MATHEMATICS: LIMINAL PERSPECTIVES FROM THOSE LIVING ON THE MARGIN

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree of Doctor of
Philosophy in the Graduate School of The Ohio State University

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The Ohio State University
2005

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ABSTRACT

Results from standardized assessments reveal substandard mathematical performances by African-American students. Many theories have been posited to address this age-old phenomenon. Through the lens(es) of Sociocultural Theory, Self-Systems, and Critical Theory, this qualitative study sought to determine factors that impact the learning experiences of African Americans who have been successful in mathematics.

Four African-American mathematics teachers (three females and one male) were interviewed and completed a questionnaire for this qualitative document. The investigator was also a participant. All four participants were educated in public schools and teach in urban school districts. Three of the four participants are currently pursuing doctoral studies; the other has a Master’s Degree. All four teach high school; two of them have also taught at the college level. Three of the participants were involved in an earlier related pilot study which served as the initial phase for this inquiry.

Participants offered their mathematical biographies through data collection protocols. Even though expected themes occurred, there was one unexpected common thread which surfaced. Learning opportunities outside of school, nurturing environments at home and at school, family expectations, extracurricular involvement, a connectedness with the church, self-regulatory behaviors (i.e., persistence and confidence) perceived utility of mathematics by significant others, African-American instructors at an early age,
and the ability to adapt to nonsynchronous environments, were among those factors that influenced the learning experiences of these participants. The fact that all four of these participants encountered challenges in Geometry and not Algebra was unexpected yet noteworthy.
DEDICATIONS

To My Beautiful Daughter
Erica Antronnette Robertson
Who Has Made My Life Journeys Worthwhile

To The Loving Memory of My Father
Willie Staley
Who taught me to be proud of whom I am, the importance of doing my best, and the
meaning of compassion, understanding, and charity

To My Mother
Margaret Branson Staley
Who provided me guidance in acquiring inner peace and a spiritual vision

To Tom Robertson
Whose assistance fine tuned and sculptured my thinking and analytical skills

To My Twin Sister and Her Daughter
Rheta Lorene Staley and Tamara Antronnette Staley
And
To My Brother
Harold Edward Staley
Whose patience and support enabled me to complete what seemed at times to be an
almost impossible task

To My Uncles, Aunts, Cousins, Nieces, and Nephews
Who showered me with unconditional love

To My Dear Friends
Jacqueline Bussey and Family
Vernadine Pickens and Crump Family
Whose thoughtfulness, trust, and care were true Blessings

To My Special Friend
Alan Bernard Jones
Whose friendship, untiring ears, and uplifting subjective objectivity afforded me
sustenance and encouragement throughout this endeavor

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ACKNOWLEDGMENTS

I want to first thank God, who has wrapped his arms around me. His Grace and Mercy has enabled me to experience and understand that Faith makes things possible—not easy.

Infinite thanks to the greatest advisor ever, Dr. Patricia Brosnan, without whom I would have never began or completed this journey. Thanks for believing in me, trusting in me, and helping me to stay on task. Your incredible support and sensitivity will forever be remembered.

To Dr. Donna Berlin, I wish to extend my deepest gratitude for your endless patience and scholarly insights. You always inspired me to make whatever I perceived as my best even better. I will always be thankful for the many hours that you spent assisting me and offering me intellectual support as well as suggestions for scholarly writing.

To Dr. Cynthia Dillard, thanks so much for enriching my learning experience by providing me with helpful feedback and encouraging me to always dig deeper. Also, a special acknowledgement to you for providing me the opportunity-of-a-lifetime trip to Ghana, West Africa—A Full Circle Retreat. My life will never be the same.

Thanks to Dr. Diana Erchick and Dr. Lisa Libby for offering your time and helpful suggestions during this learning endeavor.
I wish to thank the Independence High School Staff and Students for your ongoing cooperation and collaboration. Thanks to Independence High School Principals and the Administrative Teams of James Osborn, Rodney Roscoe, Edward Dunaway, and Michael Dodds who readily ensured critical logistical support for me whenever and wherever needed.

To Independence High School Administrative Assistants (Gwen, Connie, JoAnna, Shirley), thanks for being able to transform major problems into insignificant episodes. To O. McPeters and his custodial staff (Bernestein, Dreama, Greg, Jason, Terry), thanks for making it possible for me to access optimal study conditions. Thanks also to A. Howard, T. Valentine, and the late M. Charlton for your encouragement.

Heartfelt thanks to the best editor ever, Mrs. Barbara Lovingshimer, for your countless hours of honest, hard, constructive written and verbal feedback.

Thanks to Kevin Sullivan for your technological assistance, professional insights, and unwavering friendship.

To Millburn Johnson, Jr., thanks for your scholarly discourse, sensitivity, timely assistance, inspiration, and patience.

Thanks to Steve Drobik for your collegial support and help during my word-processing challenges.

Thanks to my awesome 2003-2004 Lunch Buddy Group (Alan, Sully, Pea, M. Banks, Tiger, R. Harrelson) who provided a sounding board during difficult times. Also, thanks to my other Buddies: D. Berring, M. Bohanon, Dr. Sybil Brown, L. Brummitt, T. Carpenter, R. Chilton, L. Cole, M. Cobb, B. Dooms, N. Harris, L. Hatton, T. Hobson, J. Jefferson, J. Lewis, V. King, P. Owens, C. Person, T. Reed, S. Reeves, B. Rowland, G.

Thanks to the Columbus Dispatch and the Routledge Publishing Company for providing permission for me to use their materials.

I wish to thank Aunt Emma and Uncle Arthur Whyte who from childhood through adulthood have always had faith in me and my potential. Thanks to the Robertson Family of Columbus, Ohio for their love and support. To Ruth and Leslie Bridges and Family, thanks for your kindness and inspiration. Thanks to my extended families of Lorain, Ohio and Detroit, Michigan who are exemplars of villagers taking care of their children.

Thanks to Michael B., Juanita J., and J. Bussey for making all of this possible.

Thanks to Christopher and Leta Bond, Minister and First Lady of Second Shiloh Baptist Church, for your prayers.
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CHAPTER 1

INTRODUCTION

The Negro race, like all races, is going to be saved by its exceptional men . . . it is the problem of developing the Best of this race that they may guide the Mass away from the contamination and death of the Worst, in their own and other races . . . education and work are the levers to uplift a people. (DuBois, 1903, p. 33)

Problem

African Americans are underrepresented in the field of mathematics and continue to perform below potential in the mathematics classroom. Data from the National Center for Educational Statistics (NCES) for the years 1992, 1996, and 2000 indicate that as early as elementary school, a sizeable gap exists between White and Black students on standardized mathematical assessments (NCES, 2004). This pattern has changed very little in past assessments at any grade level according to the August 2001 NCES report card. While state, local, and national conferences, seminars, and meetings are complementing efforts to improve and explain dismal student performances, whether narrowing the gap, closing the gap, bridging the gap, or addressing bifurcated racial and ethnic achievement patterns, the disparity and performance issues remain unresolved. The implications are severe as acknowledged by economist Adam Smith who suggested that mathematics is the sieve through which economic opportunities flow (Secada,
Fennema, & Adjian, 1995). Furthermore, the National Council of Teachers of Mathematics (NCTM) reports that mathematics “know-how” is much more than computation and algorithms. Mathematics embodies problem-solving abilities, including elements of independence, judgment, originality, and creativity (Edwards, 1990). Mathematics illiteracy translates into the inability to effectively negotiate typical consumer transactions as well as limitations in accessing upper socio-economic opportunities. For marginalized populations such as African Americans, this is significant (National Research Council Board of Mathematical Sciences, 2000; Secada, 1995).

In spite of a rich tradition of ancestral contributions in the areas of science, technology, and mathematics, the present day generation of African-American students appears to have a poor attitude toward or lack of interest in continuing this legacy (Kunjufu, 1988). These students are able to negotiate mathematical problem-solving skills in their daily routines (i.e., cell phone usage, games, and sports). Difficulties, however, are encountered in demonstrating proficiency through traditional modes of assessments that are considered by our society as legitimate rites of passage for obtaining employment or fulfilling school entry and exit requirements (Sternberg & Grigorenko, 2001).

Even for many mainstream populations, obstacles to understanding mathematics, “glass walls” (Smith, 2002, p. 1) exist between the physical world and the world of mathematics. In many cases, these obstructions are permeable. On the other hand, for students from marginalized populations, glass walls appear to manifest themselves as reinforced barriers. In addition, if the key to understanding mathematics lies in the ability to connect mathematical concepts to one’s real world relations, the issues of what
mathematics is critical in the lives of African Americans and the pedagogies best suited for using ethnomathematics in developing higher level problem-solving skills raise more questions. Further exacerbating this concern is that scholars, politicians, and boards of education cannot agree upon the mathematical and/or quantitative specifications that provide the knowledge, understanding, and habits of mind that will enable citizens to lead personally fulfilling and productive lives (Blackwell & Henkin, 1989; Resources for Science Literacy, 1997; Rutherford & Ahlgren, 1990).

Theories and “decoy issues” (Perry, Steele, & Hilliard, 2003, p. 161) have been posited to explain African-American achievement differentials and the poor performance phenomenon. The “liberal interpretation” is that the problem is linked to historical, socioeconomic oppressions in the Black community; “conservative” belief is that dysfunctional Black families are the culprits: divorce, drugs, poor parenting skills, few positive role models, and lack of ambition; the “genetic or Bell Curve model” suggests that Blacks are genetically inferior (Singham, 1998). Others believe those age-old systemic concerns such as curricular tracking (Oakes, Wells, & Yonezawa, 2000), low expectations (Fisher, 2000; Norman, Ault, Bentz, & Meskimen, 2001), and the lack of resources—human, monetary, and physical (Rodriguez, 1998)—within educational institutions, account for low academic achievement.

Research is needed to analyze and determine experiences that nurture the learning processes for African-American students, especially as it relates to the sciences. Critical ideology suggests that those who are committed to the education of all students press to understand why a significant number of marginalized students reject the “articulations” and literacies of mainstream society (McLaren & Tadeu da Silva, 1995). Indeed, if
education is how society distributes life’s options, society has a moral responsibility to make certain that those options that guarantee a personally fulfilling, high quality of life are accessible to all of her children.

While many comparative studies address factors contributing to substandard mathematical performances by African-American students, fewer studies examine factors supporting successful learners (Fisher, 2000; Martin, 1997, 2000; Moody, 2000). Shifting from this traditional deficiency model of thinking which focuses on reasons attributing to dismal mathematical performances by African-American students to a construct that explores potential for growth is an approach that might benefit proactive commitments to minimize achievement differentials. Studies of these types are especially relevant in research with minority students (Moschkovich & Brenner, 2000). Moving beyond deficit thinking to research on the reflections, support systems, and habits of mind of African Americans who have experienced success in mathematics is a first step to individual and community empowerment.

Attention to factors affecting positive mathematical experiences for African Americans may also inform theory as well as practice. Since teaching and learning are standpoint-dependent, where individuals—both teachers and students—arrive at the school doors with cultural baggages (good, bad, and ugly) attached, quality schools of education must proceed with an intentionality of purpose by aggressively addressing diversity in the classroom. It is alarming that in a recent study of approximately 50 preservice teachers, it was discovered that only 10% could provide a description of what is meant by “equity” (Holloway, 2004).
Effective teacher training programs cannot ignore studies that support the significance of positive teacher-student relationships on academic performances in general and mathematics in particular. For African-American students, strong, positive teacher-student interactions are imperative (Osterman & Freese, 2000; Rodriguez & Bellanca, 1996) since classrooms are “cultural interface zones” (Norman et al., 2001, p. 1107) where many cultures interact: student, teacher, and subject matter. When these cultures interface, it is with the hope that cultural synchronization takes place; albeit, in many cases, the reality is that opposition and conflict erupt. This environment is fertile ground for negative learning experiences, “academic opposition,” and “disengagement” (Norman, p. 1103). The culture that instructors bring to the classroom is important since this baggage sends a subtle message to students as to whom is worthy of knowledge and expectations for success. Many educators might agree with education reformists Theodore and Nancy Sizer in that “the students are watching” (1999, p. xvii) and they respond accordingly:

Teachers will take some students’ groping claims to knowledge seriously on the basis of certain signs of identity. These students they will encourage and give informative feedback. Others, whom they regard unlikely or even improper students of a particular subject . . . are unlikely to receive their serious responses. (Norman, p. 1103)

This investigation, *Mathematics: Liminal Perspectives From Those Living on the Margin*, examines the mathematical biographies and perspectives of African-American mathematics teachers, individuals who have experienced success with mathematics as
evidenced by the credentialing and certification process required for their employment. Teaching pedagogies and experiences using the theoretical frameworks of sociocultural influences, self-systems, and critical theory will be analyzed (see Figure 1.1). From this mindset here is that while the frameworks affect one another, each impacts the learning experiences of African-American mathematics students; from this set emerge those factors that influence the learning experiences of those successful in mathematics, African-American mathematics teachers. It is important to note that while the inaccessibility to quality learning environments is a true guarantor of achievement differentials and substandard performances, perspectives from within may expose untapped resources and prescriptions for success.

In 2001, the National Black Caucus of State Legislators proposed guidelines for addressing the achievement gap. Recommendations included more teacher training, equitable and more allocation of resources, development of school improvement plans, and the always-mentioned parental involvement component (Borja, 2001). Early in 1989, the National Council of Teachers of Mathematics (NCTM) published a set of provisions, NCTM Standards, considered essential to the teaching and learning of mathematics. Recommendations in this document provided guidelines and resource materials for curriculum enhancement and support for teachers, students, parents, and decision-makers. The premise on which the Standards are based is that all students can learn mathematics when provided proper instruction. In the standards-based classroom, teachers are the facilitators of knowledge, coaching students as they (students) construct their own understandings (Perez, 2000). In neither of these aforementioned forums, however, is
information offered in terms of how to engage students in processes that support positive attitudes and behaviors in the mathematics classroom.

. . . few teachers systematically help their students improve their self-regulatory processes and beliefs so they may better learn on their own . . . Educators must take a larger role in cultivating students’ capacities to regulate their behaviors, emotions, cognitions, and environments. By helping students acquire these necessary self-regulatory skills, teachers can achieve a major purpose of education: To encourage students’ desire to become life-long learners. (Pape, Zimmerman, & Pajares, 2002, p. 62)

Figure 1.1: Rationale schema
The basis of this inquiry is to determine those qualitative conditions that promote academic excellence for African Americans in mathematics. This study is not concerned with addressing reasons for disaggregated achievement differences. The focus is on how African Americans learn mathematics and understanding those structures that impact standards of excellence and learning.

Everyone has a mind capable of mathematical thinking. Whether or not particular individuals develop their potential depends largely on their initial encounters with the world of mathematics, and with the glass wall . . . what is needed is more time, more understanding, more sensitivity . . . . (Smith, 2002, p. 135)

Definition of Terms

_Achievement Gap/Achievement Differential_

quantifiable measurements of achievement differences between African Americans and an identifiable Eurocentric population

_African Americans_

other referents include Blacks, Coloreds, Blacks across the Diaspora, Involuntary Minorities, Negroes, Afro Americans; that segment of people of color with early historical roots being first on the continent of Africa and later within the United States

Autoethnography

_self-reflections impacted by cultural and social experiences

_Critical Theory_

addresses the impact of engaged empowerment in transforming systems
Culturally-Relevant Pedagogy

the matching of teaching strategies to students’ needs, community socialization, and values

Deficit Thinking

philosophy focusing on and blaming students’ inherent challenges/weaknesses (i.e., socioeconomic status, home) for failure to thrive in academic environment

Ethnomathematics

mathematics embedded in routine, cultural activities

Liminal

a standpoint-dependent perspective; not of the mainstream, dominant culture

Literacy

that body of knowledge and ways of thinking that enable individuals to lead personally fulfilling lives, negotiate routine consumer transactions effectively, and responsibly participate in society

Marginalized

minority populations such as African Americans

Mathematical Literacy

higher-order skills and knowledge required for careers in mathematics and science

Performance/Achievement

mathematical accomplishment; used interchangeably in this study

Praxis

cyclical process involving inquiry, reflexivity, and collaborative discourse with the objective of fine-tuning of a current condition, practice, or environment;
thinking about, discussing, and trying new ways to positively impact a state of being

**Pull-Out Programs**

classes in which students are taken from another class in order to participate in another specialized school study

**Quantitative Literacy**

knowledge important for day-to-day living in the real world based upon competencies that would enable individuals to make informed decisions as citizens as they attempt to comprehend and negotiate issues in our ever changing world; a dichotomy composed of numeracy/computation (i.e., algebra, data analysis, geometry) on one side and applications (i.e., problems-solving skills) on the other side; a subset of mathematical literacy

**Self-System Theories**

other referents include self-efficacy, self-regulation, and self-concept; focus is on the impact of human agency and individual motivation on learning

**Sociocultural Theory**

speaks to the impact of culture, community, and social interactions on learning

**Standpoint-Dependent**

from one’s own vantage point; a personal perspective, lens, or viewpoint

**Street Numbers**

illegal gambling operation similar to the legalized lottery system
Rationale for the Study

Individual experiences, beliefs, attitudes, community, and sociocultural factors influence the learning process (Moschkovich & Brenner, 2000; Shade, 1994). Understanding the theories associated with this construct and the relationship to the African-American learning experience establishes the groundwork for this investigation (see Figure 1.2).

Sociocultural discourse, the first rationale for this investigation, suggests that a relationship exists between culture, community, social interaction, and mathematical learning. In fact, Hilliard (2001) affirms that in productive societies, school, family, and community are interdependent. Therefore, mores, norms, and structures should all be honored to obtain and maintain congruency and fluidity within each individual institution.

Figure 1.2: Influences on African-American learning
The fields of mathematics and science education no longer accept a model of the mathematics or science learner as an individual grappling with a body of predetermined concepts and facts. Current models of mathematical problem solving include beliefs and practices that individuals develop through interaction with their physical and social environments as important aspects of cognition. It is recognized that the learner is a member of multiple communities and that, within and through these communities, the content and meaning of mathematics or science are continually renegotiated as parts of the learning process. Thus, in order to understand the individual’s thinking fully, it is necessary to analyze the individual’s home and community cultures as well as the classroom cultures within which learning occurs. (Moschkovich & Brenner, 2000, p. 457)

These forces are instrumental in understanding the mathematical socialization and identity among African-American students. This framework not only provides direction for understanding learners, learning styles, and ways of knowing, it also offers valuable information for fine-tuning educational services rendered to students of color.

The second rationale for this study focuses on critical theory, grappling with privileged agendas and racism through reflection, action, and systemic resolution. With respect to education, Critical Theorists are aware that the mindset of mainstream America understands dominant society as being educable, capable of learning, while on the other hand, labels marginalized populations as deficient (Ladson-Billings, 1999). Therefore, quality instruction, appropriate forms of assessment, and rigorous curricula are typically reserved for the privileged mainstream; adequate resources (physical, human, and monetary) are appropriated accordingly. Critical Theory seeks to reveal social, systemic
inequities with engaged empowerment or praxis, (inquiry, reflexivity, and collaborative discourse with the intent of improving current conditions) being the desired outcome. This study will examine those empowering elements that enabled the teacher participants and students of mathematics to persist and become successful in spite of their liminal position.

Human agency and individual motivation of African-American mathematics students through the lenses of self-systems will also be examined. In spite of the fact that many children of color “struggle with [the] imposed legacy of the devaluation of blackness” (Verma & Bagley, 1982, p. xiii)—by self and others—in culturally incongruent schooling environments, there exists some success for some of these students in the area of mathematics. Therefore, persistence and resiliency are among those self-constructs that will be explored to determine how and if these factors mediate positive mathematical experiences and success for African-Americans.

In this inquiry, a liminal position implies a standpoint-dependent position, not substandard, deficient, or inferior. The researcher will attempt to use the participants’ voices, perspectives, and interpretations of real world experiences to inform theory and practice. Perhaps, the ultimate goal will be in line with what Tillman (2002, p. 6) hopes are educational reform structures where “emancipatory knowledge” emerges.

Agents and catalysts that steered, pulled, and pushed teacher participants along their mathematical journeys upstream will also be analyzed. Attention will be paid to those policies, conditions, and practices that provided impetus and drive enabling participants to move on even though confronted with challenges. Practices to be examined include those that transformed negative situations into what Fine (1997)
describes as radical possibilities; a move from what is to what could be. It is the hope of this researcher that African Americans and those impacting their academic preparation move beyond deficit thinking, a “description-explanation-prediction-prescription” (Skrla & Scheruich, 2001, p. 235) construct embedded in minimal competencies and substandard performances to examining the thoughts and support systems of African Americans who are successful in mathematics. With the objective of obtaining insights into implications for theory and practice, this investigation seeks to answer the following questions:

1. What experiences (in school and out of school) facilitate mathematical achievement for African-American students?

2. What enables some African-American students to persevere and succeed in mathematics, regardless of their socioeconomic backgrounds?

3. What do African-American mathematics teachers believe and observe about their successful and unsuccessful African-American students? How do these observations correlate with their own experiences and practices?

4. What role(s) should African Americans assume in empowering African-American children mathematically?
CHAPTER 2

LITERATURE REVIEW

Emancipatory knowledge is never realized fully, but is continually dreamed, continually revived, and continually transformed . . . (McLaren & Tadeu da Silva, 1995, p. 59)

Sociocultural Theory

Reasoning skills develop both within and outside of school; all students bring knowledge into the classroom. Since students interpret the world around them through the lenses of their social interactions, these experiences or interpretative frameworks affect mathematical behaviors (Schoenfeld, 1987). It is in this spirit that Frankenstein (1997) examines the decodification of mathematics, arguing that students and teachers together should assume roles of critical co-investigators throughout the learning process. Both student knowledge and experiences should be valued. This approach links connections and meaning to learning with understanding. Implications for theory and practice emerging here are that opportunities to learn might be more accessible if culturally-relevant and culturally-specific pedagogies were embedded in curricula and teacher praxis.

From a pedagogical point of view, Schoenfeld (1987) illustrates the value of linking the conceptual language of mathematics to the daily lives of students by offering an exam problem from a National Assessment of Education Progress (NAEP) secondary math exam. Students were asked to determine the number of buses needed to transport
1,128 soldiers with each bus carrying 36 persons. Results varied: 29% answered 31 remainder 12; 18% answered 31; 23% answered 32 (correct answer); 30% calculated incorrectly. Suggesting that beliefs and intuition facilitate students in their construction of knowledge, Schoenfeld suggests that if the same type of problem had been presented in a context that young students understand (How many cars, with each carrying 6 people, would be needed to carry 133 students to a party?), more students might have fully comprehended the problem and answered correctly.

In terms of understanding cognition, Moschkovich and Brenner (2000) offer an example of Native Hawaiian children and their concept of money. In an attempt to uncover reasons that these children encountered challenges in the classroom when working with money-related problems, a researcher examined the daily lives of these students and their engagement with money. The researcher discovered that in the homes and stores, Native Hawaiian children interacted almost exclusively with quarters and dollars while classroom materials and assessments were presented using pennies, nickels, and dimes. Students’ knowledge was organized with quarters; school lessons were organized around pennies. It was concluded that enhanced learning, improved student performances, and learning with understanding could be facilitated through the integration of classroom and home settings (Moschkovich & Brenner). The entire learning environment, therefore, should be considered when analyzing and assessing student cognition and performances.

Vygotsky addresses the role of social context in the development of cognition. As cited in Schoenfeld (1987), Vygotsky emphasizes that learning is not a solitary endeavor, that the potential for development and the formation of cognitive skills are affected on the social level between people (interpsychological) and inside (intrapsychological) people. Performances of African-American students are better and students are more engaged in learning when resource materials, classroom structures, and pedagogies have social
connotations, meanings connected to prior knowledge, and contexts derived from students’ environmental orientations (Brown, 2000; Ladson-Billings, 1994; Moschkovich & Brenner, 2000; Shade, 1994). Although knowledge is individually constructed, it is socially mediated. If the commitment to minimize quantitative illiteracy is genuine, the implications for teacher training programs, curricula, instruction, and assessment are obvious.

In a recent newspaper article, “New Math Test Stumps Many Sophomores” (Sternberg, 2003, problems from the Ohio graduation exit exam were printed in the local newspaper, The Columbus Dispatch (see Figure 2.1). The focus of the article centers on the fact that an alarmingly large number of students are experiencing difficulties with the test. Passing rates in mathematics are dismal across the state for all students in general, with marginalized populations faring the worst (Ohio Department of Education 2002-2003 Annual Report). Examining the problems might lead an overly empathetic sympathizer to question the level of difficulty that the young problem-solvers encounter in trying to complete the assessment. After careful observation, however, concerns over pedagogy and practices of power might emerge instead. For example, an extended response problem was presented that required students to compare two cruise packages to determine the better deal. This is a problem where if inclusive student participation is of concern, perhaps, inclusive participant structures should be utilized to garner maximum student interaction. That is to say, the majority of young, high school students have probably not been afforded many experiences associated with traveling on cruise ships. In addition, one can probably also assume that the majority of middle school and high school students who are fortunate enough to take part in cruise adventures are probably not from urban or rural areas. Perhaps, this problem might have engaged more students had the context been situated in social interactions relevant to the students’ real world. For example, using a problem that required students to compare and determine the best
cell phone package between several competitors might have appropriately represented the objective of this particular extended response question and effectively addressed the target audience as well. It is safe to assume that the number of students using cell phones and paging devices is far greater than students vacationing on cruise ships.

Figure 2.1: Testing Math. Permission to reproduce granted by The Columbus Dispatch.
If mainstream literacy is the price one must pay to cross through the toll road to success, a sense of fairness should mandate the infusion of culturally appropriate, culturally-relevant pedagogies as well. Culturally-compatible practices are not of the same fabric as those demeaning intervention and remedial initiatives, oftentimes, pull-out programs to which many African-American students are relegated. Culturally-relevant, culturally-responsive strategies are instructional techniques that produce learning environments embedded in rigor, richness, and relevancy; these are environments where African-American students can immerse themselves in academic advancement and maintain their cultural identity, where school culture is positively linked to the home culture of the children (Hale, 2001; Ladson-Billings, 1992).

The acquisition of new information with prior learning serving as a conduit, the reshaping of old information with the acquisition of the new knowledge, and knowledge applicability are all impacted by social interactions and culture. While more research is needed on the information processing and knowledge acquisition of African Americans, Shade (1994) believes that perceptual preferences and approaches to thinking about information are impacted by culture. She continues her analyses by suggesting that in many instances, visual images (e.g., photographs, line drawings, and geometric forms) have cultural interpretations; therefore, students employ a multitude of lenses, sensory mechanisms, and mediation channels acquired in social contexts in reasoning and interpreting. The potential for boundless discourse emerges in classrooms engaging in higher-order thinking, open-ended questioning, and qualitative analysis embedded in culturally-relevant pedagogy.

Culturally-relevant pedagogy involves designing curricula in ways to engage students by synchronizing school and outside-of-school cultures. It involves utilizing strategies that honor the knowledge and experiences students bring to the classroom in the development of academic excellence and sociopolitical consciousness. Culturally-
relevant pedagogy uses students’ cultural conversations, their voices, and their experiences to guide classroom discourse. Cultural conversations that students bring to the classroom are considered resources not baggage. Recently, school reformist Ted Sizer was quoted as saying: “The fact that students differ may be inconvenient, but it is inescapable. Adapting to that diversity is the inevitable price of productivity, high standards, and fairness to kids” (Smutny, 2003, no page number). If participant engagement is to be inclusive, participant-oriented structures must be established.

There are several components of culturally-relevant pedagogy. Among these are emphases on movement and expression, collective discourse, cooperative learning, high level of engagement, and content that promotes positive attitudes towards diversity and differences (Hale, 2001). Student experiences and voices are considered important to intellectual discourse and not simply an “ethnocentric special interest group add on” to mainstream discourse (McLaren & Tadeu da Silva, 1995, p. 51).

In a culturally-relevant environment, the intellectual facilitator (teacher) must be concerned about the souls and spirits of children and aggressive in establishing an inclusive atmosphere. A 2001 study determined that the student-teacher relationship, the “effective connection,” is critical to the teaching and learning environment of African-American children (Howard, 2001, p. 137). In addition, another study concluded that mathematical challenges occur in the first year of college for most African-American students (Treisman, 1985). The participants in this study attribute these circumstances to unfriendly school environments as well as the nonsynchronization between their lives and their campus environments. In response, a program was developed, a learning enrichment initiative that promoted higher-order thinking and success in mathematics through content integration and cooperative groups.

Another proponent of culturally-specific pedagogy also argues that instructionally sound, culturally-relevant, rigorous curricula best suit African-American students. In
several states, and in particular Mississippi, mathematics educator Robert Moses linked the conceptual language of mathematics to the daily lives of students with his *Algebra for All Project* where mathematics lessons were embedded in the Civil Rights Movement (Checkley, 2001). To demystify mathematics, historical, lived events were used to broaden the mathematical thinking of students who were not previously successful. Students were encouraged to create their own symbolic representations as a means to learning mathematics. In addition, collaborative groups were formed, grounded in a culture that demanded mathematical literacy. This models the Vygotskian zone of proximal development (ZPD) strategies or social scaffolding (Stanton-Salazar, Vasquez, & Mehan, 2000) which embeds learning in contexts through social interactions where students work collaboratively with peers solving problems, posing problems, and communicating mathematically. National Council of Teachers of Mathematics (NCTM, 2000) Standards also advocate the importance of communications as a tool for enhancing and fine-tuning learning with understanding in the mathematics classroom.

The function of culturally relevant pedagogy has been compared to the role of a school bus driver—picking up students where they are and taking them where they need to go (Tate, 1995). More research is needed, however, before broad generalizability can connect cultural compatibility pedagogies to academic performances. Collegial collaborations must be nurtured to share those lessons and action research most effective in meeting the needs of African-American students in their quest for mathematics proficiency and academic excellence.

Family influences on the mathematical performances of African-American students have been documented (Ajose, 1995; Blackwell, 1981; Campbell, 1996; Stepanek, 1998). It is suggested that a correlation exists between parental expectations and the mathematical achievement of African-American students and that parents play key roles in nurturing student motivation and attitudes (Ajose, 1995; Gill & Reynolds,
The importance of mathematics embedded in practical life skills and learning applications in the home are considered crucial in the development of mathematical skills and interest (Schwartz, 1995). In fact, it is posited that positive family influences have a greater impact if accessed prior to secondary schooling (Moody, 2000; Thomas, 1999).

This inquiry seeks to determine what the teacher participants view as best practices in the mathematics classroom. In addition, this investigation is interested in understanding the nature of community influences, culture, and social interactions for the teacher participants. Mathematically engaging collaborations in which these participants were/are involved will be explored. Other environmental factors influencing the successes of the teacher participants will be analyzed for lessons that might be learned.

Self-Systems

Motivation theorists such as Thorndike suggest that task value is a prerequisite to learning and that “certain mental sets” produce a “sufficient improvement in the quality and quantity” of student interest in mathematical learning (Thorndike, 1922, p. 276). Others argue that while rewards impact performance, these extrinsic motivators do not necessarily facilitate learning with understanding (Kohn, 1995). Purposive behaviorists offer that goal directedness emerges from experiences with events (Motivation & Learning, 1998). These theories are all grounded in the relationship that individual agency has on behaviors. The motivation that is generated from within the individual ignites the desire for cognitive activity (Copeland, 1984). In this spirit, self-systems, a component of motivation theory, becomes a framework for this investigation.

Self-systems will be defined as those personal, enabling constructs affecting individual agency. Constructs such as self-efficacy, self-concept, self-esteem, and self-
regulation are among those self-systems that are similar; they represent expectancy beliefs about an individual’s perceived capabilities (Pajares, 1997). The exact relationships between these self-systems are still issues for debate among researchers. However, since individuals are products and producers of their own environments, understanding the belief constructs that control personal agency becomes relevant to this investigation. Self-efficacy and self-regulation will specifically be explored in this study.

Self-efficacy, “people’s judgments of their capabilities to organize and execute a course of action required to attain designated types of performances” (Pintrich & Schunk, 1996, p. 88) and self-concept, “cognitive judgments of personal skills and abilities” (Pintrich & Schunk, p. 84) differ. Self-concept is global and less context dependent; self-efficacy is situational and more task dependent. That is to say, while some African-American students may believe that mathematics is an area of study where their comfort levels are minimal, a global standpoint (self-concept), probability may be a topic in which this same group believes their competencies and comfort levels are above average, a situational standpoint (self-efficacy). The self-efficacy construct is important because it is future oriented, a belief that one can or cannot reach a specific goal. Knowing how African Americans feel about mathematics in general and certain topics in particular may inform other African-American students and their instructors of the self-beliefs that might positively alter student performances in the mathematics classroom. The door to improved performances in mathematics for these students may hinge on building proficiencies, competencies, and math confidence—one topic at a time, one task at a time. This ideology coincides with Piagetian thought which argues that student motivation and learning are incremental; a biological development progresses step-by-
step, responding to those activities that are in sync with the abilities and experiences of
the learner (Copeland, 1984). The implications for those committed to nurturing
mathematics proficiency among African-American students are tied to determining
appropriate strategies for assessing student knowledge and then molding the necessary
self-belief constructs so that student readiness and learning with understanding will
result.

Outcome expectations, that is to say, judgments and beliefs between one’s
behavior and anticipated results, are critical components of self-efficacy. An individual
may be highly efficacious with either low or high outcome expectations in a specific
situation; an individual may have low self-efficacy with high or low outcome
expectations. Being high in both efficacy and outcome expectations produces optimal
results since these perceptions are related to the quantity, quality of effort, resiliency, and
willingness to persist at a given task (Pajares, 1997). Efficaciousness, therefore, is
considered one of the best indicators of behavior affecting student performance as well as
future learning and the learning of new skills. Examining factors that nurture positive
attitudes and the associated performance behaviors might provide a framework of support
for African-American students as well as their instructional facilitators.

Self-beliefs and academic behaviors are intertwined in a self-reflexive
embodiment process that assists individuals in mediating behavior and cognition.
Students engage in certain behaviors, analyze the product(s) of their behaviors, utilize the
analysis to create judgments about their abilities, and react accordingly; successful
experiences, therefore, can have a major impact on efficacy (Pajares, 1997). Seeking
ways to create successful mathematics experiences are important in efforts to enhance
performances of African-American students. Depending on the task, individuals use self-efficacy beliefs to regulate motivation, thought processes, and actions in given situations. According to McCoy and Walker (1997), African-American students exhibit a “disturbing tendency” to be silent in the mathematics classroom. Shut down are the self-systems such as self-esteem (feelings about oneself), self-efficacy (individual empowerment), and self-concept, prerequisites to academic persistence and success.

Success and efficacy go hand in hand; that is to say, if students are successful in the mathematics classroom, they have confidence in their abilities and have optimistic views of subsequent successes; the desire to learn increases. If learning increases, student achievement increases. Students’ beliefs about their efficacy for academics also influence the goals they establish for academic achievement (Zimmerman, Bandura, & Martinez-Pons, 1992). Both will and skill support successful learning experiences.

Bandura (1992) argues that efficacious self-beliefs serve as determinants in motivation, action, thinking patterns, and decision making. Purporting that a positive correlation exists between efficacy and high performance attainment, he offers an example of the efficacy/action relationship where children were asked to judge their mathematical ability. In this example, students were given challenging problems to solve. Within each of the three ability groupings (low, medium, high), students judging themselves as high performers employed more successful problem-solving strategies, were more persistent, and were more successful engaging in mathematical discourse than those of equal ability who earlier judged themselves to be low performers (see Figure 2.2). Many minority students perform poorly, not because of ability, but because of low expectations, hopelessness, and the lack of persistence (Graham, 1996). Hence, student
confidence and self-esteem can be efficacious and influence academic performance (Bandura). Building environments where the development of math confidence and positive esteem are nurtured may be the missing link in the belief systems of African-American mathematics students who routinely encounter challenges as problem solvers.

This inquiry seeks to determine those attributes that have supported African Americans throughout their mathematical journeys. Some of the experiences of these teacher participants may have been negative and unpleasant. In spite of difficulties and unfriendly environments, self-efficacy prevailed. Dreams of becoming successful in mathematics were neither deferred nor aborted. The manner in which participants’ confidence and the courage to persist triumphed, in spite of and not because of ideal learning experiences, is of interest to this investigator.

This study will attempt to determine the nature of self-efficacy as well as the perception about the ability to engage in problem solving among African-American mathematics students. Analyzing how these students think and react when confronted with challenges should not only inform teacher practice, but also offer support for those students who have a low tolerance for struggle and persistence.

With regard to self-concept, some behaviorists argue that self-concept is a significant factor only when students are concerned with competition, how their skills measure up to others; self-regulation, according to this group, becomes the significant factor in mastery orientation goals and learning for understanding (Ames, 1992). For African-American students of mathematics, learning for understanding is paramount to improved performances. Perhaps, understanding those self-regulatory structures that
support long term improved, sustained, and high quality learning is essential to resolving academic performance issues.

Figure 2.2: Bandura’s Self-Efficacy. Mean levels of mathematical solutions achieved by students as a function of mathematical ability and perceived mathematical self-efficacy (Bandura, 1992, p. 6). Copyright 1992 From Self-Efficacy: Thought Control of Action, Ralf Schwarzwer, Editor. Reproduced by permission of Routledge/Taylor & Francis Group LLC.

Self-regulated learners are those who engage in and assume responsibility for their own learning experiences. These individuals become “metacognitively, motivationally, and behaviorally active in their learning process” (Zimmerman, 1989, p. 329). It is not only believed that a highly self-regulated learner participates in more successful learning experiences, it is posited that a highly self-regulated learner also possesses the tools for resolving challenges in the face of “unsupportive, academic environments” (Pape, Zimmerman, & Pajares, p. 62, 2002). Self-regulatory qualities of African Americans who have encountered successful experiences in the mathematics
classroom may provide insights into motivational orientations as well as suggestions for reducing achievement disparities, ideas for enhancing performances, and assistance in sustaining long-term understanding.

Since self-regulation creates a self-awareness of limitations placed on one’s learning environment, this self-system assists in addressing essential questions or problems in the learning process; therefore, comparing self-regulatory qualities of successful students to those experiencing challenges may enhance the quality of mathematics education for all students. Knowing and managing limitations is a proactive protocol involving several strategies:

- setting specific proximal goals for oneself, adopting powerful strategies for attaining the goals, monitoring one’s performance selectively for signs of progress, restructuring one’s physical and social context to make it compatible with one’s goals, managing one’s time use efficiently, self-evaluating one’s methods, attributing causation to results, and adapting future methods.

(Zimmerman, 2002, p. 66)

Consequently, highly self-regulated learners have several options at their disposal. It becomes a matter of knowing how to unlock the “tool kit” (Newman, 2002, p. 132) of strategies and using the instruments as sources of empowerment in the classroom. Substandard performances and the under representation of African Americans in mathematics magnify the urgency in finding the key to this toolbox.

Gordon (1996) determined that a relationship exists between resiliency, “the ability to thrive, mature, and increase competence in the face of adverse circumstances or obstacles” (1996, p. 3), and motivational patterns for African-American students. These
students appeared more goal-oriented, interested in material gain, and were more likely to participate in extracurricular activities. Perhaps, these same students are more likely to become risk-takers, fearless of nonsynchronous environments that might exist in the mathematics classroom.

This inquiry will examine the self-systems of the teacher participants to understand how to access tools for mathematical success. More discourse, however, is needed grounded in the development of self-constructs and the impact on African Americans in the mathematics classroom. Those successful programs that emphasize the importance of intrinsic task interest, task value, and motivational beliefs should be included in efforts to address issues of achievement for African-American students.

**Critical Theory**

Critical Theory is concerned with empowerment, liberation, and the struggle to capture dreams deferred due to oppressive practices and policies. Critical Theorists seek emancipation from the “Eurocentric nature of dominant traditional social and political thought” (McLaren & Leonard, 1995, p. 3). Both frameworks see empowerment as holistic, making the world a better place for everyone (hooks, 1994). This study will seek to investigate the roles that stakeholders (teachers, community, and the individual self) play in molding successful mathematical experiences for African-American students through systemic change.

From a Critical Theorist viewpoint, education has never been race neutral. Brown vs. Board of Education, segregation, desegregation, resource allocations, busing, affirmative action, and tracking are among the many skeletons, some not yet buried,
lingering in the closets of our racialized education system. Along this line of thought, it is believed that school presents students with their first encounters with systemic racism (Reddy, 1998), that classrooms are considered forums for either empowering or domesticating individuals (Freire, 1970), that literacy practices are viewed as practices of power and pathways to hope for marginalized populations (McLaren & Leonard), and that education becomes the focal point for constructing racial and social justice (Ladson-Billings, 1999). For Critical Theorists, perspectives and cultures of subordinate groups are viewed as being deliberately silenced by voices of the powerful and privileged as the struggle ensues to address asymmetrical positions of power, intervention, and control, where people grapple to define and realize their deferred hopes and dreams (Giroux, 1989). With respect to mathematics, understanding how the teacher participants managed to shatter “glass wall” barriers is of interest to this researcher.

Critical Theorists believe that the most powerful individual in the classroom is the instructional facilitator (teacher) since this person determines those competencies or literacies that are actually invoked in the classroom. A critical educator, therefore, strives to employ critical pedagogies that empower students to acquire that knowledge and higher-order thinking patterns that will enable them to “reflect upon and shape their own experiences, and in certain instances, transform such experiences in the interest of a larger project of social responsibility” (McLaren & Tadeu da Silva, 1995, p. 49). For African-American students, the charge is to use mathematical proficiency in ways that promote the socioeconomic agendas of African-American people. This translates into engaging in liberatory practices that will ensure the delivery of quality, equitable education that will nurture individual empowerment, a precursor for community
empowerment. The existence of even the faintest hint of unequal access to literacy and classroom participation should provide the impetus for a reflexive embodiment followed by collaborative discourse and action. A critical consciousness calls for the revelation and desistance of oppressive policies and practices that have become an unfortunate part of America’s legacy. With respect to the literacy crises, Jonathan Kozol’s comments as cited in Hale (2001, p. 112) eloquently encapsulate the current state of affairs:

> Our children are being educated in schools that deliver the girls to public assistance and the boys to unemployment and incarceration. The children in one set of schools are educated to be governors; children in the other set of schools are trained for being governed. The former are given the imaginative range to mobilize ideas for economic growth; the latter are provided with the discipline to do the narrow tasks that the first group will prescribe. Societies cannot all be generals, no[r] soldiers. But by our schooling patterns, we assure that soldier’s children are more likely to be soldiers and that the offspring of the generals will have at least the option to be generals.

African Americans must come to understand that literacy is at the nucleus in the struggle for liberation and power. Mathematics educator Robert Moses views mathematics literacy as a gatekeeper, an economic toll road, and equates quantitative proficiency concerns to the voter registration and Civil Rights issues of the 1960s. Some individuals argue that those in power and with influence should exercise their moral and intellectual responsibilities for ensuring that no student is left behind in the mathematics classroom (O’Connor, Godfrey, & Moses, 1998).
I believe that the absence of math literacy in urban and rural communities throughout this country is an issue as urgent as the lack of registered Black voters in Mississippi was in 1961... and... is the key to the future of disenfranchised communities. I believe we can get the same kind of consensus we had in the 1960s for the efforts of repairing this. (Moses & Cobb, 2001, p. 5)

Unfortunately, even though a commitment to a sense of moral purpose sounds good and should invoke people to engage in acts of kindness and mercy, moral purpose becomes troublesome. According to education reformist, Michael Fullan (2001), a sense of moral purpose promotes an agenda advancing the common good; privileged agendas, however, are vested in maintaining current structures as long as the agendas of the privileged are being served. The implications for marginalized populations in pursuit of mathematical literacy are that journeys upstream might be routed through high tides and rugged waters.

Critical Theorists believe that those living on the margin should assume some of the responsibility for affecting change. With respect to mathematical illiteracy, becoming accountable means engaging in praxis and collaborative discourse in search of resolution. Since African Americans in particular can directly bear witness, testifying to oppressions and circumstances emerging from the lack of mathematical literacy, this group must become involved, actively and proactively, seeking systemic relief. Grounded in the belief that the experiences of the oppressed are effective lenses for analyzing and transforming systems, marginalized voices must be unsilenced if limiting structures, human agency, and positions of influence are to change (Ladson-Billings, 1999). In other
words, the subordinate masses must become their own agents in the struggle for systemic transformations.

Voice, the validation of presence (Erchick, 2001), “discourse created when people define their own issues in their own ways, from their own perspectives” (Moody & Moyer, 1997, p. 575) becomes an important factor in Critical Theory. Liminal perspectives of the marginalized provide a window view of individual realities and the truisms for mainstream reflections (Ladson-Billing, 2000). With respect to the mathematics classroom, voice becomes the factor that addresses tensions and practices that deny access to full participation in intellectual discourse and access to learning.

It is no secret that students resist and become disengaged from any process or situation that disempowers them (Johnston & Nicholls, 1995; Tate, 1995)—an “action/reaction duality” (Norman et al., 2001, p. 1103). The under representation of African Americans in the field of mathematics, however, suggests a non-hearing, silencing, and invalidation of voice by both mainstream society and self (Johnston & Nicholls, 1995). African Americans, especially those in upper level mathematics discourse, choose or are often intimidated into voicelessness.

The teacher, the classroom’s instructional facilitator, is responsible for creating the ambiance for resolving voicelessness in the mathematics classroom. The “conscientization” of the classroom through which engaged pedagogy empowers students is addressed by hooks (1994, p. 14). If student voice is paramount to the learning process, and if mathematics is a field that is to become “acoustically resonant” (Erchick, 2001, p. 169) by making mathematics accessible to all, voice should be actively nurtured. Marginalized populations must learn and choose to actively confront and negotiate “the
institutions, processes, and ideologies that prevent them from naming their world . . . they must address both the reality they inhabit and their consciousness of that reality” (Lankshear, 1995, p. 109).

African Americans must also engage in the collaborative discourse that will transform their current reality, in this case mathematical illiteracy, to a reality where proficiency is the normative state of affairs. A collaborative discourse will gather the support system needed to affect change. It should be a “collaborative discourse and reciprocity in which thought, action, and reflection combine in informed, enlightened and committed action to dismantle and counter the hegemonic structures that support oppression” (Freire, 1970, p. 56). It is also important that, as a collective body, those seeking relief from oppressive structures and policies guard against simply “preaching in the desert” (Freire, 1970, p. 77) and thereby allowing conditions to be unaffected since no one is there (in the desert) to care, listen, or hear. African Americans must collectively and publicly use praxis as a means for negotiating the policies, practices, and structures supporting mathematical literacy.

Community mentorships might empower African-American students through awareness and education as well as assist in increasing student achievement in mathematics. Serving as positive role models and tutors, these mentorships could provide a lifeline for those students struggling with classroom challenges. This investigation will explore the nature of mentor relationships, if they existed, and how or if they provided guidance and empowerment to the teacher participants.

In the tradition of America, progress for African Americans has emerged only after episodes of conflict (Asante, 1991). That is to say, liberation from oppressive
structures and policies has resulted only through volition or what is referred to as “active will” (Asante, p. 19). It stands to reason, then, that it is only “ethos,” the “collective personality of the people” (Asante, p. 21), which will affect the fate of quantitative and mathematical literacy for the African-American community; only “collective will and consciousness” (Asante, p. 21) will advance issues of literacy for these people. In the African-American community, solidarity must focus on quantitative and mathematical literacy that will invariably be an agent to socioeconomic survival.

The African-American church has a role as well in ensuring that her children are literate. Surprisingly, the church has become the missing piece of the literacy puzzle. The church is the “one crucial gap [lacking] a dedicated academic program for serving youth” (Brown, 1999, p. 177).

The church is going to have to step in, because the situation in society is not going to change. We have to come in as a community in our church, we need to find out the students in our community, we have to find out what schools they go to, we need to know what teachers teach our kids. (Brown, p. 178)

This same view resonates from scholars who recognize the church as one link in the literacy struggle that has been overlooked, perhaps unintentionally, maybe intentionally.

The African-American church has historically served as a safe haven, a beacon of hope, and a venue for community thought and action. Grounded in inclusiveness, traditional African-American religious institutions have served as community centers. For years, church ministers have led the way in advancing political and social agendas. Interesting enough, mainstream society has always understood the role of the African-American church. During the period of the Civil Rights, churches were destroyed
because of its symbolism. That is to say, churches “represented black power, independence, and self-determination” (Hale, p. 154).

The church is in this respect both a preserver of the African-American heritage and an agent for reform. Indeed no successful movement for improving the conditions of life for the African-American people has been mounted without the support of the church. (Hale, p. 154)

The power and efficacy role of the African-American church must serve as an empowering, active agent in combating the under representation and substandard performances in mathematics. Those in position of influence must be receptive to inviting collaborative facilitators such as ministers and churches into the fold. As critical of a role that is played by the African-American church in terms of personal, social, and recreational salvation (Hale), this role should be expanded to also include an active role in the struggle for quantitative and mathematical literacy. The African-American church must ensure both quantitative and mathematical literacy for all students by mandating what Hale refers to as an “instructional accountability system” (p. xii) for the community’s children.

Since a significant number of African-American students are affiliated with the church in some capacity, this study will try to determine if such a relationship existed for the teacher participants. The nature of church relationships and whether or not they provided academic support systems will be the focus. In an earlier study, an investigator concluded that even though students were highly active in church, the church provided minimal academic support services for its member children and community people (Brown, 1999). Undoubtedly, this is an untapped resource that must be utilized in the
resolution of quantitative illiteracy and efforts to engage and recruit African-American students to the field of mathematics.
CHAPTER 3
RESEARCH DESIGN

Methodology

Research is an organized protocol informed by data collection, reflection, consultation with the experts, and discourse. The methodology, “a paradigm of choices” (Patton, 1980, p. 20), should be determined by the nature of the research and focus question(s). Whether the chosen approach is qualitative, quantitative, or a blending of both, the final decision is often impacted by researcher biases, views, and comfort zones. This discourse sought to make sense and understand participants’ experiences, perspectives, voices, and descriptions—an interpretive protocol. Accordingly, the pitfalls associated with human nature (mistakes and biases) can influence the process (Merriam, 1998). This was an investigation that attempted to understand realities of events by connecting with the participants and their settings in order to understand detailed information about personal circumstances (Patton). Broad generalizability, therefore, would be limited. The qualitative method was the heuristic of choice based on these aforementioned settings,

When gathering or analyzing data, making comparisons, and formulating conclusions, a research instrument is required in interpretive inquiry. It is a protocol, standpoint dependent, where the investigator also becomes the research instrument. This investigation was an exploratory study where reliability was not merely about
“repeatability of results,” the ideas and views expressed in this study were simply presented in a manner where results should be recognizable given another set of data; other interpretations are probable and would be certainly honored (Holloway & Jefferson, 2000).

Kirk and Miller (1986) encapsulate the paradigmatic essence of qualitative research: invention (action planning), discovery (collection of information), interpretation (analysis), and explanation (message to be disseminated); all four phases are required, sequential, and irreplaceable with a product produced at each stage. The invention phase is the point at which an individual is generally moved by a type of “selfness” such as inquisitiveness, unfamiliarity, personal gain, or humanitarianism to investigate an interest; discovery is where the researcher becomes a neutral observer of facts related to the interest under study; interpretation is the stage where the strength of the data (reliability) brings meaning to the context (validity); explanation involves packaging the interpretations, readying information for dissemination, and bringing closure to the study. Preliminary work, the pilot study, acquainted this researcher with all four phases.

This investigation embodied shades of an autoethnography where the researcher’s descriptions, voice, and personal experiences, her liminal perspectives, as investigator and participant became an intricate part of the study. That is to say, the researcher made a deliberate appearance in her work. As a parent, as a teacher of predominantly African-American students, and as an African-American student of mathematics, it would have been difficult to exclude her from the events of this investigation. However, whether data collector, trained assessor, interpreter of data, or subject under study, each role had a unique assignment. As researcher and participant, this investigator understood the
necessary multitasking and tried carefully to separate the roles; one as a neutral eyewitness, another as a trained assessor, and the other as a subjective contributor.

The autobiographical element inspiring this study necessitated the acknowledgement of biases and personal values to insure credibility (Marshall & Rossman, 1995). This safeguard was taken throughout the investigation due to its value-bound nature. Caution was exercised regarding what Weiss and Fine (2000) refer to as addressing “inside/outside dilemmas” (p. 68), the objects in the rear view mirror that might distract the critical eye; and, even though attempts were made to formulate objective accounts, experiences and situatedness inevitably connected researcher to participants. Cultural perspectives of both researcher and participants were legitimized during the design and analysis of this culturally sensitive document because this was “educational research specific to African Americans . . . their struggles as well as their successes . . . where ethnicity and position” were significant (Tillman, 2002, p. 3). Hence, objectivity might become a concern for those colleagues and research scholars who are uneasy with the possibility of subjectivity, the contamination of “research results and processes” (Lincoln & Guba, 2000, p. 175), and “participatory responsibility” (Fine, Weis, & Weseen, 2000, p. 123). Questions over the role and involvement of the investigator might be warranted. If inquiry revealed injustices in practices and policies, at some point the researcher had to decide if her moral, ethical, and intellectual commitments would permit her to remain detached from the discourse and indifferent to efforts in eliminating such structures. This call to action response is understandable when investigators are truly passionate about the work. Again, this researcher acknowledged
potential bias and made every effort to maintain a scholarly, unprejudiced approach throughout the investigation.

Understandably, research should be triggered by a passion for a particular subject and/or a topic warranting an examination (Ary, Jacobs, & Razavieh, 1996). In other words, the “So what, why is this study worthwhile?” question should be addressed prior to beginning the laborious tasks associated with scholarly inquiry. Substandard performances by African Americans in mathematics which translate to their underrepresentation in related careers and negative socioeconomic implications constitute one such issue. Secondly, not only does multicultural research advance cultural sensitivity and awareness, inquiry about people of color by people of color tends to provide a forum for enlightened discourse (Grant & Millar, 1992). Lastly, there appears to be a type of “academic ethnocentrism, scholarly elitism, a pattern of ghettoization” (Grant & Millar, p. 9) where multicultural research carries less validity and influence in white intellectual circles (Gordon, 1992). Perhaps, more studies reflecting the experiences and interpretations of marginalized populations are in order to address the comfortable, self-serving consciousness of the privileged mainstream.

The preliminary work for this study was completed. A pilot study, the “stretching exercise,” was conducted (Janesick, 2000). After reflecting and fine-tuning of the preliminary protocol, this researcher decided that there was enough merit to proceed with the investigation.

**Procedure**

A case study design was the selected strategy for this study. It was assumed that a
cross-case analysis would offer the information that could adequately address the topic. Case studies are undertaken to facilitate understanding through observations of chronological and biographical data; it is an approach that examines phenomena within its live, social context (Merriam, 1998). Case studies are appropriate when researchers use small samples and yet seek detailed information and perspectives (Merriam). The overall intent of a case study researcher is to amass sufficient information about a concern in order to conduct a scholarly inquiry about particular phenomena, in this instance, those factors affecting the learning experiences of African-American mathematics teachers; it is assumed that the researcher has an “intuitive grasp” of the topic (Merriam, p. 16). Case research has focus parameters. It is a “bounded system” (Merriam, p. 28). In this study, the exact boundaries, the context, revolved around African Americans successful in mathematics, more specifically, African-American mathematics teachers; the phenomenon involved factors affecting their learning experiences. The specificity of this design narrowed the topic, making the intent of the inquiry both manageable and attainable. The case study approach enabled the researcher to proceed with a better sense of direction (see Figure 3.1).

Figure 3.1: Boundaries of liminality
Interviews of a more unstructured type were utilized for collecting data. The interviews were in an informal conversation format where interviewees’ responses determined the next line of questioning. Preliminary questions and desired information, however, were thought out in advance based upon data obtained from both a questionnaire and earlier completed pilot study. Follow up telephone interviews were completed to clarify and seek more depth and meaning.

Data collection began during the second week of September 2004 and culminated by the first week of November. This time frame included a follow up to slow responses to questionnaires and the rescheduling of interviews. This period also accommodated work and study schedules as well.

Though this document was a requirement for a Doctoral program, the researcher determined that the presentation of the data and analysis would be in a format that would be interesting and understandable to both colleagues and the general public, especially African Americans. Targeting the reader or “audience conjuring” (Merriam, 1998, p. 221) added a real sense of practical purpose to the inquiry, laid the groundwork for the next step, follow up phase, and enhanced the investigation’s procedural cohesiveness.

Reliability/Validity/Ethics

It is the responsibility of the researcher to engage in inquiry that is both professional and humane. A type of researcher’s litmus test criterion was utilized to maintain the integrity of scholarly inquiry and protect participants. Guidelines and regulations provided assurances that concerns related to ethics, validity (trustworthiness), and reliability were held in check. As stated in Merriam (1998) “Qualitative researchers
are guests in the private spaces of the world. Their manners should be good and their code of ethics strict” (p. 214). With respect to ethics, this researcher followed the protocol established by The Ohio State University Institutional Review Board. If any unanticipated questions or uncertainty emerged, this researcher knew to immediately contact the Principal Investigator for consultation.

To insure that good knowledge was produced in a scholarly fashion, triangulation, a research protocol, was followed. Triangulation, “adding one layer of data to another “ in building a firm foundation, takes place when multiple methods are employed to assess and affirm similar propositions (Fine et al., 2000). Several types of triangulation (Janesick, 2000) can be found in qualitative studies: data triangulation (use of multiple data sources), investigator triangulation (use of multiple researchers), theory triangulation (use of multiple frameworks), and methodological triangulation (use of multiple methods). Triangulation enhances, supplements, and adds support and credibility to the research endeavor. It was the hope of this researcher that the structure established in this investigation would sufficiently address reliability and provide the audit trail for replication, continued research, and more contributions to theory, practice, and the African-American community. Every effort was made to accurately describe data and how conclusions were formulated. Memberchecks were ongoing throughout the research to provide opportunities for participants to validate their responses. Expert checks were included to assist with validating the analysis. Data sources were limited to questionnaires, face-to-face interviews, and telephone conversations due to time constraints and other logistics. Investigator triangulation was limited to one researcher; theory triangulation included three frameworks: Sociocultural Theory, Self-Systems
Theories, and Critical Theory; methodological triangulation was limited to the qualitative approach.

Selection of Participants

Subjects were contacted by telephone or in person during the third week of June 2004, providing them with an overview of the inquiry (see Appendix A). A formal, written introduction and invitation to participate in the study was sent in July 2004. A solicitation letter (see Appendix B) and consent form (see Appendix C) were sent to perspective participants upon approval from The Ohio State University Institutional Review Board/Human Subjects (see Appendix D) in September, 2004. This correspondence included an explanation of the research project, an invitation to collaborate, an assurance of confidentiality, and a gentle emphasis on the importance of a prompt response. Perspective participants were informed of both how the data would be utilized as well as when and where the dissertation would be accessible after the investigation was completed. Individuals were also informed of their freedom to withdraw consent and discontinue participation.

Participants were selected through purposeful, criterion-based sampling. This selection process required the creation of a list of specifications that directly related to the nature of the research and focus questions (Merriam, 1998). The investigator used these specifications as guidelines in deliberately, as opposed to randomly, choosing participants who could offer quality information. This process was convenient and provided data presumed to be representative, typical, and reliable (Ary et al., 1996). Participants were chosen based upon their importance to the framework under investigation. Individuals’
“brokering characteristics” (Johnson, 1990, p. 81), situatedness, and connections with the group to be studied in addition to “articulateness, personality, and compatibility” (Johnson, p. 38) also provided the guidelines for choosing a representative sampling.

African Americans who have experienced success in mathematics, those proficient and credentialed individuals such as mathematics teachers were at the center of this inquiry. Although sampling is thought to be completed when the scope of information and data reaches a “saturation” or “redundancy” level for the sake of planning, it was appropriate to project a minimal, but reasonable sample size that was thought to be adequate enough to address the phenomena under investigation (Merriam, 1998). Four African-American mathematics teachers participated in this investigation. It was anticipated that even though each individual was unique, the contributions that he or she would offer might concur to some degree with the experiences of the entire sample size. In other words, any one case would share some characteristics of the universal set (Denzin & Lincoln, 2000).

The three individuals participating in the earlier pilot study (see Appendix E) became the same people to be studied for this investigation. Trust, rapport, and communication, components of access and entry (Janesick, 2000, p. 384) had already been established with these individuals. In terms of their brokering characteristics, these individuals were active in their district’s professional development opportunities and/or enrolled in graduate school, all have at least a Master’s degree, all are products of public schooling, and all currently work in urban schools. Because of these affiliations, it was thought that the participants would be a source of quality data. In addition, because of similarly situated lived experiences, the researcher was included as a participant.
Data Collection

Questionnaires

There are several advantages to using a questionnaire. Accessibility to quality data from remote settings, low costs, minimal staffing requirements, and time that enables participants to provide thoughtful responses, are among the advantages of mailing protocols such as questionnaires (Merriam, 1998). This instrument (see Appendix F) was mailed to perspective participants during the second week of September 2004. Participants had two weeks to complete and return an 8-question document. All participants returned documents in a timely manner. Lessons learned from the pilot study encouraged the researcher to create more concise, fewer interrogatories.

Interviews

Interviewing is an effective instrument for extracting data from humans about their experiences and perspectives. While most people may not be familiar with the protocols involved in scholarly inquiry, many people do have a general sense of what is involved in an interview process. As stated in Denzin and Lincoln (2000), “Interviewing is rather like a marriage: everybody knows what it is, an awful lot of people do it, and yet behind each closed front door, there is a world of secrets” (p. 668).

Interviews enabled this researcher to ask probing, follow up questions of participants who collaborated in the earlier pilot study. Having an idea of the type of information that was being sought provided guidance in structuring questions. Probing was helpful in that it enabled the researcher to take full advantage of information gathering opportunities (Merriam, 1998). Using Patton’s terminology (1980), this was a strategy
that signaled the participant to continue talking on a particular topic (elaboration probe), that encouraged the participant to provide more depth (detailed orientation probe), or cued the participant to provide a restatement of an issue (clarification probe).

An unstructured interview approach was utilized by asking six open-ended questions (see Appendix G) in an informal setting. Face-to-face interviews, lasting 1 - 1 ½ hours, were conducted in a public library study room, college classroom, university office, and a hotel conference room. It was hoped that information would be obtained in a timely, systematic, and consistent manner, thereby limiting interviewer biases and judgment (Patton, 1998). However, when clarification, probing, or more explanations were needed, different questions may have been posed to the interviewee. As often as possible, participants were asked the same questions in order to minimize both respondent and interviewer effects. The Principal Investigator interviewed the Co-Investigator. These audio taped sessions began during the first week of October and were completed by the first week of November.

Analysis

This was where the qualitative researcher, led by her data and scholarly protocols, translated information, where she grappled with human experiences to “secure an in depth understanding of the phenomenon in question” (Fine et al., 2000, p. 119). Emerging themes and patterns derived from the data were interpreted, categorized, and reported through the researcher’s critical eyes against the backdrop of theoretical frameworks: Sociocultural Theory, Self-Systems, and Critical Theory. The goal was to
arrive at interpretations of conditions and experiences that affected the learning experiences of African-American mathematics teachers.

An inductive protocol was utilized for the analytical process. This strategy is based upon using thoughts, ideas, and theories in explaining phenomenon (Merriam, 1998). As stated in Denzin and Lincoln (2000), the inductive approach, “a preparation, exploration, and illumination” (p. 391) model, begins with the researcher becoming totally immersed in the setting, in this case, the learning experiences of African-American mathematics teachers. A reflective period was needed in order for “intuitive insights” and “nuances” to connect, and make sense of the participants’ lived realities. More reflection and analysis followed, giving way to a final synthesis.

Expert checks by colleagues insured minimal concerns related to reliability. Data was provided to experts; they provided their written interpretation of the data. These three individuals graciously agreed to meet with the researcher to discuss their views with the analysis offered by the investigator.

Evin, a White, 36-year-old mathematics colleague, is certified in both high school math and physics. He has taught a total of 10 years, 3 years in a rural district and 7 in a large, urban district. Evin is currently enrolled in a Master’s Degree program. He was one of several support systems throughout the researcher’s Doctoral program. Evin’s brokering characteristics—articulateness, sincerity, and strong knowledge base—made him an excellent choice for expert verification and collaboration.

Bourne, another colleague, is an African-American male who has worked in a large, urban district for over 30 years as teacher (industrial arts), coach (basketball and track), and counselor. For the last 12 years, Bourne has worked as a high school
counselor; for the past year, he has been specifically assigned to work with seniors. His concern with student achievement, particularly for students of color is overwhelming. He oftentimes talks about the challenges that students are encountering because of their prevailing tendencies: lack of personal accountability, low motivation, limited skills, and lack of discipline. He also talks about the need for more parental involvement similar to the nurturing, structured, environment that he had as a child.

A third expert opinion was from Ann, a 22-year-old African American who recently received her Bachelor’s Degree of Science in Nursing. She accomplished this at a small, midwestern, church affiliated college where she worked during her first two years in the university’s tutorial center assisting peers in both Chemistry and English. As a recent graduate in a field that is also under represented by people of color, it was hopeful that she could provide a youthful perspective on those factors that positively affect African-American successes in challenging curricula. This individual is also the Co-Investigator’s daughter.

Pseudonyms were used to insure confidentiality. Tapes and notes were kept in a secure place and destroyed upon completion of the investigation. A timeline was created in order to maintain order and to reasonably pace the investigation (see Appendix H).

Data collection was delayed and completed later due to unanticipated procedural snafus and personal occurrences. Since participants were acquaintances of the researcher, contacting them was easily facilitated. Fortunately, all participants graciously completed their questionnaires, showed up on time for interviews, returned consent forms, and answered their telephones whenever called. All appeared interested in the topic and always willing to cooperate; and even though participants were colleagues and
friends of the researcher, she tried to be respectful of each individual’s personal space. They were given permission at all times to decline any activity or question. This option, however, was never exercised.

Limitations

The misinterpretation of questions is inherently greater in any written communication whenever the author of the document(s) is not present as responses are being crafted. It is important, therefore, to keep questions short while employing concise language. This was a lesson learned from the earlier pilot study. Consistency in meanings amongst all participants and that all questions are interpreted in the same way is necessary when trying to establish reliability. Consistent measurement is made possible “when differences in answers stem from differences among respondents and not differences in stimuli to which respondents are exposed” (Fowler, 1988, p. 75). By limiting the number of questions and wordiness of the data document, it was hopeful that a more efficient instrument would result.

Since the data was self-report, the risk that people might not honestly answer questionnaires or interview questions always presented challenges. In many cases, participants will provide socially acceptable answers as opposed to answers that are truly reflective of the individual’s thinking. Also, with respect to questionnaires, when confronted with open-ended self-administered procedures, there is a greater likelihood that participants will not fully respond to the document. Any gaps in information were addressed in follow-up conversations with the participants.
Pilot study participants were the same individuals who were subjects of inquiry in this investigation. Even though this facilitated the research process, changes in the results on the current study may have been impacted. As stated earlier, however, this study is not focused on broad generalizability. Given another set of data, results of this study should certainly be recognizable. Therefore, minimal affects on reliability and validity are anticipated.

Also, researcher bias can be problematic in qualitative research. Being conscious of this issue and constantly reflecting upon the established research protocol minimized undesirable concerns. Collaboration with colleagues or experts in the field provided the checks and balances needed to maintain an even handed researcher perspective.

Data Reporting

The researcher decided to manually manage data collection. This more personal process was thought to enable a more interactive, personal protocol. Also, themes and categories were created around the data as opposed to data being pigeon-holed into preexisting coding. With respect to an audit trail, data used within this dissertation can be identified by the following specifications:

- Pilot Study (February, 2003)
- Questionnaire (September, 2004)
- Interview (October-November, 2005)
Researcher Perspective

This investigator’s situatedness reflects a “multiplicity of voices” (Busier & Pigeon, 1999, p. 3). Consequently, baggage attached to each could have possibly impacted research results and practices. Because the investigator is African American, a teaching professional, and a student of mathematics, her positioning placed limitations on her ability in being completely objective or totally neutral. In fact, studies detail the nature of both assets and liabilities—complexities and intimacies—inherent in insider/outsider, participant-research dilemmas and perspectives (Busier & Pigeon, 1999; Carpenter, 1999).

While insider status made it possible for the investigator to discern the intricacies of many scenarios, perhaps, another version of the same events from an outsider perspective might have represented a different interpretation. While insider status enabled her to establish a trusting relationship with other participants, at times, formal research dialogues transformed into informal conversations. While tension between scholarly research paradigms and human nature emerged, this interpretative document claims validity similar to that of other participant research investigations (Baumann, 1997; Busier & Pigeon; Carpenter).
Critiquing one’s own assumptions about the world—especially if the world works for you and if you win or have won by the current configuration and normative structures—is a formidable task. Actualizing a new knowledge … is even more difficult because it requires a self-connectedness with a different reality. (Gordon, 1992, p. 20)

Brooklyn

Brooklyn, an articulate, soft-spoken, well-mannered, 36-year-old African-American male, has taught for five years. He teaches mathematics in an urban middle school located in the midwestern part of the United States. He attended a small, liberal arts Historically Black College (HBC) in Virginia where he earned his Bachelor’s Degree in Mathematics. Brooklyn’s Master’s Degree was earned from a large, midwestern university, the same institution where he is pursing his Doctoral studies. His area of certification is high school mathematics.

Raised by his mother in urban New York, Brooklyn describes his socio-economic background as poor, lower economic status. Nevertheless, his mother often reminds him of the fact that all of their essential needs were addressed. His childhood was very structured and strict, yet loving and supportive. He has no siblings.
Brooklyn attended the local public schools as a youngster. He describes his elementary school as a hands-on experience. His middle school engaged students with plenty of board work; high school was taught by teachers whose academic background was in engineering related fields. The classes were very traditional. Lectures and note-taking were the strategies utilized by most of the instructors. His mother enrolled him in a technical and engineering high school after he passed the required entrance examination. The approximate 20-minute, one-way commute by train enabled Brooklyn to attend this school, a place where his mother thought he would have access to a better education. She felt that the education offered by the neighborhood high school was substandard.

Extra-curricular activities in which Brooklyn participated were connected with his school. He participated in football as well as track and field events. Living in a large metropolitan environment limited his community involvement (civic, or social,) opportunities.

While no one specifically motivated Brooklyn to pursue studies in any area in particular, he has always had a fondness for mathematics. He considers himself fortunate in that his parent understood the benefits of a good education. His mother nurtured his “natural curiosity” and supported his mathematical interest.

Comparative shopping in the grocery store and market provided opportunities for Brooklyn to learn practical applications of mathematics outside of school. He says that even though his formal training in mathematics occurred in the classroom, his applied mathematical knowledge was reinforced at home. Unit cost, pricing, and determining discounts were applications that Brooklyn frequently practiced outside of the classroom. His mother did not allow him to use calculators.
Subtraction involving borrowing is Brooklyn’s earliest recollection of doing mathematics in elementary school. In high school, Geometry presented some challenges. However, he does admit that when he took the Geometry class for the second time, the instructor “had more personality and was more engaging.” Brooklyn senses that the personality of the instructor as well as pedagogy affects classroom learning.

Numerical Analysis during undergraduate days presented Brooklyn with his first major mathematical challenge at the college level. He credits his professors with helping him work through the difficulties. They met with him during office hours, assisting with resolving questions and clarifying problematic areas.

Brooklyn acknowledges that his own persistence and motivation were essential in helping him through his mathematical studies. He believes that learning for conceptual understanding, positive reinforcement by instructors after exhibitions of good academic performances or at least when students attempt to complete tasks to the best of their abilities, and parental involvement are key factors for successful experiences in mathematics.

Most of Brooklyn’s teachers in elementary, middle, and high school were White. It was not until he attended a Historically Black College for undergraduate studies did he have exposure to African-American instructors on a large scale. This is where he says he received the most nurturing attention and care. He knew his teachers on a personal level and since the school was small, he had some of the same professors for more than one class.

Brooklyn believes that common cultures and situatedness enhance comfort level, learning environment, and ultimately academic achievement. He thinks that both gender
and race can have an advantage in reaching certain groups of students. He cites an example relating to classroom management where the concerns of African-American male students might be better addressed if they were instructed by African-American male teachers.

There are times when Brooklyn feels that African-American students have abilities; however, they are at a disadvantage because they are not proficient in the “language of mathematics.” He provides examples where students working a problem involving discounts and tips could understand the algorithms, logic, and the required mathematics, but did not understand what was meant by the terminology within the problem. The students did not know the meaning of “tip” or “discount.” Hence, reading comprehension and vocabulary become important factors directly impacting the mathematical successes of African-American students.

Basic abilities, including process and problem-solving skills are also important in becoming proficient in mathematics according to Brooklyn. Many students have “gaps” in their mathematical knowledge base which he insists directly affect students’ confidence levels. In addition, he observes that successful African-American mathematics students are voiced, willing to ask questions about concepts they do not understand; unsuccessful students seem to not understand the processes that are needed in problem solving and are not able to communicate mathematically.

Brooklyn encourages his students to voice their opinions, discuss, and explain their answers. He supports and guides them to understanding that there are many ways to approach and solve mathematical problems. He maintains that modes of assessment for
African-American mathematics students should include real world usage—contextual learning.

He would like to see the African-American community committed to after-school tutoring initiatives and mentoring programs by math professionals, especially African-American professionals whose careers are closely connected to mathematics. In order of importance, he suggests that sociocultural factors (family), self-systems, and the African-American community are the agents that assist in cultivating successful mathematical experiences for African-American students.

Cleveland

Cleveland, a 52 year-old African-American female, has taught for over 30 years. The first 16 years were taught in a large, metropolitan Michigan city. Since then, she has been teaching in a large, urban district in another state. She teaches in the local public schools where the majority of the students are students of color. Her areas of certification are high school mathematics, computer science, and comprehensive social studies. She earned both her Bachelor’s and Master’s Degrees from religious-affiliated midwestern colleges in Ohio and Michigan, respectively. Currently, she is enrolled in a Doctoral program at a large midwestern university.

Raised by her parents in a small, midwestern, northeastern Ohio city, Cleveland and her two siblings were exposed to a loving, supportive, and structured family environment in spite of lower socioeconomic means. Her parents, other family members, friends, church—the entire community—modeled values and character expected of their children. Active church involvement, good work ethic, volunteerism, and acts of
kindness were expected to be included in everyone’s daily living. Respect and care for self, others, and even more respect for adults established the tone of decency that all children of that time learned, understood, and followed. Cleveland was constantly advised of the fact that life’s experiences would not always be fair, but if you treated everyone the way you yourself wanted to be treated, you would land on your feet each and every time.

With racial issues reaching a tumultuous stage during her childhood, Cleveland and her siblings were taught to strive for excellence, “the best that you could do.” Education was acknowledged as a ladder, the key to opportunities. This set the foundation for Cleveland’s philosophical outlook: If you do your best, treat people the way you wished to be treated, work hard, and accept your civic responsibility, a fulfilling life is possible.

Cleveland attended the local public schools and received what she considers an excellent education, grounded in traditional pedagogy. No one in particular encouraged her to pursue mathematical studies at an early age. As a matter of fact, Cleveland says that she was good in several disciplines. As an elementary student, she was enrolled in a “pull-out” program, a “new math” initiative, but she also took French in another “pull out program.” She continued her foreign language studies, and by the time she graduated from high school, she was able to do fairly well on a French placement test that enabled her to move to a course other than the required beginning foreign language class when she arrived at undergraduate school.

For many years, Cleveland played in the orchestra: elementary, junior high, and high school. Cleveland’s parents found the means to insure that she had private violin
lessons to supplement the violin classes that she received at her home school. She still continues to pursue her violin interests. Her other extracurricular activities included Junior Achievement, Future Teachers, National Honor Society, Sun Shine Girls (girls’ church group), church choir, church usher board, NAACP youth group, and hospital/nursing home volunteer.

Cleveland’s first recollection of doing mathematics was in elementary school, first or second grade. A teacher informed the class that learning multiplication facts was required in order to be promoted to the next grade. In a panic, she went home, and with family help, learned her multiplication table. Cleveland’s next memory is working fractions. Her mother assisted with this. Cleveland remembers her mother’s comments about working fractions and the difficulties she experienced in school. Apparently, Cleveland’s mother skipped a grade and was promoted into a class with older children; her mother felt disadvantaged even though this was considered advancement. She struggled with fractions, but learned them. She did not feel comfortable asking for assistance. This experience has always made Cleveland’s mother object to “double” promotions. She felt, according to Cleveland, that a relationship existed between academics, maturity, readiness, and learning at least in the mathematics classroom.

Learning opportunities in mathematics outside of school were predominantly associated with marketplace activities or home consumer math problems. She remembers her mother’s baking projects where she was asked to determine the amount of ingredients required when recipes were adjusted to accommodate larger or smaller quantities. “Calculators were not available to us back then so determining one half of 2 ½ cups of flour took some negotiating; it was mainly a hands-on, visual thing.”
Geometry was the first mathematical hurdle that Cleveland encountered in high school. Even though she was considered “the teacher’s pet,” the course was difficult for her. Formal geometric proofs, the traditional T-diagram/statement and reason format, were difficult. Cleveland also remembers that there were older students in the class; she was pretty quiet and the only African-American student enrolled, once again. Her teacher, she thinks, tried to make her feel comfortable; however, he held her to the same standards as others, if not higher. She still remembers leaving this particular class one day in tears.

With regard to racial nuances, Cleveland remembers an incident day in math class, probably in her junior year, when a young man (she still remembers his name) verbally objected to a new high school being built in the city. He claimed that the newly built high school would relocate a number of minority students to the new building, thereby causing class ranks to take a significant drop in the old building.

The community in which Cleveland lived was a White, blue collar environment. For as long as she can remember, there had been few African Americans enrolled in Cleveland’s classes. Throughout her public schooling, she had only two African-American teachers that she could recall: her sixth grade teacher and French teacher (she still stays in contact with both ladies). After a while, she adjusted to cool, tense environments. She does remember several nurturing teachers, in elementary and in middle school. They were teachers who took time with her, showed an interest in her, and even treated her to lunch.

School was school back then, not the place for developing social relations. She understood that she was accepted and included in most study groups because she was a
good student. Cleveland admits that, for the most part, she seldom asked questions of anyone in class during her high school years. Voicelessness, no doubt, made undergraduate school a bit more challenging because she was slow to seek assistance when she encountered difficulties. Here again, there were few African Americans, seldom anyone who looked like her in any of her classrooms. “Instructors were helpful, but somehow you got the impression that they did not expect much. You did what you had to do to achieve your best in spite of the uncomfortable environment. We studied hard.”

Upon graduation from undergraduate school, Cleveland relocated to a city in Michigan. At this point, her certification was in social studies. Jobs were not plentiful in that discipline; she taught as a substitute teacher. Upon being surprisingly called by central office personnel for a conference one day, she was commended for the excellent job she was doing for the school district. The personnel director suggested that she might wish to pursue studies in a more marketable field such as mathematics. Cleveland admits to being initially shocked at not only the nature of the meeting, but also at the suggestion of pursuing a mathematics curriculum. Since this was a large, urban metropolitan school district, Cleveland was amazed that someone would take the time to counsel her on this matter. The thought that someone took the time to commend her work ethic and also make a sincere recommendation was inspirational.

Until this time, Cleveland had not thought about adding additional endorsements to her certification. As a matter of fact, she was considering changing careers because of the seemingly overabundance of teachers. After talking with other math teachers and
confering with the local colleges and programs, Cleveland made the decision to go back to school on a part-time basis to study mathematics.

"The one thing good about teaching and living in a major metropolitan city, the likelihood of encountering people who look like you at work and in school increases," admits Cleveland. This was the case at the local university where most people commuted to school and worked during the day. The program in which Cleveland enrolled was at a university situated on the northwest side of the city, walking distance from her home. Most of the people enrolled in Cleveland’s classes were individuals like her, those seeking a degree and certification in a marketable field. Even though classes were still mainly comprised of White students, this was the first time that Cleveland saw more than just herself as the representative African American in a mathematics class. She attributes this as probably one of the reasons she was able to endure the rigor of the work. “We (African Americans) formed study groups and telephone study sessions.” Cleveland remembers that the study groups stressed understanding of mathematical processes, not just getting the answers. She claims that they avoided cookbook-recipe types of explanations. “We all were very serious students.” Everyone who started with her also graduated and became mathematics teachers.

It seems as if only after returning to Ohio did Cleveland feel that it was an anomaly to be an African-American student of mathematics. “Deja vu, back to the memories of yester years where you experienced the lonely presence or the idea that, perhaps, mathematics is not a field in which African Americans excel or pursue.” She recalls how when she began teaching part time at a local junior college, department staff who did not know her would question her presence when she appeared in areas reserved
for the staff. In addition, students often asked her if she were the math instructor even though she was at the front of the room with materials getting ready to begin the class. In fact, on the first day of classes, Cleveland would often enter the room just as class was scheduled to begin so that she would not have to answer over and over again to the question, “Are you the teacher?”

With respect to mathematical performances, Cleveland notices that her unsuccessful students, high school and junior college, lack confidence, even those with good ability. Students enter the room with the attitude that they cannot do good work in mathematics; they will even admit to this. However, Cleveland fails to understand why students will seldom say that they perform poorly in language arts skills, even if they do. The stigma and concern attached to language illiteracy appear to be far removed from the quantitative and mathematical illiteracy issue.

Cleveland believes that students lack math confidence and by the time they have made it to high school, it is difficult to reclaim or instill positive attitudes related to mathematics. She tries to honor the knowledge that students bring into the classroom and constructs her strategies from there. According to Cleveland, students are amazed when you inform them that they do bring skills to the classroom. Her students appear to feel unworthy of this suggestion. Cleveland’s successful students, on the other hand, are usually determined to get the correct response as well as the understanding associated with arriving at the answer. Cleveland feels that she, too, values learning for understanding, not just algorithmic approaches. She feels that students who are able to construct mathematical knowledge and understanding are those who truly know how to do the work and can apply their learning in other similar applications.
Language Arts skills also present difficulties for many of Cleveland’s mathematics students. With the current mandated standardized tests, being able to read, comprehend, and communicate mathematically are important. Math questions involving written explanations are not high performing areas for her district. She claims that many of her students are reluctant readers and/or have poor writing skills. Cleveland feels that this deficiency coupled with lack of problem-solving skills and other foundational math skills (math facts and concepts) pose obstacles to students attempting to successfully complete standardized examinations.

In terms of those factors that promote mathematical successes for African-American students, Cleveland feels that sociocultural, family support networks, are important. “My parents were always on us about school work, grades, and social relationships. They may not have been able to help us solve systems of equations, but their motto was, ‘If Johnny can’t tell time in school, Johnny isn’t telling time at home either.’ Parental involvement establishes expectations and support systems.”

According to Cleveland, self-systems are next in importance of factors impacting mathematical successes of African-American students. Resiliency or the emotional fortitude to continue rigorous and rich curricula, along with confidence, the individual’s belief that one can be successful in such a curricula, and self-regulatory behaviors, the ability to self monitor progress and become responsible for one’s own success enable students to adapt, determine a course of action, and bounce back when students are confronted with academic challenges. These self-systems are typically nurtured through family involvement and community.
Cleveland advocates a proactive systemic commitment on the part of school districts as a means for advancing an African-American mathematics proficiency agenda. This would include intervention programs (tutoring and remediation), enrichment programs, and more effective academic counseling. Professional development for educators addressing issues of nurturing classroom environments with high expectations should also be included in these efforts.

Lastly, Cleveland believes that the African-American community has a responsibility in advancing the quantitative literacy of its members. The African-American church could become a leader in assisting in initiatives that promote mathematical and quantitative proficiency. Tutors, mentors, and advocates could all make a difference. With the youth population that churches draw through their various initiatives (sports, recreation, civic), this untapped resource could make a difference in the mathematical successes of African-American students.

Columbus

Columbus, a polite, soft spoken, 36-year-old African-American female, is beginning her third year of teaching. Her first two years were taught in an urban, midwestern middle school, one that she attended as a young student. Recently, she began teaching at the alternative high school from which she graduated. Her Bachelor’s Degree in Mathematics and Master’s Degree in Education (secondary mathematics) were both earned from a large, midwestern university. Columbus’ area of certification is in grades 7-12 mathematics.
Raised primarily by her mother, Columbus and her five siblings were encouraged to be successful in all endeavors. Expectations, acceptable academics, and discipline were “laid down.” “A ‘C’ average was adequate if that represented your best effort. Doing the best you could do was our responsibility,” Columbus maintains. As early as elementary school and continuing through middle school, the family was very active in their church, though it was more of a social involvement; academics were not the focus there.

Columbus describes her family’s socioeconomic status as low to middle income. She recalls competition and mathematical concepts being embedded in her everyday living experiences. Daily activities—i.e., cooking, sewing, sharing of group and personal belongings—provided the impetus for learning skills and concepts such as measurement, fractions, estimation, number sense, basic number operations, percents, probability, and critical thinking. When her family members took on sewing projects, oftentimes only one pattern was purchased; it was altered, however, to fit the other members of the family. The mathematics associated with the pattern adjustments was learned. In cooking, “especially with sweets, you had to make sure that everyone had equal amounts, otherwise, someone was going to complain.” Therefore, out of necessity, everyone in the family was proficient with concepts involving fractions and division.

Games provided sources of affordable family entertainment. “We played games all the time: cards, puzzles, Monopoly, and Scrabble. It was a way to socialize—entertainment for us. We were a game family; we had fun.” Having to be at your best to outplay the others created a spirited, competitive, family atmosphere. This environment,
she believes, encouraged skill development in any weak areas: social, physical, and academic.

Columbus has always enjoyed learning mathematics. It has been her strong area for as long as she can remember. Her desire was to follow in the footsteps of an older sister who also excelled in mathematics.

In elementary school, most of Columbus’ classmates were African Americans, all coming from the surrounding neighborhood. In middle school, she experienced the aftermath of desegregation and busing. Most of her classmates here were White; African Americans were the minority students. It was about this time that Columbus began to notice that there were fewer African-American students in her math classes, especially as she advanced through the upper level courses.

Early memories of Columbus’ mathematical learning in school include working in math workbooks in elementary school. Her first major challenge in mathematics occurred in high school Geometry. Columbus admits that she did not “conceptualize what was going on.” She maintains that she did not fully understand the subject, and that, perhaps, both math readiness and teaching pedagogies influence mathematical learning. “I think that if it had been presented in a different manner, I could have done better,” she says.

Extracurricular activities consumed Columbus’ spare time. She participated in INS (elementary smoke-free club), Brownies, choir, Glee Club, band, and orchestra. These activities, even though socially oriented, provided arenas where practical math skills and concepts could be applied.
In both elementary and middle school, learning environments were “comfortable” for Columbus; teaching strategies were typically very traditional. In elementary school, most of her teachers after second grade were African-American females, many of whom she “trusted” because they were “nurturing females,” not necessarily because they were African Americans. “It was easier for me to be closer to female teachers.” She, however, did “notice a difference” in middle school. In middle school and high school, teachers were less nurturing —“all about business.” Since Columbus, too, was all about business in regards to her academics, a serious atmosphere did not bother her. During these years, she had very few African-American instructors.

She acknowledges that it was her fifth and sixth grade teacher, strong in mathematics, who insisted that students master mathematical concepts. According to Columbus, this teacher understood that mastery in basic skills is the requirement for developing prerequisite abilities for success in higher level mathematics. Her seventh and eighth grade teacher (same teacher) noticed her fondness for mathematics and supported her passion for the subject. This teacher tutored her both during and after school. In high school, a Calculus teacher influenced and continued to cultivate her mathematical interests and skill development.

None of Columbus’ instructors in undergraduate school were African Americans. Only one instructor in Graduate School was African American. By this time, Columbus was determined that she would have to be her own advocate. She learned this from her sister, a medical doctor, who encountered the same experiences. Columbus made it a point of conferring with instructors when experiencing difficulties or if she did not quite understand how an assessment was evaluated. “I knew how to approach them.”
Few of Columbus’ classmates in her college academic classes were African Americans. She always felt slightly uncomfortable, “Everyone knew who you were and your name.” This did not have a negative effect on her academic performance, however. “It bothered me. I thought it was odd that no other African American needed to take these same courses,” says Columbus.

She feels that her undergraduate school actually separated students into minority and White groups before assigning them to a special type of introduction to college, required freshman orientation class. This is the only class that she can remember as having a significant number of students who also looked like her. In this particular class, students were informed of university support services and resources. Statistics regarding minority rankings on ACT scores, retention, and graduation rates were passed on to them during these sessions. Unfortunately, as it related to students of color, the information was presented in usually a pessimistic, degrading, “you’re not expected to be successful” format. Columbus says that many of her peers found this course offensive and actually complained to university officials.

Columbus believes that African-American mathematics students create mathematical knowledge and understanding through visual and real world applications. She stresses the importance of varied modes of assessments including projects, portfolios, and journals. She argues that these assessments not only engage students, these exhibitions of knowledge can clarify understandings, fine tune critical thinking, and sharpen quantitative skills.

Regular involvement in critical thinking activities and playing games are strategies that Columbus claims promote mathematical thinking. Her successful students
enjoy challenges. She notices that her unsuccessful students do not enjoy problem solving and do not want to engage in anything that involves critical thinking or competition. Columbus maintains that her unsuccessful students lack confidence in their abilities to learn mathematics. She attributes her own successful mathematical experiences to the confidence and persistence that emerged from growing up in a large, competitive-oriented, family environment.

In her own classrooms, Columbus utilizes games and hands-on activities whenever appropriate, those that involve the students without them realizing that they are engaged in critical thinking or problem solving. Games are friendly forums enabling students to mesh math concepts and problem solving. Playing games, Columbus maintains, also cultivates persistence and self-confidence, which are all key factors to success for African Americans in the mathematics classroom.

With respect to the networks that support the teaching and learning of African-American mathematics students, Columbus feels that parental involvement is most important. Secondly, she thinks that self-systems, particularly self confidence and persistence, are next. Thinking back, Columbus recalls that whenever she encountered challenges with her math, she gave herself time to attempt resolution; if that failed, she felt comfortable asking questions and seeking assistance. Finally, the family structure provides a foundation on which self-systems are cultivated. A proactive community support system (tutors and mentors) follows in importance.

Detroit

Detroit, a 47-year-old African-American female, has taught mathematics for 26 years, 14 years in a large urban school district and 12 years for the Department of
Defense Dependent Schools. She received her undergraduate degree from a small Historically Black College (HBC), her Masters Degree in Education from a small, midwestern Jesuit university, and her Education Specialist Degree from a large state university where she is also pursuing her Doctoral degree. Detroit’s areas of certification are mathematics and administration.

Growing up in a large, urban area, Detroit lived with her parents and a brother who is six years older. She describes her family’s socioeconomic background as lower middle class. Her mother and father stressed the importance of working to one’s potential, as well as the belief that through firm religious convictions accompanied by a positive attitude, all things are possible. Her parents were resolute in that she be exposed to the teachings and learnings of life that emerge from those experiences obtained through extra-curricular activities, family involvement, and active church participation.

Early in life, Detroit’s parents laid the foundation for mathematical learning outside of school. Math was understood and taught to be something needed in order to negotiate daily consumer activities. Opportunities in Detroit’s home were available which enabled her to develop and fine tune her computational acumen and reasoning skills.

Detroit’s parents owned rental properties. She was always told that someday the family’s entrepreneurial interests would be her responsibility; therefore, from a young age, perhaps as young as four-years old, her father exposed her to the duties involved in owning a business. She regularly engaged in practical mathematical applications that emanated from assisting her father as he collected rental monies from his tenants. She helped her father count monies, write receipts, and accompanied him to the bank to make
deposits. He discussed and guided her through these transactions. In addition, her father enjoyed and was successful playing “the street numbers.” This provided more opportunities to engage in quantitative discourse. Her father was dutiful with his church tithing and insisted that she not only learn to handle family business matters, he also showed her and expected her to determine and prepare the family’s church tithes (10% of earnings). Her father always made her “count big sums of money.”

Church and community are credited with developing Detroit’s self esteem and confidence. These forums provided opportunities for public speaking, development of reading and reciting skills, and exposure to positive life experiences. Other extra-curricular activities included Junior Office Training Club, Travelers Club, choir, and the churches’ youth group.

Detroit has always attended schools in a predominantly Black environment. She had family ties in the state where she attended college and also had relatives attending the university when she matriculated. These factors provided the encouragement to attend the HBC that she ultimately attended.

As a child, Detroit attended the local schools where most of her teachers were African Americans. Most teachers were very traditional in terms of their teaching methods and assessments; however, she feels that these teachers motivated her to pursue studies in mathematics. In her ninth grade Algebra class, she became enamored with mathematics. She says that she was the “smartest in the class.” However, it was her middle school math teacher and advisor to the Travel Club of whom she has warm memories and gives recognition to for boosting her self-esteem, providing opportunities for early hands-on, practical math activities, and cultivating her love for mathematics.
She remembers that this particular teacher “went out of his way to work with kids.” He selected her to serve as treasurer of the Travel Club. In this position, she was in charge of collecting money, counting money, writing out deposit slips, and going to the bank (located across the street from the school) to deposit the funds. She recounts how special she felt being entrusted with this important teacher helper role.

Detroit recalls that her first challenge in mathematics occurred in high school Geometry. She believes that her teacher did not fully understand the subject and was, perhaps, not able to present it in the most efficacious manner. When taking the class in college, not enough students enrolled in the course; consequently, the course was offered to her as an independent study. She studied her instructor’s notes, took the tests, but never really understood Geometry. It was only after beginning work with the Department of Defense Dependent Schools and after being informed that her work schedule would include teaching a Geometry course did she make the decision that she must finally master Geometry. Detroit immersed herself in geometric studies and became what she describes as one of the school’s better Geometry instructors. She believes that this was due to her complete engagement with the subject matter as well as continuous questioning, reflecting, and determining those questions that might pose difficulties for those such as herself who might experience challenges with geometric skills and reasoning.

In college, Calculus presented hurdles. Some of this tension, she remembers, might have been due to the fact that she was also co-managing sorority activities concurrent with her studies. Her math teacher who happened to be her sorority advisor refused to support or enable those behaviors that were not conducive to scholarly
engagement. She refused to “let me give up.” Detroit calls to mind one morning when this particular instructor telephoned to awaken her, reminding her that she was expected to be in class in spite of extracurricular activities. Furthermore, she was informed that if she was not ill, she had better “be down the hill and in math class within 10 minutes.”

When taking graduate courses at her hometown state university, Detroit recalls that African-American students “caught hell.” She remembers the time when she took two research statistics courses, all from the same instructor. She felt that little was expected of her and other Blacks in terms of academic performances. The professor did not offer much assistance; what she learned was because of other students in the class or others who had been previously enrolled in the courses. Again, working and living in a large, metropolitan area enabled her to see more people of color in some of her classes. She admits that because she grew up in a large metropolitan community, most of her classmates were people of color.

Detroit believes that high teacher expectations, self-confidence, and mastery of basic facts are necessary for African Americans to achieve success in mathematics. She also believes that having teachers who looked like her enabled her to associate high standards of achievement and success to her personal experiences. Detroit believes that African-American teachers have an advantage in reaching African-American students, especially in underrepresented areas of curricula like mathematics. Her rationale is that African-American teachers know what African-American children can do, in spite of barriers and glass walls; they themselves have emerged through the struggle. Thus, their expectations are aligned with an informed body of knowledge, personal experiences,
empathy, and support—not excuses and enabling endorsements. Detroit’s teachers looked like her; she felt that they had a vested interest in her success.

She notices that her successful mathematics students have an understanding of the basics (numerical operations, number sense, patterns and relationships) and conceptual mathematical knowledge. Detroit feels that, for whatever reasons, many African-American students have not been equipped with a solid foundation from which to build mathematical thinking and reasoning. These deficiencies tend to cripple their mathematical potential.

In the order of importance, Detroit believes that for African-American students, social cultural influences, particularly the home and church, and self-regulatory behaviors are precursors to learning mathematics. She understands that strong family and church involvements build the self-regulatory abilities such as confidence, persistence, voice, and the skills to become proactively accountable for individual efficacy. Sociocultural influences lead to the necessary self-regulatory behaviors that are crucial to both academic and basic survival skills.

African-American students in underrepresented areas such as mathematics must also realize and understand a lonely presence. Detroit says her friends did not enroll in her mathematics classes in high school. In graduate school, she, once again, experienced the lonely presence. Self-regulatory behaviors provide the support system for empowering individuals in these situations to remain focused.
CHAPTER 5

ANALYSIS

This is the point where the researcher is led by the data. This is where research instruments (Interviews, questionnaires, telephone conversations, and pilot study) are sorted and examined over and over again, where extraneous tones and noises are eliminated, and where messages emerge. This is the juncture where research and data are wedded (Merriam, 1998).

Against the theoretical frameworks of sociocultural theory, self-systems, and Critical Theory, the purpose of this study was to determine factors that impact the mathematical successes of African Americans, specifically, African-American mathematics teachers. This inquiry was driven by a desire

1. to provide information that might assist advocates and stakeholders in their endeavors to advance mathematical/quantitative literacy among African-American students

2. to provide a resource that might support the African-American community in assuming a proactive stance in the quest for mathematical/quantitative proficiency
3. to shift from traditional deficit thinking to analyzing student success stories in addressing substandard mathematical performances of African-American students

4. to provide insights into theory, practice, and research

Upon sifting through the data, information could be grouped into four categories. Several themes emerged under each. This alignment also enabled the researcher to better synthesize thoughts related to the focus questions. Data results fell into the following configurations:

1. Family expectations and other conditions
2. Intrinsic factors
3. Classroom experiences
4. Beliefs and philosophies

Family Expectations and Other Conditions

Family involvement, church participation, and extracurricular participation were the themes that emerged under this category. Bourne, an expert collaborator, noticed how family support and life experiences were threads weaving throughout the participants’ testimonies:

Each came from families that provided foundations in values, importance of education, doing your best, accepting responsibilities, expectations, and the importance of education. Families provided opportunities, experiences, tutoring, and reinforcement that developed their math skills and other interests. Each had someone who provided sustenance and encouragement throughout their lives.
Evin, another expert collaborator offered similar thoughts. He noticed the importance of family influences and extended support systems. The family training and caring notions that emerged fit the suggestion that for African-American students, nurturing relationships are crucial and vital to their learning processes.

Ann, the third expert collaborator had a more holistic perception. She attributed the participants’ mathematical success to the totality of their life experiences, not just one particular variable. Everyday and each experience became a building block and provided a brick in the “foundation for success.”

Family involvement and influences have always been understood as agents promoting academic success. Family involvement is considered a child’s most valuable asset (Stepanek, 1998). It is a quality home environment that is associated with higher student performances; from a very young age, there is a strong link between high parental expectations and the expectations students establish for themselves (Campbell, 1996; Gill & Reynolds, 1996; Schwartz, 1995). “Children need to know that their parents think highly of them and expect them to do well in school” (Gill & Reynolds, p. 3). This appeared to hold true for participants in this investigation where familial guidance and support networks were important components of their lives. Expectations and life philosophies were engrained at a very early age. For these participants, family involvement appeared in the form of basic parenting skills, learning opportunities at home, and in the role of decision maker/advocate in the educational process.

With respect to mathematics achievement and African-American students, research has addressed the impact that parental expectations have on student performances where children’s perceptions of their parents’ expectations added a
significant variance to math achievement (Ajose, 1995; Gill & Reynolds, 1996). Investigators concluded that communications between the home and school should begin at an early age (Ajose; Gill & Reynolds). Particularly for African-American students, productivity factors of learning such as family influences have a bearing on mathematics achievement and have a greater influence if accessed prior to secondary school (Moody, 2000; Thomas, 1999).

Brooklyn, Cleveland, Columbus, and Detroit acknowledged the prominence of parental involvement in their lives. While typically, African-American families are matriarchal-centered, only two of the four participants (Brooklyn and Columbus) mentioned being from a home led by a female parent. However, whether single parent or two-parent family, the significance of family influences prevailed. It was noteworthy that the notion of family ranged from the very concrete to an all-embracing definition, from the immediate family to the community at large. For participants in this study, family sculptured the designs for living.

Brooklyn        My childhood family was very loving, supporting, and strict. (Pilot Study)

Cleveland      I had a loving, supportive, structured family environment . . . Parents, other family members, friends, church—the entire community—modeled values and character expected of their children . . . My parents were always on us about school work, grades, and social relationships . . .

(Interview)
Columbus  Expectations, acceptable academics, and discipline were laid down for my siblings and I. (Interview)

Detroit  My parents stressed the importance of working to one’s potential. (Interview)

Time spent with family is another family related factor, a “discretionary resource,” that affects mathematical performances of African-American students (Campbell, 1996, p. 9). Higher mathematics achievement is associated with quality family engagement—time spent together. In their submissions, participants talked of time together with family: trips to the market, baking and sewing projects, playing games, and going to church. In her Interview, Columbus cited that family engagement “provided the impetus for learning.”

Mathematical Learning Opportunities in the Home and Community

For African-American children, perceived utility, the perceived usefulness of mathematics in the home by individuals due to the influences of significant others, has a role in cultivating understanding of mathematics and its applicability (U.S. Department of Education, 1992). A 1999 study concluded that for African-American children, the perceived usefulness of mathematics is a factor that is particularly important if engrained prior to secondary schooling (Thomas, 1999). Brooklyn, Cleveland, Columbus, and Detroit were exposed to mathematical learning opportunities outside of their mathematics classroom in their homes.
Brooklyn  Even though my formal training in mathematics occurred in the classroom, my applied mathematical knowledge was reinforced at home.  

(Interview)

Cleveland  My teacher told us that learning multiplication facts was a requirement for promotion to the next grade . . . with family help, I learned them.  

(Interview)

Brooklyn referred to learning about unit pricing and discount computations without the use of calculators when he shopped with his mother.  Cleveland was exposed to measurement applications when adjusting recipes to accommodate larger or smaller quantities.  Columbus addressed division issues in determining equitable quantities for her and four siblings as well as pattern adjustments to accommodate other family members.  Detroit cited computations with large amounts of monies and figuring family church tithes.

As advocate, collaborator, and decision-maker in the educational process, family involvement can have an impact on what happens or does not happen for students.  Brooklyn revealed that his mother felt that the neighborhood school was substandard.  Consequently, she enrolled him in a science and engineering school, a one-way, 20-minute train commute from home.
Brooklyn I consider myself fortunate in that my parent understood the benefits of a good education. (Pilot Study)

She [mother] nurtured my natural curiosity in numbers and encouraged me to further explore studying mathematics on a college level. (Questionnaire)

Cleveland My mother objected to double promotions. She felt that a relationship existed between readiness (academic and social maturity) and learning at least in the mathematics classroom. (Interview)

In addition to public school instrumental lessons, for many years, my parents paid for me to have private violin lessons. (Interview)

Detroit My family encouraged me to consider a Historically Black College. I had family ties at the one that I ultimately attended; I also had family residing nearby who could immediately assist me in the event of any emergency. (Interview)

Church Participation

Church involvement has traditionally provided the “faith, perseverance, and resiliency” (Hale, 2001, p. 169) that has enabled African Americans to press on in spite of challenges, glass walls, trials, and tribulations. The church “transmits messages to African-American children that through faith and self-determination, the quicksand and
landmines along the road to achievement are obstacles that can be overcome” (Hale, p.168). As young children, Cleveland, Columbus, and Detroit mentioned an affiliation with a church.

Cleveland . . . active church involvement, good work ethic, volunteerism, and acts of kindness were expected to be included in everyone’s daily living. (Interview)

Columbus At a young age, my family was very active in church, though it was more of a social involvement . . . (Interview)

Detroit They (family) taught me that with God, I could do all things. (Pilot Study) I credit my church . . . with developing my self-esteem and confidence . . . there were also opportunities for public speaking, reading and writing . . . exposure to positive experiences. (Interview)

According to Hale (2001), a religious connection— attendance, participation, and leadership— helps African-American children “depersonalize obstacles and enables them to place their personal challenges into the context of the overall struggles of African-American people” (p. 168). Difficult curricula and unfriendly classroom environments were, perhaps, more tolerable due to the training and support system provided by the church.
Extracurricular Activities

Participants in this study were goal driven. It has been suggested that there exists a high level of extra curricular participation for goal-oriented African-American students, that it is the desire for material gain, perhaps success in challenging situations that becomes the motive behind their curricular involvements outside of the classroom (Gordon, 1996). Brooklyn, Cleveland, Columbus, and Detroit all engaged in extra curricular activities. Brooklyn was involved in sports related interests (football and track). Cleveland’s activities included orchestra, career-related organizations such as Future Teachers of America and Junior Achievement, church groups, and civic organizations. Columbus’ involvement included glee club, band, orchestra, Brownies, and a smoke free club. Detroit’s extra curricular participation included church organizations, choir, Traveler’s Club, and Junior Office Training Society. The drive for success, particularly in traditional, mainstream environments, was a characteristic of these participants.

Intrinsic Factors

Identifying and understanding the internal mechanisms that enabled these participants, African Americans, to survive in a mainstream dominated environment is complex. As researcher and participant, the fact is that there will be many stories never revealed; accounts are still too painful, too real.

All four participants, at some point, experienced a departure from friends, a “lonely presence” where they understood that they were one of a few, maybe the only minority, in their classes. Brooklyn, Cleveland, Columbus, and Detroit at some point
were all enrolled in classes at predominately White institutions. With respect to unfamiliar environments, Brooklyn’s mother enrolled him in a school that was a train commute out of his community in order for him to obtain a quality education. Social alienation and nonsynchronous conditions were evident in the testimonies of the other participants as well.

Columbus Everyone knew who you were and your name. It bothered me. I thought it was odd that no other African American needed to take these same courses. (Interview)

Cleveland During my junior year in high school, I remember a young man in one of my math classes objecting to a new high school being built in the city. He claimed that the newly built high school would relocate a number of minority students to the new building, causing class ranks to take a significant drop in the old building. (Interview)

Detroit African-American students caught hell. (Interview)

I felt that White males did not respect my voice in their discussions about mathematics. (Questionnaire)

Self-regulatory behaviors, self-esteem, self-concept, resiliency, voice, positive attitudes, and motivation can undoubtedly be placed on the high end of the continuum for
participants of this study (Presmeg, 2000). It is a “positive self concept (black identity), understanding of racism, and the availability of a supportive network” that become the “source of strength” and “facilitate coping” processes for students of color (Presmeg, p. 61).

During a time when there was not an emphasis on advanced mathematics matriculation for all students such as it is today, Brooklyn, Cleveland, Columbus, and Detroit enrolled in a Geometry course. All had challenging experiences in their high school Geometry class; all four individuals persevered and toughed it out. These participants could have possibly terminated their particular mathematics track or pursued another curricular option. Brooklyn, Cleveland, Columbus, and Detroit, however, confronted their academic challenge.

Brooklyn I was successful in this course—the second time around. The problem was my own lack of engagement. (Interview)

Cleveland . . . the course was difficult . . . formal geometric proofs, the traditional T diagram/statement and reason format . . . (Interview)

Columbus I did not conceptualize what was going on. I did not fully understand the subject. (Interview)
In high school, I had difficulty grasping Geometry . . . after that experience; I did not want to take any math courses that dealt with Geometry. (Pilot Study)

Detroit My first challenge in mathematics occurred in high school Geometry.

(Interview)

Participants were also individuals who took some responsibility for their own learning. When Brooklyn encountered challenges in Geometry, he was quick to interject his role and responsibility: “It wasn’t the teacher’s fault.”

Brooklyn My own persistence and motivation were essential in helping me through my mathematical studies… Self-motivation was the reason why I continued my education. (Pilot Study)

Cleveland We (African Americans) formed study groups and telephone study sessions. (Interview)

Columbus Whenever I encounter challenges with math, I give myself time to attempt resolution; if that fails, I feel comfortable asking question and seeking assistance. (Questionnaire)

I always felt confident about doing mathematics. Even when I struggled with Geometry, I still enjoyed doing mathematics . . . (Pilot Study)
Detroit It was only after beginning work with the Department of Defense Dependent Schools and after being informed that my work schedule would include teaching a Geometry course did I make the decision that I must finally master Geometry. I immersed myself in geometric studies and became one of the school’s better Geometry instructors. (Interview)

Redden (2002) has found that African-American students in predominantly white learning environments experience greater amounts of stress, racism, and social alienation. Yet, through isolation, difficult curricula, and low expectations, these participants developed internal coping mechanisms that enabled them to “swim with the sharks,” to successfully coexist in potentially stressful and unfriendly environments and become a presence in decisions regarding their academic aspirations. Brooklyn’s persistence and motivation provided sources of support throughout his mathematical studies; Cleveland became involved in cooperative study groups in graduate school; Columbus refused to allow uncomfortable learning environments to affect her studies; and, Detroit actively sought ways to fill in what she felt were deficiencies in her knowledge base. They were able to garner the individual agency to ultimately negotiate the realities of mainstream academia.

Classroom Experiences

Powell (2000) studied African-American students’ perspectives on exemplary mathematics teachers and found that instructors’ roles in the classroom become critical in
the teaching and learning of mathematics. The nurturing ethic, in particular, is important for African-American mathematics students. Participants all referred to caring instructors who made them feel more comfortable in class, helped them through academic challenges, and/or who showed genuine interest in them. Both Brooklyn and Detroit mentioned the importance of small learning environments and having the same mathematics instructor for more than just one course.

Brooklyn I attribute my success in mathematics to my professors [HBC]. (Pilot Study)

. . . I knew my teachers on a personal level . . . the school was small, so I had some of the same instructors for several classes. (Interview)

My professors [HBC] met with me during office hours, assisting with resolving questions . . . (Interview)

Cleveland I was considered “teacher’s pet” . . . I think he [high school Geometry teacher] tried to make me feel comfortable . . . (Interview)

I had only two African-American teachers from K-12. I still keep in contact with these two ladies. (Interview)
Columbus  In elementary school, my teachers after the second grade were African-American females. I trusted them because they were nurturing females, not necessarily because they were African Americans. It was easier for me to be closer to female teachers. (Interview)

My high school Calculus teacher also influenced me through his instruction. (Pilot Study)

Detroit  One of my college math professors who was also my sorority advisor refused to let me give up. (Interview)

. . . the instructors knew you [HBC]…some instructors you had for more than just one class since the school was small … (Interview)

Most of my teachers were African Americans. They encouraged me to pursue my mathematics studies. (Interview)

Beliefs and Philosophies

Experiences, attitudes, situatedness, and wisdom afford us the ability to formulate ways of doing, ways of knowing, and ways of addressing our encounters as we travel through life’s journeys. So it was with these participants’ outlook on the teaching and learning of mathematics for African-American students. Brooklyn, Cleveland, Columbus, and Detroit were all able to offer opinions on strategies that they have found
to be most effective in teaching African-American students; they all had ideas as to the areas that need fine tuning for student success in the mathematics classroom. The prevailing themes included the notions of voice, confidence, self-regulatory behaviors, and community accountability.

Brooklyn . . . successful African-American students are willing to ask questions about concepts they do not understand . . . they realize that they must have a conceptual understanding of each unique solution process…

(Questionnaire)

I would like to see the African-American community committed to after-school tutoring initiatives and mentoring programs by math professionals, especially African-American professionals whose careers are closely connected to mathematics. (Interview)

I believe that parental involvement is key for African-American students to succeed in the classroom. (Pilot Study)

Cleveland . . . my successful students arrive at the correct answer and with the understanding as well . . . they value learning with understanding, not just algorithmic approaches . . . Resiliency or the emotional fortitude to continue rigorous and rich curricula, along with confidence, the individual’s belief that one can be successful in such a curricula, and self-
regulatory behaviors, the ability to self monitor progress and become responsible for one’s own success enable students to adapt, determine a course of action, and bounce back when students are confronted with academic challenges. (Interview)

Columbus Successful African-American students of mathematics enjoy challenges, have critical thinking skills and are confident in their abilities. These students love to problem solve . . . (Questionnaire)

Parental involvement, self confidence, and persistence are important. (Interview)

Detroit They have learned the basic facts . . . They tend to understand mathematics relationships . . . (Questionnaire)

In terms of those pedagogies that the participants have found to be most efficacious with African-American mathematics students, the key idea was the importance of capturing as many students as you can by utilizing all tools in the teacher’s toolbox.

Brooklyn . . . utilizing real world use and applications of problem solving…giving students positive reinforcement for a job well done or attempting to complete a task to the best of his or her ability . . . cooperative grouping and hands-on activities… (Pilot Study)
Cleveland  I try to honor the knowledge that students bring with them to the classroom and move from there . . . I try to teach for understanding . . . not just algorithmic approaches . . . (Interview)

Columbus  . . . you should try to vary the modes of assessment for African-American students. . . assessing . . . using journals, projects, and portfolios . . . (Pilot Study)

Both Brooklyn and Detroit suggested that common cultures and situatedness can impact teacher efficacy in the mathematics classroom. In fact, Detroit was emphatic, “. . . and finally, students need to be taught by teachers who look like them.” She continued her argument by stating in her interview that “African-American teachers know what African-American children can do . . . they themselves have been successful. Their expectations are aligned with an informed body of knowledge, personal experiences, empathy, and support . . . not excuses.
CHAPTER 6

DISSEMINATION OF MESSAGE: CLOSURE AND NEXT STEPS

…arriving on a nightmare, praying for a dream . . . (Angelou, In Ladson-Billing’s
Dreamkeeper, 1994, p. 127)

As of this writing, concerns regarding the academic performances of African-American mathematics students continue to mount; success in mathematics still eludes many of them. This inquiry, however, was not a deficit perspective, a pathological study of ills impacting their mathematical behaviors. This inquiry was not about addressing achievement gap issues, that is, the quantifiable differences between African-American mathematics students and some Eurocentric population. This researcher is not convinced that the mathematical performances of any such group are the standards to which one should aspire. This researcher was not as concerned with equity in the sense of “leveling the field” as much as she was concerned with empowerment and liberatory, emancipatory habits of mind. The objective of this investigation was focused on identifying factors that positively affect the mathematical performances of African-American mathematics students through the examination of voices and experiences of African-American mathematics teachers. The voices of African-American mathematics teachers are valid, legitimate, and appropriate examiners and interpreters of African-American mathematical truisms. The intent was to spark a participatory, collaborative discourse into transforming
current mathematical realities of a marginalized people, specifically African Americans. The researcher’s goal was to provide documentation of success factors, “critical enlightenment,” productive aspects of mathematical empowerment—a resource for practitioners, clinical educators, and the African-American community.

As stated in Chapter 3, this is a culturally sensitive document. It is marginalized discourse from a minority intellectual perspective (Gordon, 1992). Borrowing from Brown (1999, p. 194) on the role of a culturally-relevant researcher, this investigator situated her beliefs similarly:

1. researcher studies participants
2. researcher uses stories to convey points and tell about experiences
3. researcher believes that all events contribute important data; there are no “missing data”
4. researcher values voice
5. researcher seeks not only to understand, but to contribute to current situations (and to emancipate if necessary)
6. researcher believes that findings and interpretations must emerge from the culture and community
7. researcher is concerned about reciprocity with participants
8. researcher believes that research seen as a synergistic effort between her and the participants produces a more accurate account of the inquiry
9. researcher is concerned about ontology and epistemology
10. researcher writes up research for a wide audience
Theoretical Considerations

Against the backdrop of sociocultural influences, self-systems, and Critical Theory, data sources were examined for information that might address the proposed focus questions. Referring back to the Rationale Schema (see Figure 1.1), the researcher intuitively believed that factors impacting the successes of African-American mathematics students could be found upon analyzing the trajectory of experiences and voices of African-American mathematics teachers. This, in fact, did occur.

Sociocultural tendencies, the impact of culture and social interactions on learning, were prevalent among this investigation’s participants. Familial involvement for all participants was reified in basic parenting skills, mathematical learning opportunities/applications in the home, academic expectations/standards, time spent with family, the role of decision-maker advocate in the educational process, and discipline. Whether single-parent home or two-parent home, family guidance provided the early nutriment that propagated mathematical success for these participants.

Other sociocultural influences became apparent such as church affiliation and extracurricular participation. Brooklyn, Cleveland, Columbus, and Detroit had dynamic as opposed to static outside-of-school lives. The role of the church was of interest to this investigator since the church has historically been a focal point within the African-American community. Its specific influence, however, in the quest for mathematical/quantitative literacy appeared to be minimal according to participant experiences in this investigation. In a conversation with Detroit who credited her religious affiliation as a major support system in building her individual agency, she stated that the “churches have become weary . . . there is so much expected of the few
faithful workers . . . ” Brown (1999) addressed this concern in her study and went so far as to politely scold African-American churches for abdicating their responsibilities in this area. Conducting her study in a church setting in which participants were affiliated, Brown studied African-American students and their mathematical behaviors. Surprisingly, there was, just a “mere trace of academics” in this “closely intertwined dynamic community,” the church (p. 173). Void were those elements that would allow them access to the competition arena of dominant, privileged, mainstream society. Her interviewees agreed:

As a community, a church community, we’re going to have do more. Our kids come to us for spiritual guidance, but they’re going to need that and more in society . . . the church has to answer the call . . . (p. 177) the church is going to have to step in because the situation in society is not going to change. We have to come in as a community in our church. (p. 178)

Included in the ideology of Critical Theorists is the notion that racism is the normative state of affairs and not a new world order. These scholars believe that since education mirrors society, it is no accident that marginalized populations perform below acceptable standards. Education is perceived as being all about politics: “. . . the whole act of education is political in nature (Shor, 1993, p.25) . . . suggesting that the entire school experience has political qualities and consequences (p. 28).” Therefore, it should behoove African Americans to assume responsibilities in advancing their children’s mathematical/quantitative agendas. This was not apparent in the data submissions of this investigation’s participants even though three participants (Cleveland, Columbus, and Detroit) indicated an affiliation with a civic organization or church at some point in their
lives. As stated earlier, the relevancy or impact of such connectedness, however, appeared minimal in terms of advancing mathematical literacy and academics.

Self-systems, another theoretical underpinning, became evident in the participants’ submissions. Individual agency, self-regulatory behaviors such as resiliency, persistence, accountability, confidence, and the ability to understand and adjust to one’s situatedness in unfriendly environments, were shared by all participants: braving a “lonely presence” in classes, tolerating unfriendly environments, refuting instructors’ low expectations, and grappling with academic challenges. Each individual had a story to tell; each appeared to have the internal fortitude to withstand the trials and tribulations, the academic gauntlet, waiting for them within the oftentimes nonsynchronous walls of academia. Hale (2001), author of *Learning While Black: Creating Educational Excellence for African-American Children* spoke to the importance of self-systems, specifically self-concept, in the learning of mathematics when her son encountered challenges in the mathematics classroom:

. . . there is no child alive that I would want to see in such misery [attempting challenging curricula in uncomfortable, low nurturing environments] as my son . . . exclaiming that he was dumb and unable to learn math. I feel that it is possible for instruction and achievement to proceed in such a way that every child in the classroom can master the basic skills and emerge with his self-concept intact. (p. 80)

Other considerations addressed the issue of the mathematics classroom and the experiences therein. While all participants spoke highly of, connected with, and/or were encouraged by African-American instructors, there was minimal exposure to African-
American instructors in their early, formative years and only those attending Historically Black Colleges had major exposure during their college training. What is interesting here is that in many colleges of education across our United States of America, there continues to be an alarmingly low minority matriculation, especially in areas such as mathematics and science (Secada et al., 1995). Further exacerbating this concern is that the majority of the professors are probably White, and no doubt, teaching from their mainstream perspectives. It also appeared that the presence of other African-American students in classes would have been comforting and preferred to the lonely presence, low minority representation, endured by this inquiry’s participants.

Culturally-relevant, culturally-appropriate pedagogy was not a major topic of conversation or concern among participants. Perhaps, these individuals understand a teacher’s task as drawing upon whatever tools that are necessary from the master teacher’s toolbox to facilitate learning with understanding. Perhaps, participants are awaiting the results of more longitudinal research on culturally-sensitive pedagogy and mathematical performances; or perhaps, these participants believe that appropriate pedagogy should understandably reflect the needs of the students and that culturally-appropriate pedagogy should be synonymous with simply good, responsive teaching.

Conversations in the education arena and mathematics tend to support and suggest that Algebra is a gatekeeper for marginalized groups. This study suggests that, perhaps, there is a need to examine how African-American students negotiate geometric reasoning and skills in early grades. It was noteworthy that comments about challenges in Geometry occurred in conversations with all participants. In addition, a similar challenge was alluded to in the doctoral thesis of another mathematics colleague (Brown, 1999, p. 192):
“I had mentors . . . however, the Village [African-American community] did not prepare me for what I encountered in 9th grade Geometry . . . ”

Findings

If mathematical success/improved mathematical performances represent the essence of the equation, with African-American mathematics students being the dependent variable, the independent variables must include sociocultural influences, individual agency, and proactive community efforts. All are important. Given that African-American students continue to perform below their potential in mathematics and, the value claim of this researcher that success in mathematics for African Americans is attainable, how do we improve the mathematical performances of African-American students? What lessons can be learned from the four participants (Brooklyn, Cleveland, Columbus, and Detroit) who have experienced success in mathematics?

Focus Questions Addressed

1. What experiences (in school and out of school) facilitate mathematical achievement for African-American students?
   a. Learning opportunities at home (sociocultural influence)
   b. Nurturing environments (sociocultural influence)
   c. Family Engagement—Time Spent With Family (sociocultural influence)
   d. Extracurricular involvement (sociocultural influence)
   e. Connectedness with the church (sociocultural influence)
2. What enables some African-American students to persevere and succeed in mathematics, regardless of their socioeconomic backgrounds?
   a. Nurturing, caring instructors (sociocultural influence)
   b. Active parental involvement (sociocultural influence/critical theory)
   c. High expectations/standards expected by significant others (sociocultural and self-systems influences)
   d. High expectations/standards expected of self (self-system influence)
   e. Perceived utility of mathematics by significant others (sociocultural influence)
   f. Positive self concept (self-system influence)
   g. Positive cultural identity (self-system influence)
   h. Confidence (self-system influence)
   i. Resiliency (self-system influence)
   j. Persistence (self-system influence)
   k. Voice (self-system influence)
   l. African-American Instructors at an early age (sociocultural influence)
   m. Ability to seek assistance when needed (self-system influence)
   n. Ability to adapt to nonsynchronous environments (self-system influence)
   o. Traditional instruction (sociocultural influence)
   p. Love for mathematics from an early age (self-system)
   q. Attendance at Historically Black Colleges (sociocultural influence)
   r. Church involvement (sociocultural influence)

3. (a) What do African-American mathematics teachers believe and about their successful and unsuccessful African-American students?
a. Understand language of mathematics
b. Grasp basic computation and problem-solving skills
c. Enjoy critical thinking
d. Demonstrate confidence
e. Exhibit persistence

(b) How do these observations correlate to their own experiences and practices?

Noting that participants received their early years of schooling several years ago and were exposed to traditional pedagogy and assessments, all believe that modes of assessment and strategies should include:

a. Multiple types of assessments such as journals, portfolios, project-based learning, exhibitions
b. Hands-on as well as traditional approaches
c. Real world applications
d. Cooperative learning

4. What role(s) should the African-American community assume in empowering African-American children mathematically?

Actively engage in activities to advance the mathematical/quantitative literacy in the African-American community: tutors, mentors, career day
Special Considerations

Several salient issues cannot be overlooked. Participants in this study possessed a proactive mindset; they appeared to understand that they would face a lonely and nonsynchronous environment, where few minority students ventured and where common cultural situatedness would be minimal. Also, all participants encountered difficulties in Geometry, an unexpected theme. Perhaps, Geometry might be considered a gatekeeper, a filter, for those African-American students who complete Algebra and are interested in continuing in mathematics. Each participant had African-American instructors at an early age. Perhaps, this might reveal an area in need of improvement for both Colleges of Education and school districts. In addition, participants were from urban areas; the other participant lived within 30 miles of a large urban area. Even though several of the participants were involved in the church, traditionally a focal point for empowerment in the Black community, except for one participant, there was little evidence that the church spearheaded mathematical literacy efforts for these participants.

Opening the Doors to Discipleship

In many African-American churches, the minister, upon completing the sermon, will open the doors of the church to discipleship. That is to say, once the message has been disseminated, the plea for faithful workers goes out before the congregation. Sometimes no one comes forth; other times, people accept the calling to assist with and help spread the word knowing that the journey will be paved with many upstream
challenges. This researcher hopes that the problem and consequences associated with the substandard mathematical performances by African-American students are seen as an emergency, crisis situation. This researcher hopes that a few faithful workers will understand and respond to this need knowing that hard work lies before them if a difference is going to occur.

Unfortunately, quantitative/mathematical concerns among African Americans and the dismal implications are neither new nor quickly fading. There is no absence of discourse and research by African Americans about African Americans—their concerns, problems, and possible solutions. Unfortunately, perspectives have been minimized and marginalized.

What is produced by contemporary African-American scholars and practitioners has limited influence in the white bourgeois intellectual establishment. While there are well-respected Black educational scholars whose works are being published in mainstream (Anglo) journals, their ideas, theories, and experience have not impacted significantly the prevailing paradigms and ideology within the scholarly community. Although African-American scholarship is given lip service... dominant Anglo scholarship seems to be directing the field, and resulting in little overall improvement in the academic preparation of working and underclass African American and other at-risk groups of children. (Gordon, p. 21)

The researcher understands that there are many stories that have probably not been offered or many accounts not revealed. Memories from liminal perspectives may trigger uncomfortable memories. Again, this researcher contends that the mathematical
biographies of the participants provided important data and that in fact, there are no missing data. Enough information has been provided to inform both theory, practice, and most importantly, the target audience. This inquiry is from a positive, hopeful, perspective; therefore, it is best, perhaps, that some stories remain untold.

More research is needed on the impact of individual agency in the learning of mathematics and African-American students. If self-systems are as crucial to the learning of mathematics for African-American students as indicated by this investigation’s participants, efforts to determine ways of nurturing such characteristics must be sought. More from studies (longitudinal) that explore strategies that are effective with dealing with low teacher expectations and the impact on the African-American mathematics students could provide essential data. Other areas for possible related studies include stereotype threats for African-American students in the mathematics classroom, the impact of the mother and/or father on mathematics students, and self-esteem and defensive pessimism as it relates to the African-American mathematics learner. More studies are warranted if there is a commitment to impact the mathematical achievement of African-American students.

Teacher training and professional renewal must reflect best practices that serve our country’s growing clientele, a nonwhite population. If as stated earlier, that students interpret the world around them through social interactions (i.e., expectations of significant others, development of knowledge, and perceived usefulness of mathematics), perhaps, more credence to home, church, and community is in order. Perhaps power brokers should respect and honor these resources as necessary in advancing the mathematical agendas of African-American students as well as other marginalized
populations. Most importantly, the African-American community cannot become complacent and rely upon the mainstream, dominant, privileged to fully understand, promote, or serve the interests of other people’s children.

As the Reverend Christopher A. Bond, minister of Second Shiloh Baptist Church would say:

“The Doors to Discipleship Are Now Opened”
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Smutny, J. (2003, November). *Differentiation and creativity: Meeting the needs of the gifted: A professional development offering of Phi Delta Kappa International.* Symposium and induction ceremony conducted by The Ohio State University Chapter, Phi Delta Kappa on November 5, 2003 at Capital University.


APPENDIX A  TELEPHONE SOLICITATION
Dear Colleague,

I am conducting a study on the factors impacting the learning experiences of African Americans in the field of mathematics. It is hopeful that data derived from your participation will not only inform both theory and practice as it relates to mathematics education and African Americans, but also serve as a resource to the African-American community. This information, which will be used in my Doctoral dissertation, will be used solely for educational purposes. Confidentiality will be maintained throughout the inquiry. Pseudonyms will be used at all times. You are free to withdraw from participation in this study at any time without penalty. A copy of the final document will be sent to you (CD format) upon completion of the study.

I would like your assistance in completing the attached questionnaire. A self-addressed return envelope has been included. Your prompt response would greatly assist me in this investigation. I will conduct a follow up for clarification or questions that I may have.

If you have any questions, please feel free to contact me. Thank you.

Sincerely,

Dr. Patricia Brosnan
Principal Investigator
(614) 292-8060

Greta Staley Robertson
Co-Investigator
(614) 890-0773 (Home)
(614) 937-8620 (Cell)
Robertson.60@osu.edu
P.O. Box 361121
Columbus, Ohio 43236
APPENDIX B INITIAL SOLICITATION LETTER
INITIAL SOLICITATION LETTER

Dear (Colleague),

As you may already know, I’m working on my dissertation at OSU. Specifically, I’m conducting a study on the factors impacting the learning experiences of African Americans in the field of mathematics. If you’re agreeable, I would like for you to become a participant in my study. I think that you can provide invaluable insights and knowledge into this investigation. All data will be used solely for educational purposes (seminars, articles, conferences) as well as in my dissertation.

The extent of your participation will include questionnaires, interviews, and audio taping. I will ask that you sign a consent form prior to your involvement. It is important that you understand that confidentiality will be maintained throughout this inquiry.

You will be sent a copy of the dissertation upon completion, hopefully by December 31, 2004. At that time, I would like to treat you to a dinner at a restaurant of your choice as a token of my appreciation.

If you have any questions or concerns, please feel free to contact either me (614-890-0773: cell) or my advisor, Dr. Patricia Brosnan (614-292-8060) at any time. Thanks for your assistance.

Sincerely,

Dr. Patricia Brosnan  
Principal Investigator  
(614) 292-8060 (Work)

Greta Staley Robertson  
Co-Investigator  
(614) 890-0773 (Home)  
(614) 937-8620 (Cell)
APPENDIX C CONSENT FOR PARTICIPATION
CONSENT FOR PARTICIPATION IN RESEARCH

I consent to participating in the research entitled: Mathematics: Liminal Perspectives From Those Living On The Margin. Dr. Patricia Brosnan is the Principal Investigator; Greta Robertson is the Co-Investigator.

Greta Robertson has explained the purpose of the study, the procedures to be followed, and the expected duration of my participation. Possible benefits of the study have been described, as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw consent at any time and to discontinue participation in the study without prejudice to me.

Finally, I acknowledge that I have read and fully understand the consent form. I sign freely and voluntarily. A copy has been given to me.

Date:_________________________________ Signed:_______________________
     (Participant)

Date:____________________________  Signed: _____________________
     (Principal Investigator or Co-Investigator)

Date:__________________________________   Witness: ____________________
APPENDIX D HUMAN SUBJECTS
**TITLE PAGE - APPLICATION FOR EXEMPTION**

**PRINCIPAL INVESTIGATOR**
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- **Department or College:** College of Teaching & Learning Mathematics, Science & Technology
- **Campus Address (room, building, street address):** 327 Arts Hall
- **Phone:** 614-292-8050
- **E-mail:** brosman.1@osu.edu
- **Signature:**
- **Date:** 7-22-04

**Co-Investigator**
- **Name:** Greta Stahl Robertson
- **Phone:** 614-688-0773
- **E-mail:** robertson.60@osu.edu
- **Signature:**
- **Date:**

**University Status:**
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- **Mailing Address:** P.O. Box 204121
- **Columbus, Ohio 43226**
- **Signature:**
- **Date:**

**Co-Investigator**
- **Name:**
- **Phone:**
- **E-mail:**
- **Signature:**
- **Date:**

**PROTOCOL TITLE:** Mathematics: Limiting Perspectives From Those Living On The Margin

**SOURCE OF FUNDING:** personal

**REVIEWED:**
- **Approved:**
- **Disapproved:**

**Date of Determination:** 9/10/04

**SIGNATURES:**
- **Name:** Joerg L. Schulte
- **Date:**

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APPENDIX E PILOT STUDY
Dear Colleague,

Below are questions that I have developed as part of a pilot study researching the mathematical biographies and theoretical frameworks of successful students of mathematics, particularly African-American mathematics educators. Thanks so much for agreeing to assist me with this study. I would appreciate responses at your earliest convenience.

Sincerely,
Greta Robertson
Email: Robertson.60@osu.edu
Mailing Address: P.O. Box 361121
Columbus, Ohio 43236

1. Provide a description of your current job, including years of service, job title, and degree (s) that you hold.

2. Describe the community in which you grew up in and where you attended high school.

3. At what point did you develop a fondness for mathematics?

4. What or who (outside of family members) motivated you to continue in the higher mathematics curriculum?

5. Describe your first math memory.

6. List the extra-curricular activities in which you participated as a youngster.
7. How would you describe your childhood family?

8. Was there a point at which you had a negative experience or challenge with mathematics? Explain how you overcame this difficulty.

9. Where did you attend college? Provide a general description of this school.

10. Was there a family member who encouraged you to pursue studies in mathematics?

11. As an African-American mathematician and educator, what affiliations do you maintain in order to stay current in your profession?

12. Are there specific modes of assessments that are more appropriate for African-American students?

13. In your opinion, what can explain the disproportionate poor performances in mathematics among African-American students?

14. Why do some African-American students succeed in mathematics when underachievement is the norm?

15. How do you think African Americans construct mathematical knowledge?
16. What experiences facilitate mathematical achievement among African-American students?

17. How is mathematics confidence developed and sustained in African-American students?

18. What types of mathematics modeling is important for African-American students in the mathematics classroom?

19. What role should the African-American community assume in empowering its children mathematically?

20. What programs/initiatives/schools serve as exemplars in the teaching and learning of mathematics to African-American students?

21. To what/who do you attribute your success in mathematics?
APPENDIX F QUESTIONNAIRE
1. Provide a description of your current job, including years of service, job title, and degree(s) that you hold and the name of the college(s) where you earned your degree(s).

Current Position__________________Job Title________________________
Certification Area(s)______________Years of Service________
Degree______________________from________________date_____________
Degree______________________from_____________________date_____
Degree______________________from_____________________date_____  

2. What or who motivated you to pursue studies in mathematics?

3. Was there ever a point at which you had negative experiences or challenges with mathematics? Explain how you overcame this.

4. What experiences, in school as well as out of school, facilitated your mathematical achievement in high school and college?

5. What enables some African-American students to persevere and succeed in mathematics regardless of their socioeconomic backgrounds?

6. What do you observe about successful and unsuccessful African-American mathematics students? How do these observations correlate to your own experiences and practices?
7. What role(s) should African-Americans assume in empowering African-American children mathematically?

8. What organizations/ institutions/ structures might assist with improving mathematical literacy among African Americans?
APPENDIX G INTERVIEW QUESTIONS
INTERVIEW QUESTIONS

1. What experiences (in school and out of school) facilitate mathematical achievement for African-American students?

2. What do you believe and observe about your successful and unsuccessful African-American mathematics students? How do these observations correlate to your own experiences and practices?

3. How do you define sociocultural influences? What sociocultural influences most impact the teaching and learning of mathematics for African Americans?

4. (I will define self-efficacy, self-concept, self-regulation)
   Which of these self-systems has the most affect on the mathematical learning of African Americans?

5. What specific role should the African-American community assume in addressing mathematical illiteracy? Describe the ideal program/initiative/mentorship.

6. How do you address issues of substandard mathematical performances by African Americans in your building?
APPENDIX H TIMELINE
TIMELINE

June 2004
   Proposal Draft
   Human Subjects
   Contact Participants

July 2004
   Await Human Subjects Approval

August 2004
   Await Human Subjects Approval

September 2004
   Human Subjects Approval
   Data Collection: Questionnaires to Participants
   Interviews

October 2004
   Interviews
   Member Check

November 2004
   Chapter 4 Draft
   Member Check
   Interpretation of Data
   Expert Check

December 2004
   Chapter 4 Draft
   Member Check
   Interpretation of Data
   Expert Check

January 2005 - May 2005
   Dissertation Writing

May 2005
   Oral Defense

June 2005
   Graduation