not until 2006, when I first learned about cogen and coteaching as research methodologies and teaching strategies, that I found a way to understand better the teaching and learning experiences of minority students. As a teacher-researcher in my own classroom and a member of a research team using these strategies to study the teaching and learning

practices in urban schools in New York and other cities, I have had access to data that informs my understanding of minority students' learning experiences.

The Power Of Cogenerative Dialogue

There are several ways in, which I related to and identified with the experiences of the two girls described above. Like Bebe, I migrated to the United States from another country and like both girls my cultural and national identity is connected with the Caribbean. I also came from a very poor family and, although my mother did not understand the mathematics that I was doing in school, she would sit with me as I did my homework and took great interest in seeing that I did it neatly and well. Through her actions she instilled in me a very strong appreciation for education and an equally strong ambition to make something of my life by focusing on my schoolwork. Her support turned out to be critical in my life since many children in the rural Jamaican community where I grew up did not have the opportunity to go to school.

Although Bebe, Cece, and I may not come from the same places or listen to the same music, my youthful (and continuing) identification with the music of Bob Marley has helped me to recognize and appreciate the importance of music to my students. This is especially true for those who, like me, are from the African diaspora (Hall, 1990). This is a very powerful lens through, which I feel I can gain a better understanding of their lives and connect with them in the classroom. I always hoped to draw upon these common threads in creating a more inclusive learning environment while nurturing mutual respect for all the things that make us different. Cogens provide a structure in, which this can occur, building cultural, social, and symbolic capital between participants, while informing both the research that they are a part of and the teaching environment around,

which they are created.

Research has provided evidence that coteaching and cogens are forms of cultural enactment that have produced remarkable improvement in minority students' learning (Tobin & Roth, 2006). Once, Cece boldly refused to copy two-thirds of a 14-foot long chalkboard of notes that I had come in early and painstakingly put up very neatly in a logically organized manner. Instead, she turned on her cell phone and started sending text messages. She was not unique in her avoidance of the assignment. As I waited for the students to copy the material, more than half of them were talking about other things or were otherwise occupied. This made it obvious that I had not connected with my students. Cece asked me, "Mr. J., do you really expect us to copy down all that stuff you put on the board? I'm sorry I can't do that! Can I go to the bathroom?" "Yes, you can," I replied. Most of the students were moving at a snail's pace, and even the normally compliant students joined in solidarity with their peers to protest. I realized that I was enacting a practice that I had engaged in many times before when I thought that students' background knowledge was weak. Invariably, I felt that I should try to deposit as much knowledge as I could in them so that they would be able to understand the topic being taught and have their notes for future reference.

I have employed cogen and coteaching as tools of my everyday pedagogical practices for the past two years. In an ethnographic study of my own mathematics classes as a teacher-researcher conducted during that same period, one of the central themes that emerged as affecting minority students' learning of mathematics was that students' perspectives and attitudes changed during the course of the research. At the onset of the study, students did not place much value on learning any mathematics that went beyond

the very basic arithmetic required for business transactions in everyday life, such as counting their money. Few students believed that they would make it to college, and those who thought they would did not believe that they would take courses that required much mathematical knowledge. After introducing cogen and coteaching as part of my research and teaching praxis, the culture in the classroom and these same students' attitudes about mathematics were transformed.

Valuing Student Voice In The Mathematics Classroom

According to Lattimore (2005), "Listening to African-American and minority students' voices is essential in identifying those vital teaching and learning environments that contribute to these students succeeding in mathematics"(p.268). Lattimore stated that students' voices can provide insight into teaching strategies that motivate them to learn mathematics. They can also add to the repertoire of methodologies that are pertinent to improving the mathematics education of African-American and other minority students (Lattimore, 2005). The metaphor of voice, according to Secada (1995), refers to "the discourse that is created when people define their own issues in their own words, from their own perspective, using their own terms, and in a word, speak for themselves" (p. 156). Later in this chapter Bebe and Cece will speak for themselves, on behalf of their classmates, as representatives of a growing population of urban minority students who are afforded the opportunity to contribute to their teaching and learning experiences.

Research in mathematics education indicates that collaboration and peer support play a critical role in supporting students' mathematical understandings. According to Walker, when describing ethnic differences in achievement in mathematics, researchers suggest that one reason for continued performance gaps in mathematics favoring Asian American

students (on average) is the focus on collaboration within many groups in the Asian American community and particularly the fact that students frequently work in groups on academic tasks outside of schools (Walker, 2006, p. 44).

Although the cultural influences on Asian students' learning might differ from those of other minority groups, patterns related to the potential benefits of group learning strategies are likely to hold true for all students. In mathematics, collaboration among students is particularly useful. Learning to communicate mathematical ideas; gaining insight from peers while completing problem-solving activities; and discussing mathematical reasoning, proof, and justification are all important components of developing quantitative ability (National Council of Teachers of Mathematics [NCTM], 2000).

In this study the traditional pattern of urban mathematics classroom discourse is disrupted. Instead of the traditional approach, students were allowed to enact their own form of socio-mathematical learning in conjunction with the theoretical framework of coteaching and cogens going beyond mere preparation for State Examinations. In considering the voices of all students, attention was given to details including physical space, arrangement of furniture, language usage, study materials, types of presentation, curriculum, assessment, and artifacts that may be of importance to even a single student's success.

This attention to the needs of all students, listening to and valuing what each has to contribute, supported the building of solidarity and the production of a new successful mathematics culture among minority students. This does not mean that this teacher-researcher has found the answers to all of the problems. I still struggle to find ways to

deal with students who fail to get their homework assignments done or students who are having a bad day and refuse to work. However, coteaching and cogens have helped to focus most students' attention on classroom activities that serve to construct successful mathematical learning. Students began to show evidence of deeper conceptual understanding and improved logical thinking and reasoning skills, and some learned to apply the mathematical techniques, which they had learned to problem solving in other subject areas such as social studies and science. This means that most students were connecting mathematics to real-life events in ways that made sense and served useful purposes.

Understanding Minority Students' Ethnomethodological Perspectives

Some students have a very disquieting sense of their mathematical abilities that is evident in the brittleness of their understanding and problem solving skills. On the first day of my 9th grade algebra class, Cece came to my desk at the end of the class and introduced herself. She had a big wonderful smile but a very small school bag, almost like a lady's pocketbook. She was well dressed in blue jeans and jacket; designer's sneakers; a fine-braided hairstyle; and lots of jewelry around her neck, on her arms, and in her ears. She asked boldly, "Do you give math homework, Mr. J., and is high school math very difficult?" I told her that I did give homework but not too much and that high school math required a lot of work. She looked up at the ceiling, gave a loud laugh, and then said, "Math is not my favorite subject; you mustn't make it too hard." I asked her, "How was today's class?" To, which she replied, "I didn't get a thing!" Before I could say anything else to her, she said, "See you tomorrow!" and left the room in a hurry. In reflecting on this event, I realized that Cece was trying to tell me how unprepared she

was for high school math. Perhaps, even more importantly, she was reaching out to me from the very first day to let me know that I would have to find a way to understand, connect with, and help students who, like her, did not have the prerequisites for high school mathematics.

In order to address the learning needs of minority students adequately, teachers must become aware of a multiplicity of ways to structure the learning fields. They also need knowledge of the required practices that are essential, from a cultural perspective, to support students' learning and their understanding of the value of mathematics in their present life and future careers. Opportunities must be created to help these students learn mathematics and see themselves as capable of becoming teachers, engineers, doctors, and accountants instead of aspiring to be security guards, waitresses, hairdressers, supermarket cashiers, and carwash attendants.

In subsequent conversations with Cece, I inquired about the reasons for her not doing well in mathematics. Among the reasons she gave for her past failures were peer pressure, having a boyfriend, lack of parental support or supervision, low expectations from herself and teachers, and spending too much time on her cell phone or the internet. She also described how her middle-school classrooms were out-of-control and explained that most of the teachers did not seem to care enough or know how to deal with out-of-control students. She said that most days they did absolutely no classwork or homework, they just sat and talked to each other doing whatever they felt like doing. Cece's account of what went on in her middle school mathematics classrooms was confirmed by other students as common practice in some middle schools. This lack of achievement in middle school has produced many mathematically illiterate 9th graders. Based on this evidence, it

seems that there is a need for more teachers to find ways to structure the learning environment so that improved learning opportunities are created for the diversity of learners whom they instruct. Also, exploring ways to understand and connect with students' culture and everyday real-world experiences would better equip more teachers to succeed in educating minority students.

Connecting With Students' Culture

Ethnomethodology is the study of the ways in, which people make sense of their everyday lives and social worlds (Garfinkel, 1967). Students need to know that learning mathematics can affect their everyday lives in positive ways. It is therefore important for teachers of minority students to be able to contextualize the subject so that it has meaning for them. I asked Bebe and Cece if the learning of mathematics did or would play an important role in their present lives and future careers. Both said maybe. Bebe explained that mathematics was helping her do well in living environments and social studies, especially in understanding how to read graphs. Cece on the other hand, commented that she was doing badly in the sections of both courses that have a lot of mathematics but that she was doing reasonably well in the other areas. Bebe interrupted Cece at this point. She said that mathematics once helped her win a \$50 prize at an amusement park and that knowing mathematics had its uses. She also told a story about how she used her math skills in ratio and proportion to help her mother figure out the amount of ingredients needed to make three-times the number of Christmas cakes from a recipe. Cece was impressed and remarked that Bebe was so smart but that she (Cece) never got involved in such challenges as she would only embarrass herself. She said that she was not happy about that and felt a sense of shame, especially in the presence of kids who were in lower

grades than she. She blamed her dysfunction and lack of mathematical skills on the public school system, which, she said, did not provide good teachers in the under-resourced neighborhood schools. She was very angry about this and wished she had had teachers who disciplined their overcrowded classes and afforded her the opportunity to learn and succeed in school. Her greatest fear was that she might not graduate from high school in four years with her friends because she was so far behind in understanding in every subject.

Teaching and learning, when viewed from a cultural perspective, require close attention to the established learning patterns, students' perceptions, and the developed knowledge structures (Shaw, 1993). A large part of New York City's urban high school population consists of immigrant West Indians, Hispanics, and minority students born to Caribbean parents. These students have been raised in a culture different from the majority of their teachers, who are White, middle-class, and not familiar with the minority cultures that have produced students whose attitudes and learning styles are completely different from that taught in most teacher preparation programs. The major problem faced by minority students is how to adjust their learning styles in order to learn effectively from the Eurocentric perspectives of their predominantly White teachers. An equally difficult task is for teachers to find effective ways to teach these students.

Cece's recollection of her 7th grade mathematics experience provides insights into Shaw's (1993) claim that teaching strategies should align with and incorporate students' preferred learning styles. She vividly recalled that her mathematics teacher was no more than four feet tall and weighed about ninety pounds. Her speech was more Chinese than English, and she was barely audible beyond the third row of desks. Students were asked

to copy pages of notes from the chalkboard, something, which they never did. Despite this lack of response, this teacher persisted in the same way day after day. Students got bored easily, and every class seemed to produce more frustration for them. According to Cece, her instructor cared about her students learning mathematics; however, she expected students to sit quietly, copy lots of work from the board, do lots of classwork, and prepare a few pages of homework. She often became confrontational with students, and Cece found herself in trouble several times for yelling and refusing to do work. Cece got so many detentions that, after a while, it didn't matter to her anymore. Cece said that she tried telling her teacher that Black students are different from Chinese students. She explained that Black students prefer to work with their friends and that, if she stopped putting so much work on the board for students to copy, students would like her class more and do the work. Cece said that her instructor refused to listen to the students' suggestions and acted mean at all times. As a result, some students, including Cece, constantly threw paper-balls around, sang, shouted at each other, and would do all sorts of mischievous acts to disrupt the class. She noted that students in the class were not learning anything, did not care anymore, and saw the class as just a place to hang out, accepting the fact that they were not going to pass mathematics.

For Cece the 7th grade was the one that destroyed her mathematically, because one teacher did not understand her culture and refused to change her practices to meet the learning needs of her students. From Cece's account of what happened in her 7th grade mathematics class, it is clear that there were many things that went wrong. However, the teacher was not the only person who bore blame for this. Cece and her classmates were equally responsible for not taking the initiative to ensure that classroom discipline was

satisfactory and that everyone was on-task during the learning period. Even though peer pressure may have been great, Cece could have decided to act differently in class by copying the notes from the chalkboard and going to the teacher or to someone else for help in order to ensure her personal success. Students must also be taught that their education is as much or even more their own responsibility as it is their teacher's.

Bebe's And Cece's Voices

After learning about Cece's 7th grade mathematical experience and discussing it with the rest of the class, I became interested in finding out how both Bebe and Cece felt about the mathematical knowledge of students in the class and what they thought should be done to improve it. I posed the following questions and asked both students to provide a written response, either individually or as a team: How do you think students' mathematical knowledge can be improved? What should government, schools, parents, and teachers do? What should students do?

The following is an edited transcription of the written responses submitted by both students:

How Do You Think Students' Mathematical Knowledge Can Be Improved?

Students' mathematical knowledge can be improved by applying mathematics to the real world. When students are exposed to mathematics at the beginning, they apply it to the real world by counting or adding up a different number of items. By being able to do this, the students understand the material better because they are exposed to it everyday. Mathematical reasoning can be applied to help solve everyday problems, as well. For example, if someone wanted to get somewhere in a certain amount of time, they would be able to calculate it mentally and decide, which sort of transportation they should take.

Students should also understand that they can improve if they practice and challenge themselves. When students practice, they stimulate the brain to think logically and figure out the answers to different problems. It helps them have different approaches to different situations in life because they are able to think about things in a more mathematical way. Overall, students should try to apply the math they learn to the world around them, this way it benefits their overall knowledge.

What Should Government, Schools, And Math Teachers Do? What Should Students Do?

Math can be found in many different aspects of one's life. From numbers, digits, and cubes to concepts like infinity. Different people enjoy different things, just like different people enjoy different types of math. However, to become successful in thinking mathematically you need to have a good foundation and know the basics. You can't add numbers, if you don't understand how to count, and you can't interpret graphs if you don't know what a graph includes. Math is a development of concepts that takes time to learn. Students and teachers should take this into consideration when they are teaching a new concept because if they don't understand one thing, they won't understand another.

Math is also connected to other subjects like learning languages. Language is a way to communicate with one another and allows us to express our ideas in different ways. But when you think about it, math is like a universal language, it lets us communicate by solving similar problems. Once you know the basics, you could possibly end up anywhere later on. Teachers and students should always keep this concept in mind because it allows them to see math as a medium to communicate with the world, or maybe even other worlds.

Finding a common ground and ways of bridging gaps in learning and culture are not easy in urban schools that are severely lacking in resources. African-American and other minority students are academically disadvantaged as a result of teachers' ineptness in relation to diverse cultures, improper attitudes, and differential behaviors (Nieto, 1992). The schooling of minority students can improve if teacher education programs excel in preparing teachers and administrators who have greater knowledge of minority students' cultures and a deeper understanding of the impact that their life experiences have on their behavior, learning styles, and preferred teaching styles (Ford, Obiakor, & Patton, 1995). Too often teachers receive complaints from minority students that their teachers are very biased, unfair, and simply do not understand them. This is something that needs to change.

After a few weeks with my class, during which the students had a couple of quizzes and several individual and whole-class discussions, I gathered enough evidence to conclude that more than 80% of my students were severely lacking in the required skills and knowledge to succeed in 9th grade Algebra. As a result, students were not participating in class discussions, and they did not do class work to any respectable level. On many occasions they did not attempt homework and students' morale was low while their frustration was increasing. I realized that I needed to do something quickly to save my class from going under. I decided to capitalize on my sameness as a minority with my students and to approach teaching from a cultural perspective, much in concert with Margaret Shaw's beliefs about how African-American and other minority students should be taught (Shaw, 1993). The only problem I had was how to structure the learning environment as quickly as possible to afford all students the opportunity to transform

their learning.

I could think of no other teaching methodologies that could accomplish this more effectively than cogens and coteaching. According to Freire, “The teacher cannot think for her students, nor can she impose her thought on them. Authentic thinking, thinking that is concerned about reality, does not take place in ivory tower isolation, but only in communication” (Freire, 1970, p. 58). In cogens and coteaching, students get the chance to co-construct and design new pedagogical strategies that connect with others’ life-worlds and learning needs.

Gaining Authentic Classroom Knowledge

To begin the process of gaining authentic knowledge and a deeper understanding of the different perspectives affecting learning in urban mathematics classrooms, one can simply ask what the students want for themselves and what the teachers want for the students from these mathematics lessons. All participants should then provide answers, followed by a detailed analysis and discussion of the information presented. The objective for both teachers and students is to know what’s important to the other, based on how they experienced and contributed to the lesson. Tobin and Roth state that, “The very essence of knowing and learning only reveals itself when persons are acting in praxis as it is only here that their participative thinking deals with the once-occurrent nature of every act” (2006, p. vii). Learning from others can be greatly enhanced if participants discuss an event immediately following its occurrence.

Bebe demonstrated great interest in her work and exhibited a strong desire to help her classmates. Given this, she made great efforts each day to understand the content and then to become a peer tutor and an instructor to the whole class. She noticeably

commanded the respect of her peers, and developed confidence using the chalkboard to explain and share her group's work on a daily basis. Based on her accomplishments, she was unanimously elected by her classmates to be the first coteacher with me, and later to coteach with Cece.

One example that illuminates the importance of acting in praxis occurred during student coteaching. Bebe was presenting her lesson on how to find the slope of a straight line joining two points. She was interchanging the use of the words slope, incline, and rise-over-run. It became obvious that some students were becoming confused. They were not following her presentation. Others became distracted, and she was quickly losing control of the class. Sensing what was happening, her coteacher Cece announced that it was time for group practice. To address the situation in praxis, I called time-out for a whole-class cogen. Charles, one of the students sitting at the back of the class, was first to speak. The following is a transcript from a portion of the interaction that took place:

Charles: I am confused because Bebe used too many different words that I don't know the meaning of.

Bebe: Like what?

Charles: Like incline!

Charles: Why do you use all those words, instead of just slope?

Bebe: Because they mean the same thing.

Charles: But that only confuse people. In my country [Haiti] the teacher uses just one word. Not three and four and five different words for the same thing. One word makes it more easy to remember. Too many words for the same thing only confuse the math.

Bebe: Sorry Charles! I do it because I feel like it would help you guys. Some people might know one word, and not another. That is why I use them.

Charles: It is not working for me!

Teacher: Time out! I understand what you are saying, Charles. But I also see where Bebe is coming from too. Both of you have valid points. Sometimes I use different words because you may see them in different text, and you need to know that they are referring to the same thing.

Charles: That may be true, but students like me get it better if you guys only use

one simple word at a time.

Bebe: Sorry, Charles. You really have a good point. Next time I teach I will try not to confuse you.

Teacher: Charles! thanks for raising such an important point. Did anyone else have the same problem?

Some students: Yes!

Teacher: For your reflection today, write how you feel about the coteaching, and describe any problems that you had.

Students: OK! Yes Mr. J., Alright!

The above dialogue illustrates the value of acting in praxis. It affords the opportunity to deal with issues as they occur. Issues left for a later time might never be resolved, as participants may not remember all the factors that mediated against their learning when they experienced the difficulty. Bebe explained to Charles that she never intended to confuse him, but she thought that by using three synonyms students could choose the word that they like best. The majority of the class thought that Bebe's approach was good. However, Charles maintained that he did not like it, as it only created confusion for him. Bebe offered to work with Charles on a one-on-one basis in the next class to help him get a better understanding of the concept, and he accepted. The rest of the class continued to work on assigned problems in their groups, and I spent time with each group clearing up any misunderstandings or difficulties they had.

That situation also highlights differences in cultural upbringing and how these differences mediate students' ability to learn. During this discussion, other students expressed their points of view, and, while they all like and appreciated Bebe's helpfulness, they mentioned such things as her tendency to go too fast and her American accent as factors that sometimes prevented them from following along during her presentations. These criticisms were well-received by Bebe, who thanked the class for pointing them out. She promised to take corrective measures to ensure that her classmates

would benefit more from her coteaching efforts. The impromptu cogen ended after six minutes, and everyone went back to work. The immediate action taken to address a problem faced by individuals and the collective validation for students that their learning was of utmost importance resolved the issue immediately. Students were very grateful for this prompt intervention, and it would have been difficult not to notice the display of solidarity and collaboration that ensued.

Every action of a student or group of students in the learning environment either enhances or hinders learning for the individual as well as for the collective. It is therefore advantageous for all participants that value-laden relationships be co-constructed to give a distinct shape and pattern to choices and creation of knowledge. Issues should be discussed as they occur in praxis before individuals forget the context and circumstance in, which the action took place.

The Genesis Of Coteaching In My Pedagogy

Armed with the knowledge of what needed to be done and the methodologies that I believed could accomplish it, I moved swiftly to conduct a trial experiment with Bebe and Cece. Bebe was passing all her quizzes and had a positive attitude towards her work. Cece had not passed any of her quizzes and seemed to be on the verge of giving up. I conducted cogens with both students and began an experiment in, which Cece was assigned to sit in Bebe's group and Bebe was assigned to tutor her. I gave instructions that they were to plan and coteach lessons together. Cece was to take an active part in the planning, preparation, and class presentation. The thinking behind this was that by pairing up a strong and a weak student and requiring that they construct, plan, prepare, and present, self-esteem and self-worth of the weaker student (Cece) would increase. At

the same time, this in-depth involvement and increased responsibility would help her own learning, as she prepared for her new role with the support of a well-disciplined, higher-achieving peer. They were also to have cogens between themselves to discuss how each lesson went and to construct ways of addressing any concerns expressed by the class or that they may have with each other.

The first attempt was very difficult for both Cece and Bebe. Even though they had practiced coteaching together, their presentation had a lot of problems. First Cece had to overcome nervousness and the tendency of her classmates to direct every question to her because of the deficit perspective they held of her mathematical abilities. However, she had her share of supporters, and Bebe was definitely covering her back. They were also unable to anticipate each others' actions and speech, so there were numerous pauses during, which neither of them spoke, expecting that the other would. On a few occasions they asked each other to speak or used gestures to signal to each other to take turns talking. Synchrony and entrainment, the ability to transition smoothly and to take appropriate turns talking, are difficult to achieve in coteaching, even among experienced teachers. When they were not pausing too long while waiting for each other, they overlapped each others' speech. This overlapping speech is a unique feature of interactions among African-Americans and other ethnic minorities that can sometimes be misinterpreted. Oftentimes, teenagers who identify as minorities tend to speak and overlap each other to show solidarity in supporting each other's points of view and to build confidence (Seiler and Elmesky, 2007). Evidence of this also has to be interpreted in the context of student discourse.

There were some content errors, hesitations, and unclear questions on the part of both

student coteachers. However, while the students were coteaching, I assisted them by helping them to reformulate questions, reinterpret concepts, and clarify critical areas that warranted immediate attention in order to ensure that the mathematics instruction and content presented to the class was of a high quality. These issues were discussed and further clarified during the after-class cogen. In fact, students' mistakes as well as good practices were all discussed in cogens, and I made every effort to highlight, praise, and affirm positive areas of students' participation. There were many outstanding accomplishments. Most importantly, the class showed tremendous respect toward Bebe and Cece. I had given them tips on how to present a lesson and, as a result, they used the chalkboard very effectively for presenting notes and demonstrating problem-solving strategies. They also did an effective job soliciting class participation during their presentation. Overall, they were well-organized. They used a wide-range of simple problems in their demonstration to develop students' understandings of the subject matter systematically and incrementally. One notable outcome, which the whole class valued was the patient manner in, which Cece would go over a problem or try to find ways of explaining something in accessible language so that a better understanding and clarification was achieved. Another student, Charles, remarked at the end of the first coteaching session, "Mr. J, you might lose your job soon." This was his way of saying that Bebe and Cece did an excellent job. The entire class applauded Bebe and Cece at the end of the lesson. It was clear from their response that they enjoyed the class and felt that they learned a lot from it.

Understanding And Using Outcomes Of Coteaching

The experiment produced successful outcomes, so much so that cogens and

coteaching were institutionalized immediately throughout the whole class. I used both cogens and coteaching as a praxis of method and as a way to dismantle the power differential that existed between teacher and students. From my research I have shown that coteaching affords the productive use of differences in students' personalities, cultures, and mathematical abilities. In the case of Cece, a very weak student who had given up on passing, I observed the transformation that coteaching brought to her learning by providing her with the space, support, and opportunity to interact more intimately with mathematics. She stated in cogens that coteaching gave her a satisfying reason to try to deepen her understanding of mathematics. She admitted that coteaching also made her feel important and that she could get attention (which she confessed that she loved) for doing something positive in school. In the past she got a lot of attention, but it was for reasons that often got her into trouble.

Other students have also benefited from her transformation. They began to see success in mathematics as obtainable. They received first-hand insights into what it meant for students to learn mathematics and how they, too, could be productive members of the class. Cece became a role model, and her excellent performance in coteaching and her improved class grades encouraged other students. Coteaching helped students to demonstrate their knowledge and have misunderstandings clarified by other supportive members of the class. It is said that teaching what one knows to others in a way that they can understand it will increase one's own understanding and improve one's own learning at the same time. All of the coteachers and peer tutors have stated that they benefited tremendously by deepening their own understanding as a result of their participation in coteaching. This structure produced new capital, in the form of improved attitudes and

more meaningful participation in classroom mathematical activities. In turn this produced more capital in the classroom through the agency| structure dialectical relationship that operated there.

Non-dominant students such as Cece were very passive during the mathematics discourses in class before participating in cogens and coteaching. Through her collaboration with Bebe as a coteacher, Cece transformed her identity through conscious and unconscious actions facilitated by the agency| passivity dialectic. This helped her to gain both practical knowledge and a different voice, both attributes that others in the class could appropriate. Bebe accomplished something similar by making a conscious decision to take responsibility for her learning and to change her attitude and work ethic. By being with Bebe, Cece was unconsciously influenced by Bebe's dedication to her work, which Cece adopted and practiced as evidenced by the longer amount of time she sat and worked without complaining.

The relationship between Bebe and Cece continued to be the main object of study, and the results obtained confirm Tobin and Roth's claim that every action of a student or group of students in the learning environment either enhances or hinders learning for the individual as well as for the collective. When Cece passed her first mathematics quiz in more than two years, she could not contain her emotions. She was so excited and happy that she screamed, hugged Bebe, and ran around the room with her paper showing her 68% to everyone. I seized the opportunity to make it a teachable moment for the entire class, inspiring hope and possibility. I elaborated on the value of individuals making a commitment to succeed and for the strong students in the class to help the weaker ones. Discussion in praxis of individual and group understanding is one of the main classroom

structures that I promoted to ensure the transformation of students' mathematical identity and success. I used cogens and coteaching as mirrors for students to see their own mathematical learning images and to take action to modify their reflection if it was unsatisfactory. Unsatisfactory images may result from insufficient economic, social, cultural, or symbolic capital. One or a combination of any of these forms of capital could retard students' academic development, so I used cogens and coteaching to help produce a new kind of social organization in my classroom where students could feel free to talk about their problems knowing that the classroom community was there to help them find solutions.

Effects Of Cogenerative Dialogue And Coteaching on My Teaching

By enacting a classroom culture where the salient features of every lesson are collectively examined by all participants, more valuable insights are gained into the needs of all students as well as the teachers...Coteaching and cogens both are forms of praxis that set up and expose participants to learn and understand in and through the sharing of being in the classroom (Tobin & Roth, 2006, p. 4).

It is important to understand the ways in, which students and teachers think about teaching and learning together. Discovering how they consciously or unconsciously appropriate classroom structures to aid or disrupt the teaching and learning process is vitally important as learning why they tend to privilege certain ways of knowing and learning. Cogens and coteaching have become lenses and structures through, which I access, examine, and mediate the educational achievement of my students. These practices accomplish this by forcing me to consider the needs of individual students and implement cogenerated solutions in ways that are agreed upon. Using practices that cut

across boundaries between students and me and between different levels of mathematical understanding or abilities among students brings a positive result. Not only do cogens and coteaching help me to address the needs of students, but they also help me to address my own beliefs. They enable me to gain a better understanding of how students learn and to develop teaching practices that have been illuminated and critically examined by my students and me. This has also highlighted patterns of coherence and contradiction in the more traditional ways that I had taught before, which did not support, or enable students to achieve at their full potential.

So many things were wrong with my traditional teacher-centered approach. Perhaps the most significant problem was that my students equated it with a method that teachers used if they were too lazy or did not care enough about them. Cece stated that most of the mathematics teachers she had had did not provide the class with activities that would allow them to interact with the mathematics and to construct meaning and understanding based on their own exploration and guided thinking. She went on to say that the only time her math teachers would bring in some kind of activities for the class was when the teacher was being observed by the principal, the assistant principal, or officials from the New York City Department of Education. Most of her classmates agreed and expressed those opinions in very strong terms.

Students also pointed out that copying vast quantities of notes from the chalkboard was a boring exercise from, which they would learn nothing, since most of them do not read over mathematics notes. Secondly, they could not make sense of the notes as most of them lacked the basic mathematical prerequisites that mediated understanding. Furthermore, copying notes went against the natural cultural practice of students who

preferred to talk in class as they discussed ideas and work collaboratively in small groups. Consideration and discussion of these issues during cogens was central to my understanding of the needs of my students, creating opportunities for polyphonia and polysemia. In this instance polyphonia refers to the multiple voices of the students that provide structures for the classroom culture, making it more equitable. Polysemia refers to the different perspectives of all the participants in the learning environment. I have learned to value students' perspectives and voices, and they in turn have developed greater respect for me and for each other. Students have learned to value each others' points of view through our reflexive discourse and mathematical talk. I have learned to think with my students, not for them.

Promising Equitable Outcomes For Students' Mathematics Education

With the appropriation of cogen and coteaching methods in my mathematics classroom, I have found that aligning my practice with students' points of view has many significant and positive outcomes. These outcomes include remarkable personal growth, agency, and capital production for both students and me. There is evidence of increased collaboration, solidarity, and mathematics achievement as indicated by students coteaching, peer tutoring, and higher test scores on class tests and on State-mandated examinations. There has been a marked transformation of individual and collective mathematical identities as evidenced by an increase in the number of students who were consistently on-task and participating in classroom activities. However, there were also some students for whom it appeared that the study did not have as great an impact as I had hoped. These students are still achieving below their full potential even though they have shown improvements in areas such as behavior and attendance.

Bebe and Cece demonstrated that it was possible, through changes in classroom discourse, structures, and practices, to transform a learning community if initiatives and practices took into consideration the social and cultural capital of all participants. In developing what I consider to be a sociomathematical learning environment and highlighting the experiences of Bebe and Cece, my research has identified ways to succeed in this mathematically-diverse urban classroom. Bebe and Cece have not only been engaged in coteaching and peer-tutoring, they have also found ways to re-shape the mathematics curriculum, making it more student-friendly by modifying areas to incorporate the culture and life experiences of their peers without compromising essential concepts or diluting rigor.

One characteristic of Bebe and Cece's coteaching practice is that they provided several dimensions from, which to present their work. Cece remarked that she realized that not all students learn the same way and that she personally liked when things are explained to her in many different ways. As a result of this, she tried to have many different ways of explaining the same thing whenever she cotaught. In one of her coteaching sessions with Bebe, which covered the topic of Transformation, she brought in several pictures of examples from the Internet. They incorporated three-dimensional objects and shapes, and she asked her classmates to participate in a live demonstration in, which individuals were moved around to illustrate different kinds of transformations - linear, angular, and so on. The class was very interactive, and almost everyone enjoyed the activities. I also felt certain that students benefited from it and learned in a way that made sense to them. As one student stated in his reflection, "If mathematics could always be like this, it would be my favorite subject." Unfortunately, not all students expressed

such positive sentiment in their reflections. There were reflections from students that indicated that they were still struggling to understand certain mathematical concepts, and that they still feel frustrated sometimes, despite the increased support they have received as a result of being involved in this study.

When I asked Bebe and Cece why they put so much effort into their coteaching and presented their work like professionals, they looked at each other first, each telling the other to answer me. Bebe eventually spoke up, saying that they always argued about that, too, as Cece was never satisfied with using just one method of presentation. At this point, Cece cut into the conversation in her usual way by speaking over Bebe with a much louder voice and said that she knew there were some students in the class who would not get it if they used only one method. She was calm for a moment, thinking carefully how to explain herself, and then said, “I know that the way we present our stuff, the class gets it, because they tell me. They are learning, and I don’t want to stop, as my friends and I are going to pass math and graduate on time.” I was very touched by her compassion and conviction.

In her latest study of Railside High School, Boaler (2006) illustrated how the use of Complex Instruction (a multiple-ability treatment designed to rearrange status) in conjunction with reform mathematical practices can create multidimensional mathematics classrooms that broaden what it means to be smart in that context. Nasir also wrote that students who worked in groups on group-worthy mathematical tasks not only pursued higher-level mathematics courses throughout high school, but were also more interested in the mathematics they were doing. These tasks were structured by broader classroom processes promoting explicit mathematical sense from diverse racial and ethnic

backgrounds, (Nasir, 2002).

Bebe stated that Cece was like their basketball coach, “she takes the coteaching very serious. She even calls me on Sundays to talk about it.” This highlights the fact that it is crucial not to take a deficit view of any student. When I asked Cece if she believed that she could become a very good mathematics student like Bebe she laughed and said, “Of course, even better!” Then she reached over to give Bebe a hug and burst into laughter. In turn, Bebe stated that if Cece continued to work as hard as she was working, she would definitely become a very good mathematics student. Cece then looked at the time on her cell phone, and screamed, “Got to go to Ms. X class before she goes crazy on us.” They both rushed off to class.

My research suggests that it is possible to transform the mathematical identities of students like Bebe and Cece by providing them with learning opportunities that will ensure collaboration, productivity, and engagement as learners. There are many ways in, which coteaching and cogens coupled with my own ethnic and educational background have helped to facilitate the transformation in my mathematics classroom. One of the most important mathematical outcomes from this was the production and reproduction of successful classroom structures, practices, and learning environments with the implication that there will be more opportunities for students from culturally diverse minority backgrounds to succeed in urban mathematics classrooms.

Chapter 5

Promoting Students' Engagement In Mathematics: Agency And Collaboration Vs Control Over

Student agency can be considered as the ability that a student has to redirect the proceedings of a social interaction or exert her power by taking action during an encounter within a field to change the outcome for herself and others. According to Elmesky (2001) “Such empowerment not only increased their previously low chances to re-position themselves in social space either by getting a good job or by going to school, it also affected their immediate capital” (pp. 157-158). For example, a student can stand up and make her voice heard and advocate for improved conduct by group members who are engaging in disruptive activities that are preventing the group from achieving its learning goals in the classroom. In this context a student’s agency can play an important role in structuring the learning environment because of the agency | structure dialectic. According to Elmesky (2001), “Agency can be exerted in three different ways: (1) when the desired outcome of an activity changes (K. Tobin, personal communication, 11/01); (2) when resources (tools) are remobilized or used in unique ways; and (3) when rules or schemas are adapted and transposed (Sewell, 1999)” (p. 157). I use one student’s experiences in her mathematics classroom to examine what counts as student agency in discourse in two contexts. Many education researchers have documented that African-American and other minority students attending schools in urban cities are marginalized by a disproportionate number of discriminatory educational practices, including uncertified teachers and ineffectual policies (Anyon, 1997). Often these schools lack basic resources and equipment (Kozol, 1991). With the emphasis on preparing students

for standardized tests, many public schools and their teachers have adopted an individualistic approach to learning in, which students sit in rows in the classroom and information is given by the teacher. Together, these factors could mediate against students and teachers collaborating in ways that promote critical thinking, discovery and inclusion of students' voices in classroom decisions, and students' development of a sense of agency.

In addition I believe that teachers' preparedness, beliefs, knowledge of learners, and instructional style are core factors in mediating students' success. They provide structures, which can either encourage or truncate students' agency. To be able to promote student engagement in mathematics, I find it necessary to equip myself first with a good knowledge of my students' strengths and weaknesses. In addition and perhaps most importantly, I find it imperative to be aware of my own strengths and weaknesses as a teacher. Starting from this point, I am able to appreciate and value students' perspectives and build better teacher-student relationships that are mutually beneficial to the teaching and learning process. Sharing with students both my limitations and my willingness to use their ideas and experiences in the classroom not only builds positive emotional energy, but it also creates a learning environment where students feel safe and empowered to share their rich reservoir of talents and resources for a more productive learning experience for all.

Some scholars believe that school plays a pivotal role in developing a sense of agency in students' lives and that the education process can nurture or discourage this development. According to Anyon (1997), students' agency is dependent on an education process that is embedded in interlocking systems of oppression and privilege. From my

review of school statistics pertaining to students' mathematics achievement in urban and suburban schools, Anyon's point of view is salient, as the statistics indicate higher overall achievement and graduation rates in suburban schools where students frequently have access to more educational resources than those in urban schools,. In a report released in November 2001, *High School Graduation Rates in the United States* (National Center for Education Statistics 2001), the CEO for The Manhattan Institute for Policy Research, Jay Greene, stated that the national graduation rate for the class of 1998 was 71%. For White students the rate was 78%, while it was 56% for African-American students and 54% for Latino students (Greene, 2001, p. 1). The November 2006 report of the National Center for Education Statistics revealed that in 2003, the national high school graduation rate for White students was 78%, compared to 72% for Asian students, 55% for African-American students, and 33% for Hispanic students. However, in New York, the high school graduation rate for 2003 was 74% for White students, 62% for Asian students, 38% for African-American students, and 33% for Hispanic students. These statistics demonstrate that African-American high school students in New York were graduating at 17% below the national average for African-Americans overall in the U.S. and 36% below their White counterparts. This is an indication that the New York public school system is not meeting the educational needs of African-American students, It has become abundantly clear that Black students are in trouble and that most will become unemployable adults.

I share Anyon's opinion that the interlocking system of oppression and privilege both conceal and illuminate our understanding of how schools mediate young people's aspirations, expectations, and chances in life. Other researchers such as Fine (1991) agree

that students' efficacy and sense of agency in school and life are intricately woven into the amount of social and emotional development that the classroom environment facilitates. Based on my experience and the research conducted for this study, African-American and minority students have a lot to contribute to their own learning, but many have experienced schooling from a deficit perspective as teachers and school administrators have exerted strict control over the teaching and learning process. Traditionally, all the decisions privileging certain individuals and groups in the classroom have been made by teachers. In examining the consequences of a teacher-centered classroom, Tobin explained that

Emphasizing *control over* rather than *collaboration with* is, simply put: a bad idea, and those in authority who offer *control over* as a recipe for success are giving bad advice. Furthermore, systems that build policies around hiring and rewarding teachers based on *control over* students may be producing forms of teaching and learning that reproduce failure and equity concerns based on categories such as ethnicity and native language. (Tobin 2007, pp. 1-2).

In examining the 2003 statistics on New York high school graduation rates through the lens of Tobin's concept of *control over* versus *collaboration with*, it is not difficult to envision how these macro- and meso-structures (school policies and teacher's control/teacher-centered classrooms respectively) could significantly contribute to students' poor achievement. These social structures are routinely reproduced in a system in, which participants are packed together each with their own agenda, which precludes them coming together to produce a "whole." For example, in the context of teaching (the teacher's agenda) and learning (the students' agenda), teachers follow a directive from

their principal to prepare students to pass high-stakes State examinations (the principal's agenda). From the principal's point of view, this is the most important event on the school calendar. The accountability model used to grade public high schools--and used to determine, which principals keep their jobs--requires that a majority of students pass these exams, irrespective of whether or not students are learning.

Within this macroscopic policy mandate, teachers adopt a very positivistic and reductionist perspective on teaching/learning in, which all that matters is drilling students on material from previous examinations. This requires teachers to be in total control. Such a situation reduces the classroom to a place where most students experience frustration and a feeling of being used as political pawns in the Mayor's and Chancellor's chess game as they seek to prove to the rest of the nation that, based on higher test scores, schooling in New York is improving. Some students have become disinterested in school as they are not allowed to discover what it is like to participate in explorative learning, which can be more engaging and provides opportunities to co-produce knowledge. Instead, they are stuck with teachers trying to feed them algorithms for problem solving because of the passive learning, test-passing model of the present educational system.

Freire (1998) condemns this idea of teachers trying to transfer or deposit knowledge into passive students, stating that the teacher cannot think for her students, nor can she impose her thoughts on them. He argues that students are organic beings not inorganic objects and that teachers should not approach students' learning in a mechanistic way by providing them with information to be memorized. Instead Freire urges teachers to provide students with opportunities to experience learning and to discover knowledge for themselves. Mike, a 10th grade student who had four different schools since entering

middle school, explained in cogens that in public school settings students' voices are rarely valued by most teachers and that collaboration is oftentimes around sameness and rarely for academic purposes. Many poorly performing students are othered (i.e., set apart and perceived as different), and sometimes alienated by their peers in public schools. This can lead to disciplinary problems resulting in students being suspended or expelled from the school depending on the seriousness of the offense. What can be done to change this situation and give students a chance to succeed in urban public schools? The sections that follow will attempt to provide some answers to this question.

Developing Students' Agency

In my opinion the most significant aspect of examining teaching and beliefs about learning mathematics in urban schools is the ability to identify why some students are successful and others unsuccessful. Once that is accomplished, it will be necessary to find ways of countering those assumptions that have potentially negative effects on students. There are many factors assisting and hindering student learning of mathematics; some are personal, while others are societal. Students have no control over many of these influences and have to find ways of overcoming them. One method that students can use to overcome these influences is to develop a sense of agency over their social and academic life as they experience school, teaching, and learning from day to day. This chapter examines the role of agency as a framework that has enabled many of my students to redefine their identity as learners by taking control of what goes on around them in the classroom.

Students enter mathematics classes with a lot of capital that they are capable of enacting in praxis to affect each others' learning. I have observed many students and the

means by, which they draw from their stocks of knowledge and participate in unique cultural forms of learning and knowing in order to assist their peers. For example, I once observed Bebe use her fingers to show Charles an easy way to multiply by 9. She explained that she had learned several tricks like this from her grandfather in Guyana. The technique was very simple, and Charles grasped it quickly. Filled with enthusiasm from his quick success, he became agentic and made his way around the room sharing it with others who showed excitement and interest. This interaction was successful for two basic reasons: First the students were fascinated by this easy trick and second students were amazed that Charles, who seldom participated in classroom activities or contributed to the learning process, was actually doing something that was productive for the group.

The above example demonstrates how Bebe initiated a social interaction with Charles, who then reacted with interest in her actions. As the interaction developed and Charles became engaged in the activity, this generated positive emotional energy, which then structured that field affording a change in Charles' identity. His keen interest and motivation also structured the encounter, as he loosened up and began to ask Bebe questions that helped him to learn the technique quickly. Satisfied that he had learned the trick correctly, Charles found his ontology changed, and he decided to use his agency to educate his friends. First, he went to Mike who also showed interest in learning the method. As they interacted, they both laughed and expressed other positive emotions.

Since fields have no boundaries and structures enacted in one field can be transferred to other fields, Charles went around the classroom from group to group, sharing this newly learned trick with almost everyone who was interested. At one point he even left the classroom to stop his science teacher in the hallway to show him the trick. As I

observed Charles, an underachieving student, enacting the four authenticity criteria, I felt a sense of hope and a renewed commitment to my research. In my reflections and during further detailed analyses and interpretations of that event, I tried to identify all of the salient features of my bricolage of sociocultural theoretical framework that were evident in the exchanges I had witnessed. I wanted desperately to understand as clearly as possible what had happened, how it happened, and why it was happened.

Charles: Unlikely Student Displaying Agency To Much Class Appreciation

As Charles continued to move from group to group, students who had just learned the trick immediately, in turn, became coteachers of this new method of 9s with Charles. I observed that after about five minutes, most of the students had their hands in front of them and were practicing the new trick. There was an abundance of synchronous actions, laughter, high-fives, and patterns of coherence at each group. It was a very uplifting moment, as I watched the collective effervescence and interactions between students of different abilities. The positive emotional energy created around this event was a reminder that all students bring valuable resource to the learning environment every day. Therefore, it is important that teachers find ways of tapping into these resources to use them as tools for enhancing students' learning in the classroom.

As I watched what was happening, I recognized that this kind of action would not be tolerated by most teachers in a public school. Charles's changed ontology and enactment of agency produced ontological changes for many of his classmates. Solidarity built around their collective success in learning an easy technique for calculating part of the multiplication table without a calculator. This was a major accomplishment for many of the students. The way I had perceived Charles was completely opposite to the identity

and agency he was displaying. Suddenly, I realized that I had been wrong about Charles's attitude and interest in learning. I discovered that his lack of interest was not about learning mathematics but about the classroom structures and presentation methods that I had institutionalized. During discussions in cogens, the students helped me to see how some of the structures and practices were mediating their agency and learning. In response to student requests for increased (responsible) freedom, we developed new schemata, curricula, and teaching and learning practices that allowed greater movement and expression of students' agency in the classroom as they participated in learning activities.

However, not everyone participated in the activities. Review of the videotape showed one student texting, another looking in a mirror and doing her make-up, and another with his head down on the desk. I noted this contradiction to the general pattern, and in cogens the students involved stated that they just did not find the activity interesting. The girl who was doing her make-up told us that she used her calculator to do multiplication, so she saw no sense in learning multiplication trick. Something such as the multiplication trick may not appeal to every student, of course, and observing some students not participating is hardly surprising. Therefore, one of the tenets of my sociocultural theoretical framework and standpoint is that when culture gets enacted, it produces patterns of thin coherence and contradiction (Tobin, 2006). As in the example of the multiplication trick, the same attitude is observed in the general learning of mathematics, where some students show enthusiasm and make greater effort than others to understand and succeed.

In the following weeks students demonstrated self-determination and engaged in

conduct, activities, and interactions such as increased collaborations with each other during various tasks, improved student-led discussions, and using a more respectful methodology in critiquing the ideas and work of others. Together, all of these improvements contributed to a transformation of students' mathematical identities producing a new culture in the mathematics classroom. While I cannot attribute students' changing identities to any one event that occurred in class, we had frequent discussions about improving our achievement, and most students were committed to stepping up their game, based on seeing how some of their peers, like Mike and Cece, had improved academically. Addressing the following question about these successful students provided some motivation that could have helped others to succeed: What kinds of personal and mathematical identities are constructed among successful students and what kinds of experiences and goals shape these identities? When a student decided to break away from the norm and strive to succeed, she was often ridiculed and her ethnic and cultural identity was challenged by her friends. For African-American and other minority students, engaging in serious study of mathematics or behaving studiously could result in being labeled as "acting White" and in being pressured by her peers to desist. Thus, successful minority students have to be strong, stay focused, remain goal-oriented, and make tough decisions everyday.

Students As Active Agents Of Change In The Urban Mathematics Classroom

This section examines how student agency and discourse play an important role in achieving success in urban mathematics classrooms. In addition I examine the evidence provided through video analysis in two contexts: First students enacting agency to deal with inappropriate conduct of peers who are preventing others from learning and second

students using agency to mobilize the class to collaborate and solve difficult mathematics problems.

Unlike students who are privileged to attend schools that have all of the resources they need, my students experience schooling in learning environments that are severely lacking in resources. The homes, communities, and schools where these students experience life can prevent them from developing a sense of agency.

Elmesky (2001) stated that urban African-American students' knowledge of schemas and access to resources differs from students who come from a social habitus characteristic of the dominant culture. MacLeod (1995) makes the point that in an effort to exhibit agency, individuals of a subculture/subhabitus engage in oppositional actions that only lead to further entrapment within the dominant culture. Elmesky (2001) captures this phenomenon nicely in the following example:

Hallway Hangers became slightly cognizant that certain schemas like the achievement ideology were contributing to their marginalization in school, they engaged in strongly oppositional behaviors to protest the mainstream culture. In their case, and in the case of many students in urban high schools, efforts to exercise student agency through disrespecting teachers, cutting classes, or violence, for example, have led to the further development of an underclass. (Elmesky 2001, p. 42)

It is my experience that many students who succumb to this unfortunate social dynamic have a history of being perceived as someone with a less than favorable chance of succeeding in the normal culture. This then plays into the social hegemonic structures that make these students believe that they are hopelessly trapped in an underprivileged position in life. Therefore, the question is what students can do to rise above such

hegemonic structures and take charge of their lives. How can they engage the capacity to position themselves in a way that will provide an advantage? (Seiler, 2001)

A major focus of my research in my mathematics class was to help students develop a sense of agency and to use their agency to challenge the notion that African-American and other minority students cannot learn mathematics. Many of the students, especially the ones who were low achievers, developed a sense of ownership of the mathematics by taking control of what went on in the classes. They made classroom success personal, and it became a part of their new culture and lived experience. In coteaching students used their agency and creativity, and they drew on their social and cultural resources such as drama, verve, gestures, body movements, and features of everyday communication to present topics in fun and interesting ways. Two of the boys in particular, Mike and JJ, adapted rap and hip-hop music, a part of their cultural symbolic capital, to their coteaching. Their presentation disrupted or breached the monotony of everyday classroom routine. In such unsettled times, habitus reveals itself (Bourdieu, 1977). The boys developed habitus in response to the needs of some of their peers, providing a different lens and a less rigorous way of having the mathematical concepts explained to them.

The diverse backgrounds and negative self-perceptions of some students set up hurdles that were limiting their potential to succeed in mathematics. Based on the results from an in-class perception survey, most students were unsuccessful in mathematics historically because they lacked the ability to confront issues in the classroom that were hindering their success such as peer pressure and disruptive conduct of individuals and groups. Most of these problems are social structures that individual students have the

power to change in the classroom by exercising agency and taking action to create and promote a new kind of culture and learning relationship among their peers.

What Counts As Student Agency?

What follows is an example of Context 1 of student agency--Changing the Desired Outcome of an Activity--mentioned at the beginning of this chapter as one of three ways a student can exert agency. One of my students, Cece, was working in her group when some of the group members (boys) became disruptive. She was experiencing difficulty focusing on her work, so she decided to ask her peers to be quiet. One of the boys in the group kept inviting her to participate in their discussion, but she refused. Not being able to tolerate it anymore, Cece initiated a brief “time-out” so that the boys could discuss with the group the reasons why they were not on-task, and why they were behaving in a disruptive manner. The following is a transcript of the conversation and actions that took place for about two minutes, after, which the group returned to doing mathematics. (The transcription conventions are provided in the textbox following



Figure 1: Cece calling time-out to discuss disruptive conduct of group members

Episode 1

Transcription notations were adopted from Roth, W.- M. (2006). Conversation Analysis. In K. Tobin & J. Kincheloe [eds.] *Doing educational research: A handbook* (pp. 235-267). Roth cites Gail Jefferson (e.g., 1989) as his source. I use the following transcription notations listed below.

((Back to work)) : Double parentheses indicate my transcription comments.

[Shut up] : Square brackets indicate the extent to, which speech or actions overlap.

I want to learn : Underline indicates emphasis or stress in delivery.

But- : The hyphen marks a sudden stop in the utterance.

.,? : Punctuation marks are used to capture characteristics of speech rather than grammatical features.

HOW : Capital letters are used when an utterance is louder than the surrounding talk.

01 Cece: *Hey Mike and Charles, you are disturbing the group. I want to learn.*

02 Mike: *Since when noise bothers you Cece?*

03 Charles: *What's wrong with you today my girl?...We not even talking that loud either.*

04 Cece: *I say... just cool the talking, and do your work, before you let our group lose points today again, like you did yesterday. Some of us want to learn knuckle head.*

05 Mike: *A WHO YOU A CALL NAME? Since when you get so much into school work anyway- Queen Latifa?*

06 (Mike & Charles): *((Laughing and high five))*

07 Cece: *Time-out. Didn't we all agree to change and start doing our work? Answer me Mike, come on, answer me*

08 Charles: *[BUT-]*

09 Cece: *SHUT UP CHARLES, Let Mike answer.*

10 Mike: *Yes, and don't you see me working?*

11 Cece: *NO- You and Charles just goofing off, and disturbing me and Bebe. ((reaching for Mike's book)) Let me see your work? SEE- NOTHING-*

12 Charles: *But it's not bothering Bebe.*

13 Cece: *HOW YOU KNOW THAT? Just because she don't say nothing, that don't mean you not disturbing her? Well it's bothering me, and if you want to stay*

in this group, you better start doing some work today.

14 All: ((Back to work))

An analysis of Cece's actions identifies several important structures. First and most importantly, she asserted her agency by refusing to participate in the disruptive conduct (Episode 1, line 1) of the boys who were having a discussion about an incident involving Mike and a boy from another school on Mike's way to school. Cece took positive action to address a situation that was unproductive to the group. She decided to initiate a group discussion, so that the boys would have a chance to explain respectfully and to defend their actions to the rest of the group. Cece was well known to be one who would indulge in disruptive classroom behaviors. Her refusal to participate indicated a shift in her identity. She had previously agreed in cogens to refrain from misconduct in class. Her action highlighted the fact that students can use their agency to become an agent of change and an inspiration to others, helping them to overcome deficit perspectives and promoting a new successful learning culture in the classroom and in the school. Here, a new successful learning culture refers to a change in students' beliefs about their ability to learn mathematics. Their new beliefs and values (schema) are incorporated into new practices dialectically, as they used all the available resources within the classroom field to afford the achievement of their goals. Students began building collaborative relationships, working across differences, helping individuals to succeed by peer tutoring, establishing collective motives, and having shared responsibility for the success of every member of the class. I also made myself more available and increased students' access to available resources whether those resources were worksheets, modified curriculum, or increased access to the Internet, so that appropriate improved classroom structures were in place to enhance learning opportunities for all students.



Figure 2. Cece going to the chalkboard to get help in understanding a Regents math problem

Here is an example of Context 2 of student agency—Remobilizing Resources. The group was working on the Regents Exam mathematics practice problems. Some of the problems had unfamiliar words, and the problems were at a higher level of difficulty than the students were accustomed to solving. Some students, including Cece, were having difficulties understanding one particular problem. Bebe, the group's best mathematics student, was also having difficulty explaining her solution so that Cece and the rest of the group could understand it. After several failed attempts at reasoning out the solution to the problem in her group together, Cece volunteered to put the problem on the chalkboard, so that the rest of the class could assist her in understanding how to solve the problem. The class worked together in a very collaborative manner, with individuals and groups offering suggestions and explanations as how best to solve the problem. Eventually they figured it out, and Cece went over the solution very thoroughly so that everyone could understand it.

Investigating Students' Mathematics Agency And Interactions In The Classroom

My research is concerned with teaching and learning practices that afford or hinder students' success in urban mathematics classrooms. During cogens students shared their

perspectives on success in mathematics as it related to their personal goals and collective motives for the class. It became clear that the collective motives of the class were that more students would participate in class activities, work together and help each other, and improve their performance in mathematics. However, while these were the general motives of the group, there were individuals with different goals, which stemmed, partly, from their previous exposure to mathematics classrooms, which left them bereft of hope for success in the subject. According to Emdin (2007), classroom structures can mediate students' agency. "The relationship between structure and agency corresponds to the way in, which structures within a field directly affect the agency of the participants within the field. In essence, a physical, symbolic, or ideological structure can inhibit or support a student's ability to act" (p. 89). For many of my students, success in the mathematics classroom could be something as simple as being validated by their peers for answering a question correctly, because they had always been perceived as incapable of learning mathematics. Other individuals had simple goals such as just being able to understand the main concepts of the day's lesson.

For most of my students, their main goal was to pass mathematics in my class and subsequently pass the Regents Exam. Passing mathematics on the Regents examination is a state requirement for graduation from high school in New York. Therefore, passing the Regents Exam is the ultimate measure of success for students and a measure fraught with fear for many. Unfortunately, it is also a measure of success, which most schools have adopted and, which prevents teachers from creating classroom structures that would enable students to use their agency to support their own learning and discovery of knowledge. According to Emdin (2007):

Teachers' definition of success as hinging upon student test scores is a fundamental example of the corporate nature of schooling. This is to say that despite any individual teacher's belief regarding high-stakes standardized testing, their credibility as a teacher is usually dependent upon the percentage of their students who pass the standardized exam (p. 138).

Agency and social capital are important lenses through, which teachers are able to examine and understand students' roles in their own mathematics achievement. Later in this discussion will come the case of two students, Mike and Charles, both with limited social but ample cultural capital and below average mathematical ability. In this incident they helped solve and explain a difficult Regents problem, much to the amazement of the whole class, including me. The analyses of these two video clips focus on the role that agency, social capital, gestures, body language, material objects (chalkboard), and language (students' words) played in mathematics discourse and learning.

To help me better understand and interpret the information contained in the video clips, I used the work of Bayne (2007) and others whose research and video analyses of classroom learning environments were valuable resources. In the mathematics classroom students' interactions with each other and with material objects shape the mathematics discourse.

During video analyses, I first looked at what was happening in terms of students' involvement in learning activities in general at the meso-level. In other words, I tried to understand the big picture of what was happening in the classroom. I examined the roles that individuals' and groups' agency and actions played during classroom interactions about mathematics. According to Martin (2004):

Because agency is social, meaning no individual exercises agency in isolation from others, it is important to examine the practices and schema of all individuals within the field as each plays a role in co-constructing the structures of that field.

In this manner, an individual's agency interacts in a recursive relationship with individual structures as well as those of the collective. (p. 73)

Because of the dialectical relationship between the individual and the collective, what the individual student does and experiences in school cannot be separated from group actions in the classroom, and by extension, the administrative policies of the school.

When a vignette is selected, such as the one illustrated in Figure1, apart from recording the actual words spoken by individuals, I wrote down other theoretical, appealing interactions and features that I considered important in helping me make sense of what was happening and why it happened at that specific moment. As I wrote the narrative, I recorded the nature of the main event, those meso-structures that interested me (e.g., disagreement, math problems, disruptive behavior, etc.) and around, which the conversation took place. I paid particular attention to recurring actions or themes that seemed to produce a characteristic pattern of coherence and to any contradiction to that pattern of students' social and cultural resources, which were evident throughout most of the study. A detailed examination of microstructures was extremely important in conversation analysis and to my work. These examinations provide collaborating evidence that helps to substantiate or dismiss claims made regarding students' enactments of culture, which either supported or hindered their learning at a specific moment in time. These include practices such as overlapping speech, length of pauses, eye contact, head nods, laughter, gestures, and so forth.

Agency, Conduct And Interactional Order

During our everyday lived experiences, we constantly interact with other people in the world around us, and we incorporate a wide-range of resources (Sewell, 1992). As this study progressed, I used design experiment strategies (Brown, 1992) to rearrange structures and ideas continuously to come up with a best-fit model for teaching and learning in the classroom. Students, consciously or unconsciously, utilized strategies based on their social and cultural resources to meet their learning needs through an interactional order.

This interactional order was evident in my classroom. Certain Caribbean-American groups sought to control and silence other ethnic groups of students during classroom discourse. There was a rivalry between groups, sometimes stemming from out of school differences between the neighboring communities in, which students lived. In my classroom, Jamaicans and Trinidadians seemed to believe that they had a higher academic status than the Haitians or other minority students. During conversations, it became apparent how certain students' points of view were supported while others tended to be silenced. The Jamaican and Trinidadians in my class seemed to believe that they had the right to talk first at all times and dominate all conversations. Often, they said that they were better academically than other groups, and many did not listen or support students from other groups. They used their superior mathematical knowledge to "other" and exert power over others by dominating conversations. In examining othered populations in his study of high school students in his physics classroom in the Bronx, Emdin (2007) stated that: "These Othered populations are often robbed of an opportunity to critically engage in school and schooling by a normative positing and positioning of

negative ideas about their intellectual ability and efficacy within classroom” (p. 189). It is my observation that the groups doing the othering tried to make those students being othered feel stupid or uncomfortable during discussions, so much so that those students sometimes refused to participate in classroom discussions or to ask questions in class.

This was a very big problem before the introduction of cogens in my class. Some students complained that this was affecting their learning and that they were afraid to ask questions about things they did not understand for fear of being viewed as stupid. Charles (a Haitian student) said that he actually felt stupid in the math class and that this was one of the reasons why he refused to do work. The introduction of cogens, during, which students agreed that no individual or group voice would be privileged over another, solved this problem. Students learned to respect what others had to say, and allowed everyone equal opportunities and turns at talk during classroom discourse. “Cogenerative dialogues takes these notions of discourse and bring them to another level by focusing on the dynamics between dialogue participants and the co-generated results of the conversations they exchange” (Emdin 2007, p.44).

Diaz-Bone et al. (2007), considers “the Foucaultian concept of discourse to belong more to a meso- or macro-level than to a micro-level (as in conversation analysis or ethnomethodology) although it influences socialized individuals and interactions in social situations” (p. 2). According to Foucault, one of the more useful purposes of discourse is not the content of the discourse itself, but the transformations that the discourse has effected. Through the introduction of cogens in my class, the rules of classroom discourse changed, this transformed both individual students’ attitudes and group conduct and identity.

In the context related above, Cece's agency consciously propelled her to utilize a combination of resources such as her belief, mean street talk, determination, gestures, which included stern facial expressions, solid eye-eye contact, and hand movements to make her point during that discussion with Mike and Charles. She seemed to have used every strategy she could summon to defend her right to have a productive learning environment free from disturbances by her peers. Emdin wrote of the "ice grill" on his and other students' faces as they travel through the rough terrain of inner-city neighborhoods, as a protective mask. He stated that:

The "ice grill" on students' faces is the physical manifestation of the conferring of power of others against them. Hook (2004) described the hyper-vigilance of Black people in response to the trauma of daily oppression at the hand of a dominant society that results in a constant guarded stance. I argue that this hyper-vigilance is where the cold, stern looks and attitudes students exhibit originate. It is formed by the need to create a façade of brute strength that conceals vulnerability, and a mask of disinterest that obscures wonder and curiosity. (p. 5).

The other participants in that discourse involving Cece used foul language, body movements, and laughter in an attempt to intimidate her, truncate her agency, and quiet her, but she remained adamant and got the boys to stop disrupting the group.

When Cece got frustrated and attacked the boys for failing to be quiet, both sides got very loud, and the transcript of their exchange of words seems inadequate to convey what they wanted to say. During the verbal exchange, they became very demonstrative, employing the use of body parts such as the hands and face to help convey meaning. Thus, analysis of video clips requires the analysis of both the spoken word and gestures

to make sense of and interpret the meaning of what was said. According to Roth, the learning environment allows people to use their bodies and conduct (action) as resources for organizing and framing their verbal interactions (Roth, 1999). I took the approach that I always take whenever students are trying to argue through a disagreement in my class. I allowed them time and space to make their points before I intervened.

As I listened to both sides of the argument, I discovered that the boys were talking about an incident that took place on their way to school. Mike was apparently disrespected by a youth from another school in front of his girlfriend. To the boys this represented a breach of their local culture and required further action, as Mike's image and status were weakened. The goal of formulating a plan of action to retaliate against the youth in the evening took precedence over learning mathematics during that period. Mike was engaging his cultural resource of toughness, stubbornness and determination so that he could have his conversation. He was not about to shut up so that Cece could focus on doing her work. Cece, who also engaged her street and local culture of toughness and fearlessness to confront Mike, equally matched his actions. Both had their way until they said all that they had to say to each other.

The determination and resoluteness from both Mike and Cece helped them both to survive in the tough inner city community in, which they live. They have also used these qualities to their advantage in the mathematics class and have achieved great success. Mike, who was two grade levels behind his age, made significant improvement in his performance during the time this study took place. He used his agency along with the structures created in the classroom (such as coteaching, peer tutoring, access to computer, and cogens) to become more engaged in learning activities. Cece, with her equally strong

personality, supported Mike, and the two worked together in mutually supportive roles. Because there are no boundaries between cultural fields (Tobin, 2006), students such as Mike and Cece have been able to appropriate and to use structures and cultural capital gained in one field such as the neighborhood for their success in other fields such as school.

Student Appropriating Culture Learned In One Field To Other Fields

From the sociocultural perspective school, classrooms, home and community are fields – “places and spaces that are physically and temporally defined, within, which the participants in them enact culture” (Bayne, 2007, p. 25). It is the activity that the participant is engaged in at a specific time that determines the field. Since fields have no boundaries, participants can be in one space physically but enacting the culture characteristic of another physical space. For example, when Cece got up and went over to the boys to confront them physically and verbally (very loudly) because they were preventing her from concentrating on her work, she was enacting her street culture learned in the rough neighborhood in, which she lives, a necessary tool to defend oneself and one’s rights in an inner-city community (Anderson 1999). She further explained in cogens that, by being with her older siblings on the streets, she learned from an early age that she had to be aggressive, or else she would be abused by others.

Bayne (2007) also stated that the notion that the culture, which takes place in schools is mirrored by that, which takes place in arenas directly or indirectly related to schools at both the meso- and macro-levels (Turner, 2002), is not unusual; it is rather likely to be the norm. Thus, Cece’s actions in confronting the boys aggressively should not be surprising, as culture-associated schema and practices within a field easily become

resources that are appropriated by individuals as well as by the collective, when experiencing similar encounters in different fields. Since the way individuals interact and solve problems is largely based on past experiences, whenever the context and conditions that define a problem parallel a past experience, people naturally process the situation using familiar schema and practices that have worked in other fields. This holds true, of course, providing that there are supporting structures in the present field for enacting these practices.

Sewell (1999) stated that practices get enacted in fields such as the mathematics classroom, and Tobin noted that fields have no boundaries, thus cultures from other fields such as the neighborhood also get enacted within the classroom. Seiler (2001) explained that fields are nested within each other. For example the classroom is nested within the school, which is within the neighborhood, etc., and each of these different fields has its own structures, schema, and practices. According to Martin (2004):

Structures includes both physical factors, including material, human, and symbolic resources as well as ideological factors, such as the values and beliefs of the individual and community that are all connected to cultural practices. These structural factors are intimately connected, as it is the beliefs and values (schema) that one holds that shapes how resources (materials, human, and symbolic) are understood and ultimately used. (p. 17)

Cece's decision to enact her agency and confront the boys was grounded in her knowledge of the effects that came from past experiences. She was aware of the pattern of conduct of the boys and knew when to intervene so that her learning was not jeopardized. She also knew that it required more than just asking them to be quiet and

that she needed to include some body language that would be more forceful. Because of the repeated nature of the boys' conduct, Cece learned to identify patterns of talk that enabled her to know the difference between times when the boys were on task, from when they were not. She had been on both the good and the bad sides of classroom behavioral practices, so she was well qualified to recognize the emergence of potentially unsuccessful learning transactions.

Cece Using Her Agency To Gain A Better Understanding

In Context 2 Cece's frustration pushed her to seek help outside of her group. She decided to ask the class for help. She also realized that she needed to engage in more than just conversation to assist her understanding of the mathematics problem she was struggling with. In other words, she needed additional structures -- resources and ideas -- that would simplify the problem for her.

Action-Based Phenomenology

Cece chose to go on the chalkboard, a material structure, which now put the problem in front of the entire class. Combining speech, gestures, movements and material resources, she was now in a position where she could enact with her hands, eyes, and head structures that invited suggestions and ideas from the class to support and redirect her own effort in understanding and solving the problem. Her actions also provided evidence that she believed that, as students, they collectively had the potential to achieve academic success.

Movement And Verve

Analysis of the vignette also shows the synchrony among students' actions as they participated in this shared event. Cece's movement to-and-fro across the board as she

took suggestions from everyone not only kept her busy but also seemed to connect her motion to the learning experience. In addition it stimulated and motivated the whole class to be involved in the activity. Lloyd and Smith, (in Tobin & Kincheloe, 2006), writing from a phenomenological perspective, argued that a study of flow must connect us with the motions constitutive of that experience in a practice-in this case, that, which flows back and forth between swimming and writing. Lloyd and Smith's argument was that, for one to write about swimming, one should live the experience by engaging in the act of swimming. In a parallel sense, Cece was living the experience of engaging in the act of mathematical problem-solving using the technique of hands-on participation, which requires physical movements to construct improved understanding. Roth (1999) also argues that hand and arm movements, gazes, and utterances were all involved in establishing common ground in learning situations.

Cece took an important step that is essential for individual and collective identity transformation. She was convinced that the class had the skills and abilities required to change the situation, and she was willing to try something different by inviting everyone to assist her. She was not sure of what others had done. However, she felt that it was possible to produce a collaborative effort with the ultimate goal of finding a solution of the problem by engaging and facilitating input from everyone. Central to my research is the belief that there are no limits to students' abilities and potential. When students are provided with structures that enable them to use each other as resources and go beyond the one-dimensional perspective that the teacher is the source of all authentic knowledge in the classroom, they experience improved learning. In this paradigm they produce new opportunities for more sustained development and success, as new culture, which is

capable of transcending boundaries of different fields, both in and out of school gets produced for their own empowerment.

Even though I had watched this videotape of Cece taking agency and inviting the class to help her figure out the solution several times before, it was not until I was writing this section and analyzed the tape again that I came across something very important that I had missed before in Mike and JJ's contribution to the collective effort. The problem Cece and the class were trying to figure out dealt with an architect designing a museum entrance in the shape of a parabolic arch. Among other things, students had to select the diagram, which would best represent the shape of the arch for the given dimensions from a set of four diagrams and also to estimate the angle the arch would make with the floor.

Mike, JJ, and Charles always took a while to settle down and get working, and throughout the class they would be either talking or taking breaks to do activities other than mathematics. They weren't really disruptive, but JJ has a learning disability and is unable to stay focused for long periods of time. Whenever he acted out I would just ignore him for a while, and he would then go back to work when I asked him to do so.

Mathematics Experiment: Paper-Balls And A Trash Can

During this problem solving session, the tape revealed that JJ was making paper balls and quietly shooting them in the trash container from different positions in the room as he sneaked around pretending to be visiting different groups to see what others were doing, while Mike watched to see if he was making the shots. However, the interesting thing that the video revealed was that they were actually carrying out a mathematical experiment to figure out the problem. They seem to have been doing this in an almost playful manner, with JJ doing a little dance, a little rolling of his wrist, and extending his

arms as if it was to follow and guide the ball into the trash container, the basket.

Whenever he scored he would do a little hip-shaking dance and said “Yeah”! I was totally shocked to discover this. I observed that Mike was collaborating and instructing JJ to throw the ball higher or lower depending on his distance from the container. When I saw them throwing the paper balls into the trash, I told them to cut it out, and to sit and try to figure out the problem. I wasn’t aware that they had continued to do their experiment when I wasn’t looking. Very interestingly also, during the clip from, which I transcribed the portion of their conversation in, which JJ claimed to have figured out the solution to the problem, I noticed that they had made several different sketches on loose leaves. The pictures weren’t very clear as the camera was not focused on them, but it was sufficient for me to assume that the drawings illustrated the different trajectories of the ball during their experiment.

The following is the transcript of part of the conversation that went on between Mike and JJ from the best I could hear, as the audio quality was not very good due to all the noise in the room.

JJ: Look Mike, I think I have it figured out.

Mike: What you mean?

Mike: Let me see your drawing!

JJ: Hold on little ...

JJ: It’s like when we playing basket ball and ...

Mike: Yes, you making a shot.

JJ: See, if you have enough space, or far away, you don’t need to throw the ball so high.

Mike: So, that’s it...

JJ: When you are close in, you shoot higher...

Mike: And not so hard either!

JJ: You remember that jump shot ... you nearly...

Mike: Just cool my youth.

JJ: Cece, Cece... come here!

Mike And JJ's Basketball Experiment

After their experiment the video showed Mike and JJ, like many others, making drawings and having discussions around the problem. Different groups were trying different strategies, most drawn from their everyday experiences and memory of architectural designs similar to the problem description. However, the boys were using a different strategy. They were drawing on their cultural resource of playing basketball since the trajectory of the ball in motion from the shooter to the basket is usually a parabolic shape. The class had also had a math lesson in the gym a few months earlier when they were studying quadratic equations, so they probably remembered that experience and were using that knowledge to their advantage.

Research conducted in other urban city high schools among African-American students revealed remarkable similarities in students' habitus. In Philadelphia, Elmesky found that high school African-American students in her physics lab had "high energy levels, fluid movement, and singing/rapping contributed to their learning process" (Elmesky, 2001, p. 87). In his research in an inner city high school in the Bronx, New York, Emdin (2007) stated that students in his chemistry class were always using hip-hop music to assist their learning. In this present study, conducted in Queens, New York, the above example demonstrates how African-American high school students used their cultural resource of sports to structure their classroom learning in mathematics. Boykin (1986), states that there are eight dispositions of African-Americans through, which actions and cultural resources can be understood. They include: oral tradition, spirituality, movement, verve, affect, communalism, expressive individualism, and social-time

perspectives. Boykin argues that these dispositions are complex and intricately woven together, and although they may be found in other cultures, they are always present in African-American culture, influencing actions and interactions in all social fields, individually or in combinations. JJ's celebratory dance and verve during his mathematics experiment can be interpreted according to Boykin's definition of movement and verve as follows: movement is "an emphasis on the interweaving of movement, rhythm, percussiveness, music, and dance, which are taken as central to psychological health" and verve is "a propensity for relatively high levels of stimulation, to action that is energetic and lively" (Boykin, 1986, p. 61).

Mike and JJ used movement and verve along with their knowledge and vast experience of playing basketball as resources for their learning. They used something that they knew very well, a material resource, to help them construct knowledge of something unfamiliar. Using the mathematical problem solving strategy of eliminating the answers that do not fit the model, their practical experience and their experimental results, they were able to eliminate diagrams of the arch that would not work. While their actions would get them in trouble in a traditional classroom, and, while a few other students in the class may have been disturbed or distracted to some extent, the value of the overall transaction, in which two low performing students could use their own agency and be so creative in a mathematics classroom, is sufficient evidence to show that marginalized students are capable of learning if the right structures and practices that allow them the opportunity to explore and discover knowledge on their own are enacted in the classroom.

Cece's Bold Move To Strengthen Her Mathematics Toolkit

One of the goals of this study is to catalyze social transformation that I have identified as being able to produce improved mathematical understanding for students. I am also particularly interested in examples of contradictions to the notion that African-American students are less capable of succeeding at mathematics than their White counterparts. I also seek to identify structures that hinder students' success and to cogenerate strategies that will change them and afford the expansion of students' agency. Cece has emerged as a success story in this study because her story is a contradiction to the notion that African-American students from inner-city neighborhoods are unprepared for the challenges associated with being successful in school, a position that is supported by the dominant school culture. Emdin's (2007) research in an inner-city high school in the Bronx produced similar success stories for marginalized youths as Cece. He argues that while it is a fact that there are many factors such as poor resources, more inexperienced teachers, and lower funding in urban schools that may mediate against minority students' success, he has observed that "students in urban schools often express tremendous interest in school topics and subjects when their interests are piqued and their opinions are valued" (p. 4).

Roth, McRobbie, Lucas and Boutonne (1997) observed that phenomenological understanding (as experienced from the first person point of view) is fundamental to a conceptual understanding of physical or mathematical concepts. Based on the analysis and examination of several video clips that focus on events that included Cece's actions in the classroom, I concur with their observation. Piaget (1970) suggested that there is a relationship between experience and knowledge. In his research, Roth stated that Piaget

distinguished between lower-order, single abstraction of objects that lead to concrete-operational knowledge and higher-order, reflective abstractions of actions that lead to formal concepts. However, he explained that, in contrast, his research appears to indicate that even highly abstract concepts (e.g., force, acceleration, and velocity) and that their relations are grounded in bodily experiences (Roth et al., 1997).

Sometimes it is not enough for students to discuss ways of solving problems. They need to utilize structures that allow for hands-on involvement, movement and interaction with material resources within a field. At home, students figure out how to play new games on their electronic gadgets. When action takes place in this field, new resources become available for participants to use to create new culture. Since fields have no boundaries, this means that practices that produce successful outcomes can be enacted in other fields such as the classroom, as long as there are appropriate structures to afford enactment in that field. According to Swidler, culture has a great impact on one's action as it provides a tool kit of perspectives, symbols, rituals, and experiences that people can use to construct "strategies of actions" (Swidler, 1986). As my students work collectively, they enlarge the problem-solving tool kit in the classroom field, thus increasing the available resource, that is, strategies that students can use.

As Cece bravely placed herself to the front the classroom, this in itself showed her commitment to succeeding in mathematics, and at the same time she revealed herself as a contradiction to the assumption that students like her are not interested in academic pursuits. According to Sewell (1992), structure is created by both the individual and the collective. In this case, even though Cece made an independent decision to ask the class to help her get a better understanding of the problem, whatever happened after that was

going to be a shared experience *in* mathematics learning *with* her peers. The video analysis indicated that as she exerted her agency, her peers also reacted with similar agency. Each gave suggestions and played a role that helped to structure the entire classroom field, constantly creating a dynamic flux of structures that the collective was appropriating towards the common goal of solving the problem. As the interaction went, on I observed that fluency developed. There was a very distinct pattern, almost recursive, between students' agency and the structures that were being appropriated. From a theoretical perspective, schema and practices are woven together by the agency|structure and the individual|collective dialectics. Examination of subsequent tape revealed patterns of new culture that were created along with contradictions. While the new learning culture was benefiting many students and the classroom practices were being shaped differently, there were individuals who were not making use of the new structures - schemas and resources that are made available to assist their learning, and they continued to perform below their potential. Some of those who benefited from the change in classroom structures as well as to their identity such as Cece, Mike and JJ, and who were previously marginalized in other classes in the school by lack of capital and resources to succeed, were now enjoying success in those classes. Because of their shared experience in the mathematics class, which had empowered them, they were able to resist some of the macro school structures by using their agency in positive ways such as planning student tutoring classes after school to create improved learning opportunities, not only for themselves but for others as well.

As a teacher-researcher, I have discovered that many students are being educated in classrooms where teachers still believe that they are the primary source of knowledge.

During cogens, Cece often advocated for student control of classroom learning activities, stating that they learned a lot more when they discussed and used each other as resources. I agreed with her observation, as well as that of Wharton (2009) who stated that, “Although many programs proclaim to be meeting the needs of their learners it is obvious that this is not the case given the teacher is the essential element of the classroom” (p. 5). Using students’ cultural knowledge as tools for making sense of mathematics, Wharton infused her mathematics class with everyday examples that helped to create epistemic objects to, which students could relate and understand mathematics more. In trying to encourage and motivate the adult learners in her General Education Development (GED) class, she wrote, “I told my students they were involved in a *mathematical accident*. The idea of an accident was used to explain students’ behaviors and attitudes towards mathematics. Each student’s injury is different, but with mathematical therapy the damage could be repaired” (Wharton, 2009, p. 9). Her accident metaphor could be useful in explaining to students like Cece, Mike, Charles, and others in my mathematic class who also have had serious damage done to their mathematics learning over the years that there is still hope if they are willing to undergo the mathematical therapy.

Highlights From Students’ Discussions In Cogen: Valuing Everyday Activities--A Rattlesnake And Mongoose

Sometimes students’ discussions in cogens are not directly related to the teaching and learning of mathematics, but they are nevertheless very relevant to their social and emotional development. As such, these discussions are salient to the students’ educational development and learning experiences. In this section I will share highlights and interpretation from one such discussion in, which students talked about simple

everyday activities such as eating food and playing games, and show how these are connected to their learning in school.

Charles, one of the boys in my cogens shared the following story told to him by his grandfather:

When I was a boy, for several days I was confused to find my lunch cookies eaten every morning when I woke up... I decided to pretend to be a sleep one night so that I could see what was eating my cookies...to my surprise I saw a large mongoose making his way up unto my little wooden table in the corner of my room where my cookies were wrapped in brown paper bag...to eat my cookies. I threw a piece of wood at him. From that night I put my cookies in a large jar and locked it tightly.

Meme, another student told a story her grandmother shared with her family. I was scared to death one evening while I was sitting on my verandah combing my hair. I was about fourteen years old. I heard the hissing sound of a snake behind me. I screamed as loudly as I could, and my father ran out to see what was wrong with me. It was a rattlesnake under my chair. He killed it with a broomstick. From that day I remain terrified of snakes.

Students living in cities may never have to worry about a mongoose eating their cookies or a rattlesnake invading their house, but they have far more serious influences and social problems threatening their potential to be successful. While some students shared stories and had fun connecting with each other's culture and upbringing, others described and discussed their everyday activities, many of, which are having negative effects on their lives. Unlike Charles and Meme's grandparents' invaders, today's students' mongooses and rattlesnakes are moral and societal. Advancement in

technology, modernization and globalization have provided cell phones, iPods, MP3 players, microwaves, and the internet; instant communication changes the roles of students and the way business gets conducted. It would however be great if it were possible to prevent some of these invaders from attacking today's youth with cookie jars and broomsticks. However, this is not possible.

The advancement in technology and modernization has provided many conveniences and also delivered people from thieving mongooses and rattlesnakes in their homes, but at the same time they have opened up pathways that have led many youths away from fulfilling their educational dreams. In this study I have learned that many students are struggling to cope with everyday activities in their lives and that schooling is not their number one priority. The ad hoc ways in, which they work and attend school compared to the interest they show in other nonacademic endeavors, is sufficient evidence that there is a decline in the value they place on education.

Neoliberalism And Globalization As Educational Rattlesnakes

According to Tobin (2009), over the last few decades public education systems in the United States and around the world have not escaped the effects of globalization and neoliberalism. Education policies are being made that transform all levels of public schools into competitive market places where principals become CEOs and students are trained how to pass State examinations rather than taught how to become thinkers and creators of knowledge. Tobin noted that,

Although neoliberalism supports human dignity and individual freedom as central values, what is usually meant by freedom is a guarantee that individuals have the freedom to participate in the market and trade. Beyond being able to participate it is

not clear what individuals are free to do and in what ways markets afford equity and social justice, social constructs that pertain to collectives rather than individuals (Tobin, 2009, p. 4).

It appears to me that in 2001 when the *No Child Left Behind* (NCLB) act was passed, a piece of neoliberalism politics, urban school youths were further marginalized and set up to fail as school administrators then had to follow a political agenda that did not have students' learning as its main focus.

In 2004 when I began teaching mathematics in an urban public high school I was upset by the seemingly low level of mathematical understanding that some of these students possessed. I wanted to do something to change the situation, but I found out that there were many hurdles to get across before I could do anything in the public school system. Teachers exerted their power over students, and students had little input into what happened in the classroom. Tobin observed a similar approach to teaching at City High. He explained that, "In rejecting this approach to teaching I wanted students to participate differently in my class and learn to do the same science as youth in the suburbs, or for that matter, as my former students from Australia" (2009, p. 33). Fortunately, I was able to get a transfer to another public high school where I was given permission by the principal to enact schemas and practices that would be able to help another set of disadvantaged inner city youth. I was able to institute cogens and coteaching as change agents to support students' mathematical understanding.

Cogen: Helping Students Cope With Family Crisis--An Agentic Approach

Cogens have served multiple purposes in my class. One of these is that it has been used as a defender of students who are battling the effects of the erosion of their family

life and need the support of others at school to help them defeat this intruding rattlesnake. Cece, employed the discussion strategies that she learned in cogens to help work out a solution to an ongoing feud between her stepmother, her father, and herself. JJ, used the strategies he learned in cogens to convince his chemistry teacher to reassign him to a different group in his chemistry lab where he could get to work with a more productive group and avoid failing chemistry again. From observations and discussions with students, it is clear that they have learned the fundamentals of cogens, and are applying the structures in other fields to afford agency as they try to cope with everyday activities and eliminate or minimize negative influences in their lives.

Some students have stated that cogens provide a safe place where they also feel and experience comfort from each other and where they know that they can meet to discuss problems or share success in a meaningful way. This is something that is lacking in many of their homes, as they either never see their parents or their parents are too busy to stop and listen to them. Some students have also made it a routine to have their own cogens in their group on a daily basis. This has helped them to develop more detailed understandings of specific concepts in ways that fit individual needs and expectations in a non-threatening atmosphere. In this setting, students are more comfortable in using their agency and taking action as they remove social restraints and are not inhibited by their misunderstanding. They know that they are in a safe learning environment and that their opinions are valued. Even when someone laughs, they know that no disrespect is intended, that it is all good humor, and that it should be taken in that light.

Chapter 6

Collaboration, Cogenerative Dialogue And Coteaching In Urban High School

Mathematics Classroom

Why is it that African-American and other minority students remain underrepresented and continue to perform below their potential in mathematics? This question has been asked for decades. Perhaps the most helpful way to understand and answer this question is to understand the history of African-American education in the United States as well as to examine the present state of African-American mathematics education.

Given the history of African-Americans in the United States, a big-picture explanation might suggest that these outcomes are the legacies of mathematical experiences characterized by differential treatment and denied opportunities. Woodson (1990), an African-American historian and educator, discussed this historical legacy point of view as early as 1933:

Negroes, then learned from their oppressors to say to their children that there were certain spheres into, which they should not go because they would have no chance therein for development. In a number of places young men and women were discouraged or frightened away from certain professions by the poor showing made by those trying to function in them... In the same way, the Negro was once discouraged and dissuaded from taking up designing, drafting, architecture, engineering and chemistry (Woodson, pp.50-51).

Contemporary scholars (e.g., Ladson-Billings, 1993) also raised this issue in discussions of mathematics achievement among African-Americans. A review of current literature suggests that there is research devoted to diversity and culturally compatible

pedagogy in mathematics. In many of these studies, researchers have asked whether the curricula and pedagogical styles currently used in schools are compatible with the academic needs and learning styles of African-American and other minority students. In my opinion this points to the fact that there is still the need for much more studies in this area. According to Martin (2000), “If curricula and pedagogy do not connect mathematics to the everyday lives of students in sufficiently meaningful ways, students may disengage from activities that they do not see as important or relevant” (p. 10). The data from this study support Martin’s perspective. Examples of these concepts in action are the focus of this chapter.

The curricular and professional standards of the National Council of Teachers of Mathematics (NCTM 2000) serve as a foundation for the principles of mathematics learning, content, and teaching. To support students’ learning of mathematics, the curriculum requires an approach that will help students value the role of mathematics in real life and build students’ confidence in first understanding mathematical principles and then in applying them to their world. The findings of this study also indicate that to support these curricular goals teachers may want to consider inviting students to become co-constructors of their own knowledge through coteaching, cogens, exploration, discovery, and collaboration.

Cogenerative Dialogue: Examining Patterns Of Coherence And Contradictions

The emergent nature of this study allowed for the discovery of patterns in students’ actions that supported learning and for the recognition of any contradictions to these patterns. Thus, during this research I focused on and investigated further those practices (e.g., teamwork, coteaching, cogen) that seemed to produce the most beneficial results.

Cogen has been used in different ways in urban science classrooms for more than ten years and more recently in mathematics classrooms in New York and Philadelphia. In this research that was conducted in my mathematics classroom, one of the emerging issues was the misalignment between pedagogy and students' culture that has contributed to less-than-optimal achievement for African-American and other minority students. The objective of this study was to find and implement a method that would bridge this misalignment. This ultimately led to the use of cogen as a tool to explore ways to overcome it.

During conversations with students in my cogen I primarily sought to ascertain students' perspectives on their learning of mathematics. I introduced methods of daily journaling and cogen, in, which students shared their experiences, failures, and successes. This provided both me as a teacher-researcher as well as the students themselves with access to different forms of knowledge about African-American and other minority students' ability to succeed in mathematics. Teaching and learning are inseparable events that teacher and students shared.

The discussion about what was and was not working gave students a sense of empowerment, and a feeling that their perspectives and opinions were important and valued by the teacher. Identification of ways to improve the teaching and learning of mathematics became less difficult over time. This pattern of social interaction allowed students to become more and more comfortable in sharing their different perspectives, challenges, and failures as well as their successes. In this mathematics classroom student agency became a social construction that was often motivated by a student's social and symbolic capital within that community. As students learned from each other, this study

revealed an increase in student agency resulting from a heightening of peer and social consciousness and a desire to succeed as others showed that they could. This acted as a catalyst and provided a means of addressing social reproduction and identity transformation that improved student learning.

Why Some Students Are Turned-Off By Mathematics

In my cogens with students, two of the major issues identified as hindrances to their success were the teaching methods of most mathematics teachers and the formal relationships between students and teachers in the classroom. My students complained that most of their previous White and Asian mathematics teachers neither valued their voices nor were sensitive to the differences in cultural learning styles that existed. For the most part students recalled mathematics classrooms where facts, formulas, and algorithms were given with a set of instructions and assignment sheets. Once supplied with this instructional material, they were told to begin working. Opportunity to collaborate with peers and to discover mathematical knowledge on their own or in small groups was very fragmented and superficial. As a result, most students stated that they never truly developed a sound conceptual understanding of the mathematical concepts that were presented in elementary and middle school. Most students also experienced a control-over instead of a collaboration-with relationship with their mathematics teacher. One student remarked, “mathematics is the most boring class for me. I always tell my teachers, but they don’t care.” This and other similar remarks made by students informed me that minority students are concerned about their learning. In this study I implemented structures and strategies (e.g., coteaching) that fostered collaboration among students and between them and me, which greatly enhanced the learning experience and success of

those minority students.

According to Emdin (2007), “once students and teachers establish a productive classroom relationship that affords fluid communication and the valuing of students’ voices, students and teachers co-construct pedagogical techniques and curricular materials that facilitate success in science” (p. 17). In my research the utilization of cogens and coteaching as ways of incorporating students’ voices and sociocultural perspectives into everyday classroom practices, have helped to construct a new learning culture – associated practices and schema – that address the issues stated above, in the classroom field. During this research, based on my ongoing reflection and the incorporation of students’ perspectives into the teaching and learning process, classroom practices were transformed to make the learning environment a truly student-centered one. A salient aspect of this research involves placing issues of student voice and student involvement at the center of the teaching and learning of mathematics in every area, including lesson planning, instruction, and classroom management.

Cogenerative Dialogue And Groups: A Transformative Tool

During this study, several different forms of cogen were used either formally or informally, in an attempt to discover a model that would bridge the misalignment between mathematics instruction and students’ learning. When used in this way, cogen allowed teacher and students to engage in conversations that examined the existing teaching and learning structures. By so doing, opportunities were created for participants to contribute to and to be involved in successful classroom transactions. Forms of cogens varied from one-on-one between individual students and me, to small groups of four-to-six students representing the different tables in the class, to whole class cogen.

My students were accustomed to working in groups of four at a table, but this arrangement had its drawbacks. It lent itself to certain individuals doing all the work, while others talked and contributed very little. Even though it appeared as though the class was getting the work done, many individuals were not learning sufficient mathematics, and this was apparent on test results. What I wanted was to find a way to keep students working in groups but to ensure at the same time that all students were active participants in the learning process. This issue was discussed in full-class, in groups, in one-on-one cogen, and decided to make each table a cogen group having its own facilitator. Each individual would have equal responsibility for the success of the group. The students and I also agreed that the facilitators of the different groups would have the added responsibility to huddle several times during class activities to discuss the progress, accomplishments, and challenges of their groups and to share ideas.

At the end of each lesson, a representative from each group (not necessarily the facilitator), would share that group's successes and challenges to the rest of the class, during a whole class cogen. At this point the goal was to have multiple perspectives in assessing the quality of teaching and learning that took place. By allowing for a polyphonic discourse, this multi-layered approach allowed as many students as possible to contribute their reflections on the lesson. This gave rise to a polysemic perspective that would provide a rich context for judging the alignment or misalignment of instruction and for learning the outcome for the individuals and the collective. As a teacher-researcher, I was in a unique position where I able to consider and respond to students' perspectives by implementing these ideas as part of my plan of action for improving learning and as follow-up discussions and analysis.

Students daily reflections were a very important data source in this study as students were not afraid to express their true feelings and perspectives based on how they were experiencing learning and social life in the classroom. It was from this data source that I learnt that cogens did not solve all of the problems students had. While it was a great tool, and provided the kind of structures that benefited many students, some students even believed that it may have created some problems for them. Collectives, among some of the problems that a few of the students expressed they had were the following: some students felt that only certain students get all the recognition, while others did not get quite the same support from the class; their level of mathematics understanding was still limited even though they managed to succeed because of the help and support received from the group; while they may have benefited by developing better social skills, they did not gain any new mathematical skills or competencies; some expressed the view that the increase pace of the class and the demand for more work make it more difficult for them to cope; there were some tensions over shared decision-making in various groups; some felt that a few students (the more agentic), were having too much power, which led to unequal involvement by others. Even though many of these issues were discussed in cogens, they nevertheless were important concerns that I had to address in redesigning the study as it progressed

Deconstructing Student Roles In Cogenerative Dialogue

According to Martin (2004), “the notion of shared responsibility is central to these [cogenerative] discussions as participants reflect on shared experiences, power relationships, and the differing roles and perspectives of all those involved” (p. 44). Prior to the implementation of cogens in my classroom, at the end of each day’s lesson I would

provide students with a summary of the main ideas and a recap of formulas. During this time, it was unclear to me whether or not students were paying attention or even listening. For most students, this was a signal that the class was over and that it was time to gather their belongings and get ready for dismissal. No general discussions, reflections, or sharing of experiences ensued during or at the end of the lesson.

In the ultimate format of my mathematics class, students were seated in groups of four around tables. While allowing different groups to conduct their own cogen on an as-needed basis during class to ensure that everyone participated equally and learn we discovered that there were certain students who were still not succeeding. Using the whole-class cogen model, we create a plan of action to meet the needs of every student in the class. Students decided to pair up and have one-to-one cogen with their partners. Students felt that underachieving peers should get the opportunity to share their problems and receive specific help in a caring and nurturing relationship that could improve their mathematics achievement.

During formal and informal cogen, I allowed students to share their perspectives on my teaching as well as on their learning of mathematics in the classroom. This shared perspective helped me better understand the collective and individual needs. These classroom conversations and interactions played a central role in identifying and addressing the teaching and learning needs, as participants expressed their thoughts about their individual social and academic situations. Student practices and the way in, which these repeated patterns of interactions afforded student agency (and ultimately mathematics achievement) contributed a wealth of understanding to my pedagogy and its alignment to the sense students could make of what was being taught. The quality of

these conversations and student-teacher interactions was pivotal to the production and social reproduction of a new classroom culture that sought to empower students to take on new roles. I was also challenged to become more accommodating of students' suggestions and to let go of negative perceptions (some societal and others personal), of African-American and other minority students' disposition to learn mathematics.

Using Cogenerative Dialogue And Coteaching To Meet The National Teaching And Learning Standards For High School Mathematics

As we collectively reviewed our teaching and learning practices in cogen and examined our successes and failures, we realized that some of the problems revolved around lack of student involvement and collaboration in the day-to-day classroom activities. According to the NCTM *Teaching Principle*, "Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well" (NCTM, 2000, p.16). According to Martin (2004), cogen provides a neutral field – places and spaces that are physically and temporally defined--within, which the participants in them enact culture and in, which participants examine the conscious and unconscious parts of structure (Sewell, 1992). These components include schema and practices that afford agency in the classroom field. In this way I was able to get a deeper understanding of how students learn mathematics, including a more acute awareness of individual student mathematical development. According to the NCTM (2000), "Teachers actions are what encourage students to think, question, solve problems, and discuss their ideas, strategies, and solutions" (p.18).

Oakes (1990) among others has indicated that African-Americans and other minority students are the predominant groups placed in lower-level academic classes and that

students placed in these classes often receive substandard instruction. Recognizing that African-American and minority students have the same intellectual competencies in mathematics as their White peers the current study addressed the problem of substandard instruction by allowing students to become coteachers with the hope that their involvement would develop an approach in line with both their needs and the State proficiency requirements. Thus, I set high expectations for my students and adhered to the rigorous teaching and learning standards set by the NCTM to ensure that students received high-quality instruction and developed a deep understanding of concepts, problem-solving skills, and reasoning skills.

The incorporation of cogen and coteaching as teaching and learning methods in my research let students experience a different kind of pedagogy. According to Haberman (1991), “the pedagogy typically faced by African-American students is very directive, controlling, and debilitating”(p. 291). This is the same kind of pedagogy my students had experienced according to their testimony, and described in our cogen. Also, according to the National Assessment of Educational Progress (NAEP) teacher survey of 2006, teachers of Black and Hispanic students were more likely to use multiple-choice testing, which concentrates on lower-level skills, than teachers of White students. However, during this study, cogen, coteaching, and student collaboration have provided students with the opposite experience. They had to participate actively and collaborate among themselves and with their teacher.

The NCTM (2000) Learning Principle states that, “Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge” (p. 20). This learning principle is very important for two reasons. First, the

idea that learning mathematics must be done with understanding is essential. High school mathematics requires not only computational skills but also the ability to think and reason mathematically. Second, the principle asserts that students can learn mathematics with understanding. I share this belief, and have very high expectation of all my students.

Cogenerating Changes In Classroom Culture To Improve The Teaching And Learning Of Mathematics

One of the main purposes for implementing cogen in my classroom was to create a new classroom culture in, which students of different sociocultural background and mathematical ability could successful interact and collaborate with each other, despite a number of social problems existing between students of different ethnicities within the classroom. In my classroom there are many students who were born and went to school in different Caribbean countries who have had different educational and social upbringing from their peers who were born in the United States of Caribbean parents. The students who were born in the Caribbean have experienced a very strict and authoritative education system, one in, which students were given information (e.g., algorithms) and asked to memorize them. Also, even among the students who were born in the Caribbean, there are difference in culture among Jamaican and Haitians, and others. Having such a diverse group of learners requires a teacher to allow for shared understanding of cultural differences, acceptance, and tolerance of each other's differences. According to Roth and Tobin (2002), cogen allows participants to "use current understandings to describe what has happened, identify problems, articulate problems in terms of contradictions, and frame options that provide us with new and increased choices for enacting teaching and learning" (p. 252). With this in mind, cogen can be conceptualized as a social field

(Bourdieu, 1986), having no boundaries (Tobin – discussion in research squad meeting), where the agency | structure, the capital production| reproduction, and reproduction | transformation dialects are all present, and deeply intertwined, affording the production of new culture as participants interact with each other. As I introduced new teaching and learning practices to enhance learning, these then structured this social field, and, through a recursive dialectic relationship, students become more agentic, creating a new form of learning culture within the mathematics classroom.

Other researchers such as Martin (2004) noted that, “it is easy to see how the culture that is produced (consciously and unconsciously) in cogenerative dialogue in one field can serve as a resource for the interactions and dispositional practices that get enacted in other cogenerative dialogues and in other fields, such as the chemistry classroom” (p. 121). In the mathematics classroom under study, students used the resources (skills and dispositions) acquired in cogens, to transform their mathematical identity, conduct, and interaction with the content matter and with each other. Bayne (2007) stated that, “It is important to note as well that cogenerative dialogues address unsuccessful, disruptive interactions and other contradictions as well” (p. 26). In my tenth-grade inclusive mathematics classes, cogen played a unified role in bridging the gap between low- and high-achieving students. The effect of having cogen as a safe space where students could articulate their differences without creating further animosity or having their ideas laughed at created new possibilities for student collaboration and the building of solidarity across difference.

In this research, cogens were more than just conversations between participants who shared a common experience. They were common meeting ground where students and

teachers collectively generated plans of action to address the learning needs of students. All participants in the conversation spoke about issues that were important to them, and the group examined these issues.

Teaching And Learning In My Mathematics Classroom: Vignettes, Student As Resource, Teamwork And Cogenerative Dialogue

This section presents an example of teaching and learning in my mathematics classroom. The objective here is to help the reader understand and appreciate the sociocultural teaching/learning framework in the research classroom. This includes but is not limited to teamwork, students as resources for each other, and cogen, which underlay my decision-making during this study. It also highlights the value of discussion among students in constructing mathematical understanding as they developed strategies to overcome obstacles and create the best practice for all to succeed in learning mathematics.

These vignettes took place while students had been working on a unit that examined various aspects and properties of triangles. Because the class was an inclusive one with students functioning at different levels of mathematical understanding and abilities, students were encouraged to work in teams to collaborate and to support each other.

According to Martin (2004), “Characterized as essential to successful cogenerative dialogues, ‘buy-in’ is established by fostering a shared understanding of the roles of participants and the rules and goals of these discussions” (p. 124). This understanding was very critical for my students, especially since many had very low self-esteem about their mathematical knowledge and problem solving skills.

Sharing their ideas in a safe space, and not having their peers laugh at their

understanding or lack thereof was a very valuable resource that allowed students with low self-esteem to increase their participation and to join in discussion in the classroom. I was able to get students to talk about problems and issues that were affecting their achievement in mathematics, and, more importantly, to get the class to believe in and to buy into the idea that they could cogenerate solutions to many of their own problems. Martin (2004) further asserts that a final component necessary to “foster buy-in” is to focus on what Roth and Tobin (2002) call “collective action.” According to Martin, “these shared experiences fostered a community of trust and solidarity with others that enabled us not just to reflect on our beliefs and practices, but also to change them” (p. 124). Over time, I noticed the development of this same belief and disposition among my students as they collaborated more and strove to make learning a team effort. Students also provided vital support for their peers in a restructured classroom atmosphere, where teamwork and positive emotional energy fueled trust and solidarity across differences in mathematical abilities, which resulted in increased student agency and fluency in mathematics.

In reviewing videotapes of classroom lessons I was amazed at the frequency with, which synchronous actions occurred among students, whether those actions were the simultaneous nodding of heads and other body gestures indicating an agreement, the raising of hands together, the use of common language together such as “I get it now,” or just an outburst of laughter because of comments that were made. All these indicated a cohesive group whose collective actions promoted the formation of a new classroom learning culture and the building of solidarity among a diverse group of learners, which I believe resulted from cogen.

While there were many patterns of coherence among most students, not all interactions resulted in positive outcomes for every student. Video analysis also revealed contradictions and showed many examples of students who were not engaged or involved in classroom activities. Cogens served to address many of these contradictions by allowing those students to voice their ideas and reasons for non-participation. Among the reasons students gave for not participating were: personal problems that they were trying to cope with, which included having to work late at their part-time jobs, which left them feeling very tired and sleepy during class; One student related to me in an one-on-one cogen that the reason she was not participating was because she was worried about her mother's relationship with her stepfather. She explained that the two have been fighting, and her mother's face was swollen. She was thinking of running away as she can no longer tolerate living at home; another student explained in cogen that he was not participating in class activities because he really doesn't like math, and that he was totally confused, and was too ashamed to ask for help. These are only a few of many reasons that students have given for not participating in class activities. What is also of interest is the vast amount of non-academic reasons given by students. There seemed to be a complexity of social issues that play significant roles in hindering students' success in schools. These were not treated as exceptions to the norm, as problems to be solved, but rather as a normal part of social life in the classroom environment. Each circumstance was important, and had something to teach. These conversations were also very beneficial to the class as a whole, as students developed a deeper awareness of the struggles and challenges some of their peers had to overcome and of their shared experiences. They allowed the individual members of the class to connect with each other

in a more supporting and caring way.

The following example makes salient the fact that teamwork and cogen, as a regular classroom practice, can have a positive impact on student mathematical understanding, participation, and achievement. It also provided me with an opportunity to incorporate much of the sociocultural theoretical framework that I have learned. Having shared much of this knowledge with my students in cogens, it was not difficult to get the class to buy in and to accept suggested changes. Many of the students, especially Mike, Charles, JJ, Bebe, and Cece had become very agentic and supportive of the research project and had a genuine interest in transforming the learning environment to support improved mathematical understanding and success of the class.

The Interior/Exterior Angle Problem: Moving Towards Success

One lesson, a discussion of the relationship between interior and exterior angles of triangles allowed students to discover the relationship between the exterior angle and the sum of the two remote interior angles. Based on the class's discovery, I wrote the following formula on the chalkboard: ($m\angle 1 = m\angle 2 + m\angle 3$), where $m\angle 1$ is the measure of the exterior angle of the triangle labeled 1 in Figure 3a, and $m\angle 2$ and $m\angle 3$ are the measures of the two remote interior angles.

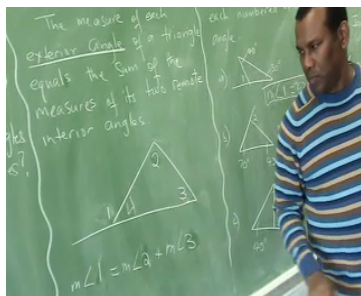


Figure 3a. Samuel writing the relationship between the exterior angle and the two remote interior angles of a triangle.



Figure 3b. Cece at the chalkboard. Samuel and the rest of the class helping her to solve an interior-exterior angle problem.

After I wrote the example on the chalkboard, I walked around the room observing students at work and listening to their discussions. As I listened, Mike was very busy trying to explain the formula to Charles and Cece. Bebe was assisting JJ and Meme, who were still working on a problem from an activity assigned at the beginning of the class. Other students were talking about different problems on a worksheet, which they needed to complete during class.

Mike and Cece's development since the beginning of the study had been substantial. As a result, they had acquired a lot of symbolic capital and used their agency and increased mathematical fluency to assist the class in many different ways. Each exuded a lot of positive emotional energy, and they were not been afraid to ask questions when they didn't understand something or to speak up for themselves, their group, or the rest of the class. Uniquely, Cece developed a keen sense for details and conceptual understanding. I listened to her in discussions with Bebe and Mike several times, and she always refused to accept anything from Bebe without a clear explanation, one, which she understood, and, which made sense to her. This often drew a lot of attention to her group. When questioned about this in cogens, she stated that it helped her to overcome the fears and anxiety she carried for a long time about learning mathematics.

In my mathematics classroom, as in any other field, culture got enacted as social life unfolded and student performed various roles during a lesson. In reviewing classroom videotapes I found several clips that evidenced student success in learning mathematics during this study. However, I chose the vignettes included in this section because they captured a wide array of different actions and interactions. They show evidence of students being a resource for their teacher and for other students and evidence of student

dialogue, positive emotional energy, teamwork, peer support, and solidarity in the classroom field.

The six vignettes also highlight some of the changes that took place in the teaching and learning culture in my classroom as a result of the implementation of cogens and coteaching during this study. Cogens and coteaching have made a lasting impact on students who participated in them, both on an individual level as well as collectively. Students have expressed how their attitudes towards school and mathematics have changed as a result of being involved in cogens. Many have stated over and over again in their reflections, that they are experiencing success, not only in mathematics, but in other subjects as well, and even in their personal relationships because of the discussion skills learnt in cogens. As can be seen in the vignettes, students' roles expanded in many ways. Students took control and responsibility for their own learning and developed a more caring and collaborative identity.

As mentioned above, in this example, the main focus for a meaningful conversation was the shared experience of the class's earning the relationship between the exterior angle and the sum of the remote interior angles of a triangle. This is not a very difficult concept; nevertheless, many of my students, including Cece, were finding it very challenging and were unable to solve assigned problems. I saw that Cece was having difficulty understanding and completing her worksheet, so I decided to ask her to go to the chalkboard to solve one of the problems. I also knew that with her social and symbolic capital, by getting the entire class to focus on helping each other to come to a better understanding of the concept, she would be able to assist many other students who were struggling.

In figure 3a I numbered the exterior angle 1, and the two remote interior angles 2 and 3. During this exercise, I merely acted as a scribe, allowing students to discuss and figure out where the different angles were located. I wrote what they told me. Many students, including Cece, knew what was meant by exterior and interior angles of a triangle, but they were unsure of what was meant by remote interior angles. Students were instructed to look up the meaning in their mathematics text, discuss it in their group, then share and explain it to the class. When a consensus was reached, I was informed, after, which I wrote the formula on the chalkboard as dictated to me by the class (the measure of the exterior angle of a triangle is equal to the sum of the two remote interior angles).

Collaborating with students in this way and getting them to focus on their work and on what they were each saying, reduced the power differential between teacher and students and broke down social barriers that oftentimes mediated against students' participation and hindered learning, especially among already marginalized students. During discussion of what went well in this lesson in whole-class cogen, students identified instances where they thought I should have told them the answers to questions, but they noted that, when I did not, they were forced to discuss it with each other and that they came up with the correct answers on their own. This they thought was very positive, as it boosted their self-esteem, and they had more confidence to confront other challenges together without my help. Thus, students realized that they could be valuable resources for each other and that I was not the only resource available to them in the classroom.

Cece had experienced a change in her identity that had expanded her roles both in the classroom and in her family. This was another reason for selecting these vignettes that involved her. Her many roles in class and her identity transformation supported her

commitment to be successful in mathematics and in school, despite the fact that she learned very little mathematics in middle school. In the classroom, she had become very agentic and used her agency and social capital to enhance her own, as well as others, learning of mathematics.

In this vignette Cece is standing at the chalkboard trying to figure out, which angles were the remote interior angles of the triangle on, which she was working. The vignette also shows the structure of the class during board work, and especially during cogens and discussions. During these times the rest of the class always moved forward towards the chalkboard, and I would sit at a table between students. This movement was due to a direct request made by Charles in cogen. Here is what Charles said:

Charles: I feel it would be better if we sit closer together when we do our work.

Teacher: Why?

Charles: Because it makes me feel like everybody is friends. Sometimes you should sit with us to Mr. J.

Whereas usually, students sat at their tables, and I sat at my desk at the front of the class, in response to this brief conversation, the class and I decided that we would restructure the classroom so that tables were right next to each other and that we would sit together during discussions.

This restructuring of the classroom helped to create a closer-knit community. Students became more focused and engaged in the lessons. More students seemed less timid, interacted with others, and exhibited more agency. The English as a Second Language (ESL) students interacted more fluidly with the rest of the class, and they benefited greatly through more collaborative work. Students also enacted a similar seating arrangement in their Social Studies and Earth Science classes resulting in improved academic success in both classes, according to the teachers of those classes.

Even though this was not a new or original idea, as students have been sitting like this in Gym class and even in the cafeteria, it made a marked difference in the mathematics classroom. As students and I engaged in a conversation about the lesson we developed very different ways of interacting about the same problem.

We watched as Cece recreated a drawing of the triangle in her problem and proceeded to label the angles with numbers just like the ones I had drawn in Figure 3a. While she was at the chalkboard with her back to the class, her peers were busy having discussions and figuring out the problem. However, no one shouted out the answer, as everyone wanted to give her a chance to figure it out by herself. This was a previously agreed-upon protocol to, which the class adhered during board work. I mention this because it speaks to the importance of being able to support others' learning by being part of a team that obeys rules. In the vignette, Mike was explaining to Charles how he figured out the angles. As he watched, Cece wrote different incorrect combinations of pair of angles for the two remote interior angles, he had to restrain himself from shouting out the correct answer. He kept making sounds like "Oooch!" and Charles had to remind him to be quiet. Bebe also turned around and looked at him sternly, after, which he began to make drawings in his notebook. After spending some time at the chalkboard in silent contemplation and failing to figure out the correct angles, she then turned around and asked the class for help.

As I reflected on this vignette, I thought about the many ways in, which Cece and several other students reconnected to the learning of mathematics. On several occasions Mike verbalized that if weren't for cogen and the opportunity to work in an environment where students support each other, he would probably have dropped out of school. Cece,

by standing at the chalkboard for a long time trying to figure out the problem and refusing to give up, also spoke volumes about her new math identity and changed attitudes. In cogens, Cece often spoke about how she had been inscribed and stereotyped by others mainly because of her ethnicity and mode of dress. As the debate continues regarding African-American and minority students learning mathematics in urban schools, the prevailing notion is that these students lack competence and interest. However, this vignette reminds me that this notion is not true, and that minority students can become very much interested in learning mathematics if teachers create the kind of environment that affords them a fighting chance to succeed.

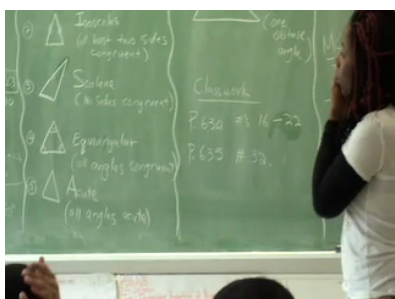


Figure 4a. Cece unable to figure out the answer to her problem, but looking back at the diagram and formula in Figure 3.

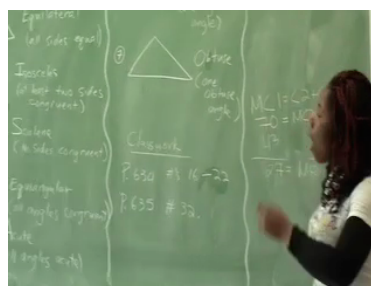


Figure 4b. With the help of the class, Cece got a better understanding of the problem.

Even after Cece was unable to identify the correct pair of angles for the remote interior angles of her triangle, she still refused to give up or to accept help from her classmates at this point. JJ inquired:

JJ: Cece, do you want us to help you?

Cece: Not yet JJ. Let me look at Mr. Jackson's triangle first.

Mike: I got you girl. I have it right here.

Cece: No Mike! Don't tell me. I want to figure this out.

Mike: If you say so.

The vignette shows that Cece became very focused and carefully examined the positions of the angles in my triangle. She decided to take the risk of figuring things out

by herself. Normally she would let the class help her and do much of the thinking for her, but this time she was determined that she could do it on her own. When asked about this decision in cogen, she explained that she understood the concept but had problems at first because she did not know that the interior angle next to (adjacent- angle 4 in Figure 3a) the exterior angle was not one of the remote interior angles.

I had deliberately changed the orientation of the drawing and the position of the exterior angle in the problem that Cece was solving to check for conceptual understanding. Her problem had the exterior angle extending in the opposite direction to the diagram I had on the board. Initially, this change proved very confusing and made the problem very difficult for her. She explained that she was trying to compare her triangle with mine and record angles in similar positions as it relates to the triangles position on the chalkboard. She recorded one of the remote interior angle and the angle adjacent to the exterior angle. This was incorrect, but she couldn't figure out why.

Eventually, she asked the class for help but told them not to tell her the answer. She only wanted to know what she was doing wrong. A few people made suggestions that weren't exactly correct. Finally, I entered into the conversation when I realized that no one had a correct explanation. I explained the idea of remote interior angles relative to the exterior angle, and explained about the interior angle that was adjacent to the exterior angle, and the positions of the other two interior angles. After my explanation, I believed that the class, including Cece, had a much better understanding.

This vignette also showed the use of body language and facial expression in communicating of emotions. Cece placed her left hand on her cheek, her head leaned slightly to the left, and she had a very puzzled look on her face. She was carefully

examining my triangle and trying to understand the diagram. Listening to the videotape recording, I could hear her faintly saying “Hmmm” several times as she seemed to get some insight and understanding of the problem. The tape also revealed that she moved closer and then away from both her triangle and mine a few times, and on two occasions she tilted her head in an almost horizontal position when viewing her triangle, as if to align her vision with the direction of a line connecting the remote interior angles. After a short time, Cece finally figured out the correct angles. This moment was captured in the next vignette.

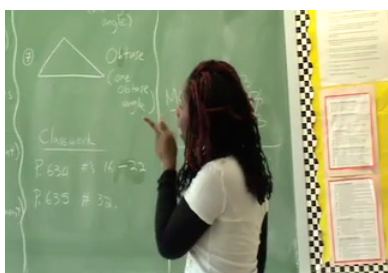


Figure 5. With the help of the class, Cece finally got the problem figured out.

“Oh, see,” Cece shouted excitedly, “I see my mistake now. The remote exterior angles are not next to the exterior angle!” She exclaimed. With her mouth wide open, and a look of delight on her face, she ran back and forth in front of the chalkboard screaming. “Look at Mr. Jackson’s drawing!” [Urging her classmates to focus on the diagram in Figure 3a], “Let me show you now!” said Cece to the class. It was a victorious moment for her, and she was really happy. The class, especially Bebe, was also happy that she finally got it correct. For a moment I wondered if I was in a mathematics class. I didn’t know that students could get so excited about mathematics. I got the feeling that I had just witness a favorite sports team score a major win over an arch rival, and all the fans were celebrating.

These two vignettes also captured a lot of Cece's body language and facial expression at the point of her success. They showed her emotionally responding with excitement by opening her mouth widely as she said repeatedly, "Oh, I get it now! I get it now!" The vignettes clearly indicate that she experienced victory and was relieved that she had found the solution to her problem.

The class reaction to Cece's success based on the conversation that followed informed me that students felt empowered and believed that they all have the ability to succeed in mathematics. Bebe stated that she knew Cece would figure out where she was going wrong, because, since Cece started to coteach with her, Cece's attitude towards learning had changed so much. I, too, experienced a change in my identity as a teacher because of the agency students exhibited towards learning. My participation in these conversations within the class helped me understand and realign my instruction in praxis (in the moment) so that the learning needs of students were met. According to Martin (2004), "once a community of people share a feeling of solidarity, the positive emotional energy shared by the collective can be transferred to the individual and can be used to make change" (p. 127). During this study, I was not afraid to admit that some of my teaching practices were not meeting the needs of students and made the necessary changes required to support students' learning better.

Cece was now filled with confidence that she understood how to solve interior/exterior angle problems. She requested that I allow her to demonstrate her knowledge by going over the problems on the work sheet with the class on the chalkboard. The class agreed to let her play the role of teacher in this exercise. With the help of the class, particularly her friend Bebe, she first re-examined the problem that she

was assigned, and solved it correctly. The videotape recording revealed that a short dialogue between Cece and a few of her classmates ensued as follows:

Mike: "Oh wow! That's interesting." [making fun of Cece].

Cece: [just laughed]

Bebe: Good job!

Cece: Thank you.

JJ: Cece...try number three on the worksheet. [offering Cece his worksheet]



Figure 6. Bebe helping Cece to get her answer correct by pointing to an error in her calculation.

Ethnographically I want to describe Figure 6 as showing the mutual focus of students on what Cece was doing on the chalkboard. Students had their bodies oriented so that they were facing the chalkboard.

Students sitting towards the back and along the sides of the tables can be seen leaning forward, making eye contact with each other. With hands raised, they waited

to be invited to have a turn at talk. This display of cooperation and mutual respect, behaviors learned in cogens, served to build solidarity and enhanced teamwork. Respect for each other's ideas and experiences was severely lacking prior to students' involvement in cogens. Creating a classroom culture, which embraced polysemy and polyphony allowed us the opportunity to address and resolve many social issues that normally prevented a diverse group of students from working together successfully.

In Figure 6, Bebe is seen pointing out a calculation error that Cece had made. Bebe was able to move the problem-solving exercise forward by controlling the amount of unnecessary interruptions by students who wanted to have other non-related conversations. I interpreted this as a student taking the initiative to ensure that the class

stayed focused on the task at hand. By using her social and symbolic capital from being in cogens and coteaching several times in the class, Bebe not only kept the class focused, but she was also able to deal safely with breaches, especially allowing people turns at talk. In one instance when Mike started to interrupt Charles, she turned around and stared at him. This action was enough to get Mike to abort his interruption. He, like many of the students in the class, had developed respect for Bebe because of her mathematical ability and concern for their learning.

Chapter 7

In Closing: Highlights And Lessons Learnt From The Study

In this final chapter, I re-examine some of the findings from this study and discuss the implications of the research for educating African-American and other minority students. I also suggest that cogen and coteaching be considered as means of transforming teaching and learning in urban classrooms where marginalized students are being educated in less-than-optimal conditions.

This dissertation focuses on improving the teaching and learning of mathematics in urban schools for African-American and other minority students. The question of how to teach African-American and other minority students in urban classrooms has been an important issue of contention in education research and policy for the last few decades. Who our students are, to a large extent, determines how we teach them. Also, as this study has shown, the school and classroom structures, student-teacher relationship, expectations, belief about student knowledge, culture, and ability to succeed are important factors affecting how both students and teacher function in the classroom.

My students played important roles as co-researchers in this two-year-long ethnographic study conducted in a Queens, New York high school in, which I employed cogen and coteaching as the two central research methods for connecting with students socially, culturally, and academically, as I believe in a polyphonic and polysemic characterization of our classroom experiences. This is central in understanding how African-American and other minority students interact, construct knowledge, and experience learning in urban schools. Different theories were utilized at different times to make sense of the class's practices and understandings as new outcomes were produced

as the study progressed. At the same time, my identity along with the students' identities was constantly being transformed by the experiences in the classroom.

At different stages of the research, the changing focus, ontology, and epistemology dictated the theoretical method that was employed. For example, during the analysis of cogens, I used a combination of sociocultural theory (Sewell, 1992; Tobin, 2006), theory of emotions (Collins, 2004; Turner, 2002), and theory of conversation and discourse analysis (Roth, 2006) of naturally-occurring talk and actions, to make sense of what was happening and why it was happening in the classroom. During the analysis of coteaching, in addition to the theoretical lens used in the analysis of cogens, I included theory of coteaching (Roth & Tobin, 2002), standpoint theory (Sandra Harding, 1998), and concepts such as structure | agency (Sewell, 1998), and agency | passivity (Roth, 2007), dialectic intrapersonal | interpersonal agency, authenticity criteria (Tobin, 2006), and others to interpret the individual and collective perspectives and to assign meaning to social life as experienced in the mathematics classroom in, which students and teacher collaborated to improve learning opportunities.

In the classroom the main focus was on using the research findings to improve students learning. Multiple data resources such as videotapes, field notes, one-on-one interviews, cogen, and students' work were used to inform and support my decisions as the study progresses. Cogens and video analysis played the most important roles. Video analysis provided critical support at the micro level for transactions that occurred at the classroom or meso-level. This was used to identify patterns of coherence and contradictions in classroom activities, which not only served as a formative assessment tool but guided the direction of this study. The objective was to use the microscopic

analysis to provide further concrete evidence either to support the mesoscopic claims, or to disprove them. Making sense and understanding what was going on in the classroom was an extremely important part of the analysis and allowed me to understand further how the collective and individual interactions created structures either afforded the teaching and learning of mathematics classroom or truncated it. In addition throughout this study, I explored how the culture developed in cogens could be transferred to the mathematics classroom to transform existing structures and increase students' agency and to create a more socially- and culturally-aligned classroom that will be more student-centered and successful.

I contend that one of the ways that I was able to connect with students in this study and was able to transform classroom practices was by recognizing and valuing students' cultural capital and then using this to build social capital with them. I decided that I would go against the traditional teacher model, which delivers all the power to the instructor, and to include students in every classroom decision and, by so doing, significantly reduce the power differential between teacher and students. Through the implementation of cogen and coteaching, students and I were able to collaborate and have co-responsibility for teaching and learning mathematics. I learned from the study that when students became emotionally connected to classroom practices and owned them, participation and learning followed these positive experiences. After many cogens in, which students expressed their skepticism and negative experiences in school, I concluded that the building of positive, mutually-respected relationships between teacher and students, regardless of race or socio-economic status, was one of the most important factors in having successful classroom interactions and in building solidarity.

Through coteaching and cogens students were able to find ways of structuring their learning experiences to increase their agency and to enhance collective learning. In this study students focused on bridging the gap between low- and high-achieving students and diverse groups in my mathematics classroom. According to Elmesky (2001), “for a study that is concerned with social transformation and student agency, a research process that encourages action and change or catalytic authenticity is extremely important” (p. 75). Students’ acceptance of cogen and their enthusiasm in helping to create an improved learning culture demonstrated how this study afforded and developed their agency. One student, Cece, even had cogens with her family and solved a difficult family problem that had been unresolved for years.

African-American and other minority students continue to perform lower than White students. In addition, high school graduation rates of African-Americans remain low, and these students are also underrepresented in Advanced Placement and upper level courses (*The Manhattan Institute’s report, April 19, 2006*). These were crucial facts and motivating points that were considered in this study. Simply putting students of diverse backgrounds and mathematical abilities and competence into one setting with access to the same resources did not bridge the educational disparities between Whites and minorities, or between diverse learners. Instead, the commonly cited achievement gap suggests the need to examine critically how socially-, historically-, culturally-, and racially-constituted circumstances get negotiated within classrooms in urban schools that serve predominantly African-American and other minority students whose teachers are mainly White. Current research also asserts that there is an urgent need to reexamine this gap as students and teachers come from essentially different social and cultural

backgrounds and have always had great difficulty in interpreting the actions of the other (Tobin, 2005).

Throughout the two years of this study, a number of different questions helped to guide it along at different times. However, the following were the two overarching questions that remained throughout:

- a) How do urban African-Americans and other minority high school students use their stock of knowledge to learn mathematics from experiences in a variety of fields that are salient to their life-world?
- b) How does participation in cogens and coteaching afford transformation and reproduction of mathematics education, expansion of agency and multiple-identities, and produce cultural adaptation, synchrony, and solidarity?

As I thought about the experiences I have shared with African-American and minority students as a teacher-researcher in this study, I also reflected on the recommendations of many other studies that had been done in similar schools, emphasizing the importance of teachers building capital with students (e.g., Elmesky, 2001). This study also makes that recommendation based on the successful teacher-student relationship that developed and propelled it to a successful end.

By making a conscious decision to include students as active participants in this study, I was able to see how powerful teachers' decisions are in structuring the learning environment and in affecting students' achievement. Before this study I was the kind of teacher who always exercised my power over students, as I thought that most students needed strict discipline in the classroom in order to get their work done and to achieve academic success. I never thought to collaborate with students or to listen very much to

their perspectives. This was a big misconception on my part that built negative emotional energy and alienated many students from mathematics. This research has taught me that students can play very important roles in their own education, and the extent to, which teachers afford them the opportunity to create a new learning culture will determine whether or not the cycle of debilitating social reproduction gets broken.

The experiences that characterize the co-construction of mathematic knowledge between African-American and other minority students in this study provide a significant interpretive framework with, which to examine and make sense of outcomes in mathematics achievement in urban classrooms. By highlighting students' experiences and contributions to their own mathematical success and identity transformation in this study, mathematics educators and future researchers can identify key components of my theoretical framework, which are vitally important and can be used to improve the teaching and learning of mathematics in different ways, and among different groups of learners. For example, this study revealed that despite strong school policies and hegemonic force pushing in the direction of teacher-centered classroom instruction for the sole purpose of producing higher pass rate on State exams, students do not have to be passive recipients of these influences. Cece and others have demonstrated that by using their agency to become active participants in the mathematics classroom, they can overcome negative mathematics experiences by becoming coteachers-actively constructing new meaning and culture-for improved mathematics teaching and learning for individual and the collective. Students were able to exercise a great deal of agency for increased mathematical understanding, the production of social capital, and the building of solidarity across difference.

In this study, cogen was a vital theoretical and methodological tool that chiseled away the traditional teacher power over/control, and created a safe space where teacher and students could exchange capital. Cogen not only addressed the vertical but the horizontal power differential. In my class there were many different ethnic groups, each trying to control the others. Through cogens, power was evenly distributed, and participants took collective responsibility for creating a more equitable learning environment and a friendlier atmosphere. One of the cardinal rules of our cogen was that no person's voice should be privileged. At the center of these discussions was the consideration only for the collective good of the class. All matters of concern to each participant were given equal respect and attention, and a genuine effort was made to cogenerate a plan of action to address the situation. By its design, cogen also allowed for mutual focus and the building of respect for all participants. This was important for the building of solidarity across a very diverse group of learners from varied backgrounds, cultures, and socio-economic status.

What I also found interesting was the extent to which students were able to narrow their wide-ranging lived experiences during discussions of various mathematical concepts, and to make parallels and form relationships, which focus on illuminating different ways of knowing and learning. This provides supporting evidence that urban African-Americans and other minority high school students use their stock of knowledge to learn mathematics from experiences in a variety of fields that are salient to their life-world. As student became motivated, they took control of their own learning and were determined to invest more time to become successful. Those who lack the motivation received support and encouragement from their peers to help them overcome such

negative feeling. The few who were still performing at levels below their potential attributed this to their long-standing continuous negative experiences and beliefs about their ability to learn mathematics.

The findings of this study have important implication for practice and policy in urban education. I have found that cogen and coteaching afforded students agency to contribute to their own education by being involved in and reflective about teaching and learning. This research has implications for future studies of teaching and learning and the way students experience mathematics in the classroom. As participants in cogens, students became empowered to be co-constructors of learning opportunities within the classroom. This has far-reaching catalytic potential to create a new learning culture that could improve students' achievement across subject areas and multiple classrooms. My position as a teacher-researcher enabled me to introduce cogen and coteaching as part of my daily classroom teaching practice. In this way, I experienced the opportunity to involve students in this research as active participants. This practice is in alignment with the emergent research design that allows for simultaneous analyses and modifications of the research to meet the learning needs of students. As such, this research has implications for inspiring more teachers to conduct research as teacher-researchers in their own classrooms, and to re-examine their beliefs about urban minority students' ability to succeed in mathematics. This study has changed my own teaching practices, the way I interact with students, and my views about African-American and other minority students' ability to succeed in mathematics.

The available literature on African-American and other minority students' mathematics learning and achievement in urban schools would lead us to believe that

failure is inevitable. However, the day-to-day experiences and results from this study revealed an opposite outcome when appropriate classroom structures are provided, and a curriculum, which incorporates students lived experiences is used to connect mathematical ideas to students learning. One of the most important mathematical outcomes from this research is the production and reproduction of successful classroom structures, practices, and learning environments, with the implication that there will be more opportunities for students from culturally diverse minority backgrounds to succeed in urban mathematics classrooms.

References

- Abbas, A. O. (1997). The teacher's role in college level classes for non-science majors: a constructivist approach for teaching prospective science teachers. (Doctoral dissertation, The Florida State University, 1997).
- Anyon, J. (1997). *Ghetto schooling: A political economy of urban educational reform*. New York, NY: Teachers College Press.
- Bayne, G. U. (2007). Identity, culture and shared experience: The power of cogenerative dialogues in urban science classrooms. (Doctoral dissertation, City University of New York Graduate Center, 2007).
- Bayne, G. U. (2009). Cogenerative dialogues: The creation of interstitial culture in the New York metropolis. In W-M. Roth, & K. Tobin, (Eds.) *World of science education: North America*. (pp. 513-527). Rotterdam, The Netherlands: Sense Publishing.
- Boaler, J. (2006). Urban success: A multidimensional mathematics approach with equitable outcomes. *Phi Delta Kappan*, 87, 364-369.
- Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge, MA: Cambridge University Press.
- Bourdieu, P. (1986). *The forms of capital*. New York, NY: Greenwood Press.
- Boykin, A. W. (1986). The triple quandary and the schooling of Afro-American children. In U. Neiseser (Ed.). *The school achievement of minority children: New perspectives* (pp. 57-92). London, England: Lawrence Erlbaum.
- Boykin, A. W. (1994). Harvesting talent and culture: African American children and educational reform. In R. J. Rossi (Ed.), *Schools and students at risk: Context and framework for positive change* (pp. 116-138). New York, NY: teachers College Press.

- Brown, A. L., (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions. *Journal of the Learning Sciences*, 2, 141-178.
- Calabrese Barton, A. (2001). Science education in urban settings: Seeking new ways of praxis through critical ethnography. *Journal of Research on Science Teaching*, 38, 899-917.
- Daniels, H., & Zemelman, S. (2004). *Subject matter: Every teacher's guide to content area reading*. Portsmouth, NH: Heinemann.
- Darling-Hammond, L. (1994). *The current status of teaching and teacher development in the United States*. Background paper for National Commission on Teaching and America's Future. (Eric Document Reproduction Service No. ED 379 229).
- Elmesky, R. (2001). *Struggles of agency and structure as cultural worlds collide as urban African-American youth learn physics*. (Unpublished doctoral dissertation, The University of Pennsylvania).
- Elmesky, R., & Tobin, K. (2005). Expanding our understandings of urban science education by expanding the roles of students as researchers. *Journal of Research in Science Teaching*, 42, 807–828.
- Emdin, C. (2007). Exploring the contexts of urban science classrooms: Cogenerative dialogues, coteaching, and cosmopolitanism. (Doctoral dissertation, The City University of New York, 2007).
- Erickson, F. (1986). Qualitative research on teaching. In M. C. Wittrock (Ed.), *Handbook of Research on Teaching* (3rd ed.) (pp. 119 – 161). New York, NY: MacMillian.
- Erwin, J. E. (2003, September). Giving Students What They Need. *Educational Leadership*, 61(1), 19-23.

- Ford, B. A. Obiakor, F. E., & Patton, J. M. (1995). *Effective education of African American exceptional learners: New perspectives*. Austin, TX: Pro-Ed.
- Foucault, M. (1972). *The archaeology of knowledge*. New York, NY: Pantheon
- Freire, P. (1970). *Pedagogy of the oppressed*. New York, NY: Continuum.
- Friedman, T. L. (2005). *The World is Flat: A Brief History of the Twenty-First Century*. New York, NY: Farrar, Straus and Giroux.
- Garfinkel, H. (1967). *Studies in ethnomethodology*. Englewood Cliffs, NJ: Prentice Hall.
- Gasche, R. (1986). *The tain of the mirror: Derrida and the philosophy of reflection*. New York, NY:Harvard University Press.
- Goffman, E. (1983). The interaction order: American sociological association, 1982 presidential address. *American Sociological Review*, 48, 1-17.
- Greene, J. P. (2001). *High school graduation rates in the United States*. The Manhattan Institute for Policy Research. (Nov. 2001 report). Retrieved from http://www.manhattan-institute.org/html/cr_baeo.htm
- Greene, M. (1995). *Releasing the imagination: Essays on education, the arts, and social change*. California, CA: Jossey-Bass.
- Greene, M. (1997). The passion of pluralism: Multiculturalism and the expanding community. In S. Cahn (Ed.) *Classic and contemporary readings in the philosophy of education* (pp. 510-521). New York, NY: McGraw-Hill.
- Haberman, M. (1991). The pedagogy of poverty versus good teaching. *Phi Delta Kappan*, 73, 290-94.
- Hall, P. M., & McGinty, P. J. W. (1997). Policy as the transformation of intentions: Producing program from statues. *The Sociological Quarterly*, 38, 439-467.

- Hall, S. (1990). Cultural identity and diaspora. In P. Williams & L. Chrisman (Eds.), *Colonial discourse and post-colonial theory* (pp. 392–403). New York: Columbia University Press.
- Harding, S. (1998). *Is science multicultural? Postcolonialisms, feminisms, and epistemologies*. Bloomington, IN: Indiana University Press.
- Hooks, B. (2004). *Rock my soul: Black people and self-esteem*. Simon & Schuster: Atria.
- Hutchins, E. (199). *Cognition in the wild*. Cambridge, MA: MIT Press.
- Johnson, M. L. (1989). Minority differences in mathematics. In M. M. Lindquist (Ed.), *Results from the fourth mathematics assessment of the National Assessment of Education Progress* (pp. 135-148). Reston, VA: National Council of Teachers of Mathematics.
- Kincheloe, J. (2001). *Getting beyond the facts: Teaching social studies / social sciences in the twenty-first century* (2nd. Ed.). New York, NY: Peter Lang.
- Kincheloe, J. (2008). The vicissitudes of critical pedagogy: Critical research and the bricolage. *The Paulo and Nita International Project for Critical Pedagogy*. Retrieved April 30, 2009, from <http://freire.mcgill.ca/content/vicissitudes-critical-pedagogy%3A-critical-research-and-bricolage>.
- Kincheloe, J. L., & Steinberg, S. R. (Eds.). (2007). *Cutting class: Socioeconomic status and education*. Lanham, MD: Rowman Littlefield.
- Kozol, J. (1991). *Savage inequalities: Children in America's schools*. New York, NY: Crown.
- Ladson-Billings, G. (1993, March). *Skills and other dilemmas revisited: Issues of equity and achievement in mathematics*. Paper presented at the research presentation of the

- annual meeting of the National Council of Teachers of Mathematics, Seattle, WA.
- Lattimore, R. (2005). Harnessing and channeling African American children's energy in The mathematics classroom. *Journal of Black Studies*, 35, 267-283.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York, NY: Cambridge University Press.
- Lloyd, R. J., & Smith, S. J. (2006). Motion-sensitive phenomenology. In K. Tobin & J. Kincheloe (Eds.). *Doing educational research: A handbook* (pp. 289-309). Rotterdam, The Netherlands: Sense Publishers.
- Lubienski, S. T. (2006). Examining instruction, achievement, and equity with NAEP mathematics data. *Education Policy Analysis Archives*, 14(14). Retrieved August 29, 2009, from <http://www.epaa.asu.edu/epaa/v14n14/>.
- Lucas, T. & Villegas, A. M. (2002). Preparing culturally responsive teachers: Rethinking the curriculum. *Journal of Teacher Education*, 53(1), 20-30.
- MacLeod, J. (1995). *Ain't no makin' it: Aspirations and attainment in a low-income neighborhood*. Boulder, CO: Westview Press.
- Martell, R. F., & DeSmet, A. L. (2001). A diagnostic-ratio approach to measuring beliefs about the leadership abilities of male and female managers. *Journal of Applied Psychology*, 86, 1223-1231.
- Martin, S. N. (2004). *The cultural and social dimensions of successful teaching and learning in an urban science classroom*. (Doctoral dissertation, City University of New York Graduate Center, 2004).
- Martin, D. B. (2000). *Mathematics success and failure among African-American youth: The roles of sociohistorical context, community forces, school influences, and*

individual agency. Mahwah, NJ: Lawrence Erlbaum.

Nasir, N. (2002). Identity, goals, and learning: Mathematics in cultural practice.

Mathematical Thinking and Learning, 4, 213–248.

National Center for Educational Statistics (1997). *The condition of education, 1997*.

Washington, DC: U.S. Department of Education.

National Council of Teachers of Mathematics (2000, NCTM). *Principles and standards for school mathematics*. Reston, VA.: National Council of Teachers of Mathematics.

Neo, M., and Neo, K. (2002). Building a constructivists learning environment using a multimedia design project – a Malaysian experience. *Journal of Educational Multimedia and Hypermedia*. 11(2), 141-153.

Nieto, S. (1992). We speak in many tongues: Language diversity and multicultural education. In C. P. Díaz (Ed.), *Multicultural education for the Twenty-first Century* (pp. 112-136). Washington, DC: National Education Association.

Nieto, S. (2000). Affirming diversity: The sociopolitical context of multicultural education (3rd ed.). New York, NY: Longman.

Resnick, L. B. (1991). Shared cognition: Thinking as social practice. In L. B. Resnick, J. M. Levine & S. D. Teasley (Eds), *Perspective on socially shared cognition*.

Washington, DC: American Psychological Association, pp. 1-22.

Roth, W. M. (1999). Discourse and analysis in school science laboratories. *Discourse Processes*, 28(1), 27-60.

Roth, W. M. (2006). Conversation Analysis: Deconstructing social relations in the making. In K. Tobin & J. Kincheloe [Eds.] *Doing educational research: A handbook* (pp. 235-267). Rotterdam, The Netherlands: Sense Publishing.

- Roth, W. M. (2007). Theorizing passivity. *Cultural Studies of Science Education*, 2, 1-8.
- Roth, W. M., McRobbie, C., Lucas, K. B., & Boutonne, S. (1997). The local production of order in traditional science laboratories: A phenomenological analysis. *Learning and Instruction*, 7, 107-136.
- Roth, W. M., & Tobin, K. (2001). The implication of coteaching/cogenerative dialogue for teacher evaluation: Learning from multiple perspectives of everyday practices. *Journal of Personal Evaluation in Education*, 15, 1, 7-29.
- Roth, W. M., & Tobin, K. (2002). *At the elbow of another: Learning to teach by coteaching*. New York, NY: Peter Lang.
- Roth, W. M., & Tobin, K. (Eds.). (2007). *Science, learning, identity: Sociocultural and cultural-historical perspectives*. Rotterdam, The Netherlands: Sense.
- Russo, P. (2004, February), What makes any school an urban school? Retrieved from http://www.oswego.edu/~prusso1/what_makes_any_school_an_urban_s.htm
- Secada, W. G. (1995). Social and critical dimensions for equity in mathematics education. In W. G. Secada, E. Fennema, & L. B. Adajian (Eds.), *New directions for equity in mathematics education* (pp. 146-164). New York, NY: Cambridge University Press.
- Seiler, G. (2002). *Understanding social reproduction: The recursive nature of structure and agency within a science class*. (Doctoral dissertation, University of Pennsylvania).
- Seiler, G., & Elmesky, R. (2007). The role of communal practices in the generation of capital and emotional energy among urban African American students in science classrooms. *Teachers College Record*, 109, 391-419.

- Seiler, G., Tobin, K., & Sokolic, J. (2001). Roadblocks on the path to understanding science and technology. *Journal of Research on Science Teaching*, 38, 746-767.
- Sewell, W. H. (1992). A theory of structure: Duality, agency, and transformation. *American Journal of Sociology*, 98, 1-29.
- Shaw, M. A. (1993). *African-American strategies of successful adaptation in response to diseducation: A phenomenological investigation*. (Doctoral Dissertation, University of Northern Illinois, 1993).
- Siry, C. (2009). *Creating an authentic approach to elementary science teacher education, United States* (Doctoral dissertation, City University of New York Graduate Center, 2009).
- Smith, D. (1997). Phenomenology, methodology and method. In J. Higgs (Ed.), *Qualitative research: Discourse on methodologies* (pp. 75-80). New York, NY: Routledge.
- Steinberg, S. R., & Kincheloe, J. L. (1997). *Kinderculture: The corporate construction of childhood*. Boulder, CO: Westview Press.
- Taylor, P. C., & M. Campbell-Williams (1993). Discourse towards balanced rationality in the high school mathematics classroom: Ideas from Habermas' critical theory. In J. Malone & P. C. Taylor (Eds.), *Proceedings to Topic Group 10 of the Seventh International Congress of Mathematics Educators (ICME-7)*: University of Quebec, Canada: Key Centre for School Science and Mathematics, Curtin University of Technology.
- Ten Have, P. (1999). *Doing conversational analysis*. London, England: Sage.
- The Manhattan Institute's report online. (2006). *New York's high school graduation rate*.

Retrieved September 1, 2009 from www.manhattaninstitute.org/html/cr_48.htm#10

Tobin, K. (2005). Urban science as a culturally and socially adaptive practice. In K.

Tobin, R. Elmesky, & G. Seiler (Eds.). *Improving science education: New roles for teachers, students and researchers* (pp. 21-42). New York, NY: Rowman & Littlefield.

Tobin, K. (2006b). Learning to teach through coteaching and cogenerative dialogue. *Teacher Education*, 17, 133-142.

Tobin, K. (2009). Tuning into others' voices: radical listening, learning from difference, and escaping oppression. *Cultural Studies of Science Education*, 4, 505-511. DOI: 10.1007/s11422-009-9181-x.

Tobin, K., & Kincheloe, J. (2006). *Doing educational research: A handbook*. Rotterdam, The Netherlands: Sense Publishers.

Tobin, K. & Roth, W.M. (2006). *Teaching to learn: A view from the field*. Rotterdam, The Netherlands: Sense Publishers.

Tobin, K., Roth, W. M., & Zimmermann, A. (2001). Learning to teach science in urban schools. *Journal of Research on Science Teaching*, 38, 941-964.

Tobin, K., Seiler, G. & Walls, E. (1999). Reproduction of social class in the teaching and learning of science in urban high schools. *Research in Science Education*, 29, 171-187.

Tobin, K. G., & Fraser, B. J. (1998). Qualitative and quantitative landscape of classroom learning environments. In B. J. Fraser & K. G. Tobin, (Eds.), *International handbook of science education* (pp. 623-640). Dordrecht, The Netherlands: Kluwer Academic Publishers.

- Treisman, P. U. (1985). A study of the mathematics performance of Black students at the University of California, Berkeley. (Doctoral dissertation, University of California, 1985).
- Turner, E., & Varley, M. (2007). *Fostering critical mathematics agency among upper elementary Latino/a youth*. Paper presented at the Annual Meeting of the American Educational Research Association, 2007. New York, NY.
- Turner, J. H., (2002). *Face to faced: toward a sociological theory of interpersonal behavior*. Stanford University Press. Palo Alto, CA.
- UNICEF (2005). *The state of the world's children: Childhood under threat*, UNICEF Publications, New York, NY.
- Van Manen, M. (1997). *Researching lived experience: Human science for an action sensitive pedagogy*. (2nd ed.). London, Canada: Althouse Press.
- Walker, E. N. (2006). Urban high school students' academic communities and their effects on mathematics success. *American Educational Research Journal*. 43, 43-73.
- Waters, M. C. (1999). *Black identities: West Indian immigrant dreams and American realities*. New York, NY: Russell Sage Foundation/Harvard University Press.
- Wilson, M. C. (2004). *Closing the achievement gap*. New York, NY: Penguin Group.
- Wharton, F. (2009). *Cogenerative dialogue: Improving mathematics instruction in an adult basic education program*. (Doctoral dissertation, City University of New York Graduate Center, New York).
- Woodson, C. G. (1990). *The mis-education of the Negro*. Nashville, TN: Winston-Derek Publishers. (Original work published 1933).