I, Tamra C. Ragland, hereby submit this original work as part of the requirements for the degree of Doctor of Education in Curriculum & Instruction.

It is entitled:
Don't Count Me Out: A Feminist Study of African American Girls' Experiences in Mathematics

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Don’t Count Me Out: A Feminist Study of African American Girls’ Experiences in Mathematics

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by

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Abstract

The purpose of this qualitative study was to explore African American female students’ beliefs, and self-perceptions about their mathematics experiences. This study used mathematics autobiographies, focus group interviews and individual student interviews to generate data that was analyzed for emerging themes and patterns as to how the students see themselves as learners of mathematics. This data answered the following research questions: (a) What are African American students’ perceptions of themselves in high school mathematics, and (b) How do these perceptions of themselves as mathematics learners contribute to their experiences, success or failure, in Algebra I? The following themes: (a) parental support; (b) beliefs about the importance of mathematics; (c) beliefs about mathematical ability and effort; (c) personal goals and motivation; and, (d) perceptions of mathematics experiences and teachers, informed the findings for this research. The findings support the nature of qualitative, feminist research, which looks at the whole person through each person’s narrative. I discovered that these five themes are intertwined and inseparable, and that the themes supported the research questions collectively, rather than independently. This research also supports the intersectionality of self-perceptions, beliefs, goals, motivation and self-efficacy and their impact on mathematics achievement. The findings of this study concluded that the girls’ various beliefs about mathematics, goals and motivation, parental involvement, and self-perceptions result in varying levels of academic resilience that may explain mathematics success or failure, which impacts mathematics participation.
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Chapter 1: Introduction

Statement of the Problem

Successfully teaching mathematics to African American students is a cause for concern for many districts, especially urban school districts. While African Americans students have made gains, White students still continue to outperform them (U.S. Department of Education, 2011; Strutchens & Silver, 2000). However, discussions about African American students’ mathematics achievement continue from the perspective of the cognitive domain. The conversation about the influence and impact the affective domain has on African American students’ participation and achievement is silent at the school district level. If gains are to be made with respect to cognition in mathematics education, such as learning skills, academic deficiencies, teacher expectations and instructional practices, then affect cannot be ignored. This discussion must take place if significant reform is to continue and African American students are to make parity with other groups.

Research shows that African American students have positive attitudes toward mathematics (Strutchens & Silver, 2000; United States Department of Education, 1995; Stiff & Harvey, 1988). This suggests that African Americans value mathematics and view it as important to success in their future. Reyes (1980) says there is a relationship between students’ self-concept and student achievement, and that successes and failures affect student confidence. If student confidence level is high, the student will take higher levels of mathematics. Higher levels of mathematics are required for higher paying careers in STEM fields. However, “There is significant evidence from the National Assessment of Educational Progress that formal mathematics instruction has adversely affected Black achievement” (Stiff & Harvey, 1988, p.192). NAEP scores for eighth grade Black students’ were 262, compared to 293, for eighth
grade White students (U.S. Department of Education, 2011). Although African Americans have made significant gains over the years, the NAEP scores show that recent eighth grade African American students are thirty-one points behind their White counterparts in mathematics achievement.

**Significance**

McLeod’s (1992) assertion that affect was prevalent among dissertation writers is still true today. A search of ProQuest revealed over 500 dissertations that studied students’ beliefs and attitudes in mathematics. The overwhelming majority were quantitative studies using the Fennema and Sherman attitude scales (1976) to attempt to show causal relationships between attitudes and beliefs with respect to race/ethnicity, social economic status, and gender. In fact, it is not just dissertations, but most research, that tends to focus on the quantitative or causal side of this critical issue, rather than the qualitative or descriptive side of it. Whether quantitative or qualitative, a gap exists on affective factors such as beliefs, confidence, self-efficacy, and motivation as it relates particularly to African American students’ with an outcome of success or failure. These dissertations and other research, did not provide the particular perspective of African American students’ perceptions of themselves as mathematics learners, which included what motivated them to do their homework, what beliefs they held about themselves as mathematics learners, how their parents supported them, how much effort did they put into learning mathematics, and what experiences impacted their beliefs about mathematics.

This study is an investigation of how the students interpret their prior mathematics experiences, interactions with their mathematics teachers, how they see themselves as mathematics learners and how the intersectionality of these experiences influences their self-perceptions and ideas about mathematics and themselves as learners of mathematics. However,
little has been written about the affective domain and its impact on African American students. This research will fill the void of qualitative research that explores African American students’ beliefs about their mathematics experiences, using the students’ voice at the high school level, using a feminist perspective.

**Purpose**

African American students should be included in discussions about the teaching and learning of mathematics. Unfortunately, we do not ask them enough about what they think, need, or want from us, as the guides on their mathematical journey. As teachers, we think we know what the students should know and therefore the students’ perspective and motivation should change to fit our agenda. Malloy (1997) states, “mathematics educators have little knowledge of how African American students perceive themselves as mathematics students, how they approach mathematics, or the role of culture in their perception and mathematics performance” (p. 23). What mathematics teachers think and what students think are different. There are huge gaps between teacher and student such as age, content knowledge, and maturity. Teachers have so much knowledge that we often become blinded by it, we completely overlook our students’ knowledge or perceptions of themselves as learners. Often our knowledge motivates us to teach students from our vantage point instead of their vantage point (Malloy, 1997). This knowledge can also cause us to forget our own struggles with mathematics, as was my case my first two years of teaching. During those first two years, I taught the subject, rather than the student. I forgot about my own struggles with Algebra I, and I did not relate to my students’ struggles with Algebra I. I was not reflective in my practice, and looked at my students as having deficits, rather than differences. Consequently, for these and other reasons, the majority of my students failed Algebra I that year.
Teachers are instrumental in shaping the thoughts, beliefs and experiences of students in the mathematics classroom. We have tremendous power in the decisions we make, and that includes what we teach, how we teach, and how our expectations and interactions with our students ultimately affect their success or failure in mathematics. All of these factors contribute to students’ self-perceptions and contribute to whether or not a student will put forth the effort to set and achieve goals in the classroom. Because of this, the research questions essential to this dissertation are:

a) What are African American students’ perceptions of themselves as learners in mathematics?

b) How do these self-perceptions contribute to their experiences, success or failure, in Algebra I?

**The Autobiographical Roots of This Research**

The ‘Algebra For All’ movement had its beginnings in the late 1980’s and was the beginning of conversations about how all students could and should learn algebra as a requirement for satisfying high school graduation. Algebra was, and still is, viewed as the gate-keeper course of further academic study in high school and college in math, science and technology. This critical course becomes the context in this study based on my previous experience as both a student in, and a teacher of Algebra I.

The ideas, expectations, and strategies identified in Algebra for Everyone (1990) are worthy and admirable goals and expectations in theory. Further, NCTM fully supports this goal and has determined it to be an issue of equity and clearly states, “Expectations must be raised - mathematics can and must be learned by all students” (NCTM, 2000, p. 13). In so doing, students must have teachers with high expectations and that can be “responsive to their
prior knowledge, intellectual strengths and interests (p. 13). Too often, however, algebra has been the sift or sieve (Ladson-Billings, 1997) used to weed out, sort and separate African American students.

It is the knowing and understanding of Algebra that is empowering in and of itself. To paraphrase a slogan on an NCTM T-shirt, “Do Algebra…and you can do anything.” This slogan implies a critical pedagogy, one that empowers all students, to use mathematics as the vehicle through which they can transform themselves and change their world. I grew up in the city and was educated in the same public school system where I taught. First, as a substitute teacher, and later a student teacher; I noticed the level of student frustration and apathy in mathematics classes. At the time there was and still is, a high Algebra I failure rate in the district where I taught. Over the years, I also noticed that when I introduced myself to someone outside the teaching profession, and told them I was a mathematics teacher, I was sure to hear, “You must really like math,” “You must have been really good in math,” or the most popular, “I hated math when I was in school.” The assumptions of both my students and other adults I encountered were that I always liked math, was always good at math, and that I must have received good grades in the subject. All of these beliefs were the furthest thing from the truth. I struggled to learn mathematics, especially Algebra I, just like a great deal of people. As a matter of fact, whether I did well or not depended on the course, whether I liked my teacher, and whether I thought the teacher cared about me learning it. If you looked at my transcript from eighth grade through my first semester of college, you will see various grades, ranging from A to F, for classes Algebra I through Pre-Calculus. My third year as a classroom teacher, I decided to write my mathematics autobiography to share with my students to let them know that I, too, had similar experiences. My autobiography was meant to be an exemplar of an assignment I wanted
them to complete, but I did not tell them initially it was my story. I asked the students to read through it, and then we discussed the story as a class. Someone always asked if this was my story, and I said yes. Most of my students were surprised, because they, too, believed that I must have always been good at math and that I always loved the subject. The story about my mathematics journey showed them that I had the same feelings of frustration, and the same attitudes that they had, when I was their age. They were surprised that with all of the difficulty I experienced, they wondered why I became a mathematics teacher. Through my mathematics autobiography, I wanted my students to know that if I could succeed in mathematics, in spite of the obstacles I faced, then they could too. Because of their constant feedback, I often thought about how to provide learning experiences that would allow my students to enjoy mathematics, and become confident problem solvers. My challenge as a mathematics teacher was to provide experiences that created cognitive dissonance within my students. By that I mean, experiences that stretched them, empowered them, and still allowed them to achieve in mathematics.

**Summary**

This study involved qualitative inquiry with a feminist framework. My journey as a student and a teacher will be revealed in order to shed light and understanding to that of my students’ lived experiences, and how my experiences paralleled or differed from those of my students.

Chapter 2 discusses the literature connecting the feminist and hermeneutic phenomenology as a theoretical framework. The feminist perspective recognizes that knowledge starts with the researched and is socially constructed. The feminist perspective also seeks to connect the researcher and the participants being researched, while hermeneutic phenomenology supports the research of lived experiences. The conceptual framework is discussed in the second
part of chapter 2. I look at influences on African American participation in mathematics, and the affective factors - beliefs, goals, motivation, causal attribution theory - as well as resilience - that impact African American mathematics achievement. In Chapter 3 I outline the research design chosen to interview and analyze the four girls’ narratives. Students wrote mathematics autobiographies, and participated in focus group interviews and individual student interviews. These thoughts and ideas generated the collected data, and the voice-centered relational method of data analysis was employed to listen to the voice of the girls and analyze the data for emerging themes. In Chapter 4 I present the findings of the study, while in Chapter 5 I present the discussion, implications and recommendations for further research.
Chapter 2: Review of Literature

“If I think I can, or if I think I can’t, I’m right.”  Henry Ford

This research examined African American girls’ self-perceptions in high school mathematics and how these self-perceptions contributed to their experiences of success or failure in Algebra I. The purpose of this chapter is to illuminate the literature that supports the factors that influence student self-perceptions and explain how these self-perceptions contribute to mathematics experiences. This chapter is organized in two parts. In the first part I describe the feminist and hermeneutic phenomenology literature as two complementary layers of the theoretical framework. In the second part I cite literature from the affective domain that supports the conceptual framework of this research.

Theoretical Framework

Feminist research requires the understanding that truth and knowledge are socially constructed and the experiences are given meaning by the contextual or relational circumstances of those experiences. “Feminist research is uniquely feminist because it is feminist beliefs and concerns that act as the guiding framework to the research process” (Brayton, 1997, p 4). There are no agreed guidelines or methods that feminists agree to define feminist research (Brayton, 1997; Reinharz, 1992) in an effort to be inclusive, rather than exclusive. But feminist research methodology is different from that of other research methodologies. Feminist research seeks to: a) recognize diversity; b) seek connections between researcher and researched (Patton, 2002); c) develop social change (Patton, 2002; Reinharz, 1992); d) value “women’s ways of knowing” (Belenky, Clinchy, Goldberger, Tarule, 1986); and, e) is cross-disiplinary (Reinharz, 1992). Feminist research recognizes that a masculine world-view exists in research and that it is the woman’s experiences that need to be valued and the standpoint from which research starts.
Women stories have been absent or have been interpreted from a male perspective (Belenky et al., 1986). Narratives become a primary vehicle through which women convey their experiences and give their experiences meaning. It is their stories that give them authority and expertise; therefore listening to their language and how they translate their experience is important to feminist research (Brayton, 1997). This framework seeks to explain the gathering of information about the girls’ experiences and the meanings they give to these experiences. It is also a critical process through which I “found my voice” and “give voice” to the girls’ in this study. “During this phase the researcher understands a phenomenon and finds a way of communicating that understanding” (Reinharz, 1992, p. 16). Feminist research does not advocate speaking for others, but rather speaking out for others (Reinharz, 1992). I present the voices of the girls and include my own personal experience. It is my voice that frames the argument, which includes each chapter beginning with a defining quotation, followed by an introduction, relevant literature or examples that relate to direct quotes wherever a girl is speaking.

The theoretical framework for this research has two layers. The second layer utilizes hermeneutic phenomenology. “Phenomenology asks for the very nature of a phenomenon, for that which makes a some-“thing” what it is” (Van Manen, 1990, p. 10). This point of view is the study of lived experience, and as such is retrospective, rather than introspective. “A person cannot reflect on lived experience while living through the experience” (p. 10) and so we look for breadth and depth in the interpretations of these lived experiences. Hermeneutics gives the frame of reference for interpreting understanding or meaning. Hermeneutists clearly construct reality on their interpretations of data, with the help of the participants who provide the data (Patton, 2002).
Hermeneutic theory argues that one can only interpret the meaning of something from some perspective, a certain standpoint, a praxis, or a situational context, whether one is reporting on one’s own findings or reporting the perspectives of people being studied (and thus reporting their standpoint or perspective) (Patton, 2002, p. 115).

Thus hermeneutic phenomenology is the study of the nature of lived experience and is the source of the data. Like feminist theory, personal experience is the starting point, and interviews and biographies serve as the chief sources of data. Thus this layer of the theoretical framework drove the method of data collection.

The review of the next body of literature provides the conceptual framework of this research. This consists of literature about influences on the participation of African American students in mathematics, the affective domain which includes beliefs, goals and motivation, causal attribution theory, and resilience.

A great deal of research has been spent on identifying causes for the mathematics achievement gap between African Americans and other racial/ethnic groups. This achievement gap research often includes racial/ethnic (Matthews, 1984; Rech and Stevens, 1996; Reyes and Stanic, 1985; Stiff and Harvey, 1988), socioeconomic (Reyes and Stanic, 1989) and gender disparities (Fennema and Sherman, 1976) with respect to cognition in mathematics education such as learning skills, academic deficiencies, teacher expectations, and instructional practices (Beane, 1985). Another focus of researchers is to explain this gap using the above variables as they relate to the affective domain in mathematics education such as attitudes (Hart, 1989; Kloosterman, 2002), beliefs (Garofalo, 1989; McLeod, 1992, Op’T Eynde, De Corte and Verschaffel, 2002; Schoenfeld, 1999), emotions (McLeod, 1992; Op’T Eynde, De Corte and Verschaffel, 2006), and values (Goldin, 2002). Both types of research are equally important in
explaining this gap and both types of research provide explanation to a multi-dimensional issue, although in different ways. The purpose of this qualitative study was to explore the affective perspective of African American female students’ mathematics experiences, which included their beliefs about themselves as learners of mathematics.

Affective factors.

This chapter provides an overview of factors that influence African American participation in mathematics. This includes affective factors such as student attitudes toward mathematics, which often influence participation, course selection, and mathematics achievement (Matthews, 1984; Rech & Stevens, 2001; Reyes & Stanic, 1985; Stiff & Harvey, 1988). The review of the literature was necessary because my study focused on the experiences of four African American girls and what each one believed about themselves as learners of mathematics. McLeod’s (1992) review of the literature and subsequent reconceptualization of affect in mathematics education included three dimensions: beliefs, attitudes and emotions. Figure 2.1 shows the hierarchical nature of beliefs based on McLeod’s reconceptualization.
Figure 2.1. McLeod’s Reconceptualization of The Affective Domain

Figure 2.1. Adapted from “Research on affect in mathematics education: A reconceptualization,” by D. McLeod, In D. Grouws (Ed.), *Handbook of research on mathematics teaching and learning*, p.575-596. New York: Macmillan.
This was followed by Goldin’s (2002) inclusion of values as a fourth dimension. Grootenboer (Grootenboer & Hemmings, 2007) further reconceptualized the four dimensions of the affective domain as a Venn diagram with four overlapping circles, under which an arrow shows direction of increased or decreased cognition, stability, affectivity and intensity (Figure 2.2). The interlocking circles pictorially represented the interchangeability of terms and constructs, also suggesting that the definition of beliefs and attitudes are synonymous (Hart, 1989; Kloosterman, 2002) as are beliefs and values (Op’t Enyde, de Corte, & Verschaffel, 2002).

Figure 2.2. Grootenboer’s Reconceptualization of the Affective Domain

While this chapter is meant to be representative, not exhaustive of the literature, I will use the literature to define affective terms and give reference to findings in mathematics education. Because affective factors such as beliefs and attitudes are often used interchangeably, I created a graphic organizer based on McLeod’s reconceptualizations to add clarity and to categorize these factors for the purpose of my research (Figure 2.1). While Grootenboer’s conceptualization (Figure 2.2) has merit, it is not used for two reasons: 1) according to Clarkson, FitzSimmons, and Seah (1999) “values are demonstrated in the actions carried out by a person, whereas beliefs can be verbally assented to, but do not necessarily lead to observable behavior in public” (p.3). Given this definition, values will not be a focus of this review of the literature, especially since observation was not a method of data collection (Grootenboer, 2007), and 2) McLeod’s (1992) reconceptualization distinguishes between types of beliefs in mathematics education, particularly beliefs about mathematics, mathematics teaching, the social context, and self. I am also including self-confidence, self-efficacy, attribution theory, and motivation, in the category of beliefs about self, all of which are relevant to my research.

**Influences on minorities mathematics participation.**

Matthews (1984) conducted a comprehensive review of the literature on the influences of learning and participation of minorities’ mathematics achievement from which 24 studies performed from 1973 through 1981 had as a major focus to understand why minorities are underrepresented in mathematics. Her research found three common variables in all of the studies: parents, student and school. With regard to parents, she determined that because of family structure, which may be due to the prevalence of single parenthood, mother’s occupation and education may be a greater predictor of student success and performance than father’s, and that mother’s attitudes and beliefs toward mathematics influence children to perform and
participate (Matthews, 1984). Additionally, while minority students had positive attitudes toward mathematics (Matthews, 1984; Silver & Strutchens, 2000; Stiff & Harvey, 1988), they did not perceive mathematics as particularly useful or see how it applied toward future schooling and careers (Matthews, 1984; National Center for Education Statistics, 1995; Stiff & Harvey, 1988). Matthews also found that while teachers, counselors and parents are all significant in positively influencing students’ attitudes toward mathematics, Black students favored teachers who offered another opportunity to pass tests, stayed after school to work with them, followed the textbook, encouraged them, and explained problems well (1984:1981).

Matthews concluded that more research was needed to explore the mother’s parental influence, factors influencing minorities to continue their mathematics education, and comparisons between successful and unsuccessful students. Additional research (Rech & Stevens, 2001) addressed variables related to the mathematics achievement of African Americans such as mathematics attitude, self-concept, and learning style and concluded that as early as fourth grade, “attitude was identified as a predictor of mathematics achievement, and educators should be aware of the important role that attitude plays and the need to take action to improve negative attitudes” (p. 349). Thomas’ (2000) research on Walberg’s nine educational productivity factors with regard to African American High school students, which include motivation or self-concept, found that self-concept was influential with regard to mathematics achievement. “Self-concept as measured by their perceptions of their ability in mathematics is directly related to achievement outcomes” (p. 180). Thomas (2000) also suggested in his findings that if African American students’ beliefs about their ability are changed, their achievement will improve.

My study does include Matthews’ suggestion for future research by taking a particular
interest in factors that influence African American mathematics education, particularly affective factors such as beliefs, attitudes, emotions or values. For the purpose of this research, my major focus is African American students’ beliefs.

**Beliefs.**

Our society does not value being numerate the way it values being literate. Too often many people freely admit that they cannot do math and others accept that as truth that cannot be changed. The same people who believe and admit “I am not good at math,” would probably be embarrassed to say they cannot read. Moreover beliefs such as, “math is hard,” or “math is not important” are commonplace. These statements emanate from beliefs based on experiences with mathematics, mathematics teaching, others’ beliefs about our ability, or beliefs about ourselves. For some, attitudes and beliefs are the same, and for others these constructs are defined differently (Hart, 1989). Hart (1989) defines beliefs as judgments about a set of concepts. According to McLeod (1992), it is our beliefs that directly influence the development of our attitudes and emotions. Kloosterman, Raymond and Emenaker (1996) assert that our beliefs influence our actions. For example, parents read books such as *The Little Engine That Could* while repeating “I think I can, I think I can, I think I can.” This statement reinforces to the child the belief that the little engine has about himself: I think I can do it. McLeod’s (1992) review of the literature of affect in mathematics education suggested four categories of beliefs. Those categories, beliefs about the social context, beliefs about mathematics, beliefs about mathematics teaching, and beliefs about self are presented here.

**Beliefs about the Social Context.**

McLeod (1992) includes classroom interactions and parental influences in his conceptualization of the social context of beliefs, but not peer influences. Education is a social
process and I include peer influences in this conceptualization, because students interact with their peers and their teacher within social norms while learning mathematics (Cobb, Yackel, and Wood, 1989). Teachers can create an environment where students feel comfortable expressing themselves through social interaction in the classroom, and helping to establish the classroom norms under which mathematics will be learned. For example, a teacher called the attention of the class to recognize one groups’ insistence on continuing to work on one problem until it was solved. This was an illustration of persistence, and that it was appropriate to “feel good” and have satisfaction in the accomplishment regardless of how many problems were solved (Cobb, Yackel, and Wood, 1989) thereby contributing to a positive mathematics culture in the classroom. Practices that achieve the opposite effect would be social comparison through posting of grades. This practice promotes the belief that learning is competitive. How teachers structure their classrooms, which include their social interaction with students and also peer influences have an impact on students’ beliefs in their mathematics ability and motivation. This includes, but is not limited to, pedagogical decisions such as the use of cooperative learning. Kloosterman, Raymond, and Emanker (1996) found students’ beliefs about cooperative learning were related to teachers’ practices. Students of teachers who used cooperative learning, and taught cooperative and interpersonal skills, viewed group work beneficially. These instructional strategies play a significant role in developing students’ beliefs about mathematics, because it is through the social context of the classroom that students make meaning of mathematics, develop their beliefs, and their beliefs influence their actions.

Peer groups play a significant role in the social context of the classroom. Peers have significant influence over students’ beliefs about academic achievement in elementary (Ide, Parkerson, Haertel, and Walberg, 1981), middle (Berndt, Laychak, and Park, 1990; Cauce, 1986;
Ryan, 200; Wentzel and Caldwell, 1997) high school (Hallinan and Williams, 1990; Ide, Parkerson, Haertel, and Walberg, 1981; Nichols and White, 2001; Stewart, 2007) and are important in adolescent development (Ryan, 2001; Stewart, 2007). According to Hallinan and Williams (1990), “…influence is any factor that affects the formation of a person’s attitudes and opinions by acting directly on his or her beliefs” (p. 123). Students exert influence through the formation of friendships with like-minded or similar individuals. The strength of the relationship is determined by similarity, which is based on attitudes, beliefs and values (Hallinan and Williams, 1990; Nichols and White, 2001; Ryan, 2001), and formed through proximity (Nichols and White, 2001) and selection (Ryan, 2001). Proximity is a direct result of the school structure and class composition, which includes tracking (Hallinan and Williams, 1990; Nichols and White, 2001). It is within school that adolescents socialize and select friends who are like themselves. Nichols and White (2001) asserted that within the context of a high school Algebra I class, both regular track and low-track peer groups, called cliques, had higher achievement than single students, and that academic goals were affected by clique composition. Students in this study had greater Algebra I achievement when they were an actively engaged participant of a clique instead of being an isolated spectator in the classroom. Additionally, same-track friends exert more influence than different-track friends. Hallinan and Williams (1990) found that “friends in a different track are less influential than are friends in the same track in shaping a student’s college plans and attendance” (p. 130). While the exertion of influence depends on the strength of the relationship, its effects can be positive or negative depending upon the peers with which a student chooses to associate (Berndt, Laychak, and Park, 1990).

Close friends or best friends were found to generate more influence and impact academic achievement than peer groups (Berndt, Laychak, and Park, 1990; Cauce, 1986; Hallinan and
Williams, 1990; Ide, Parkerson, Haertel, and Walberg, 1981). When Berndt, et al (1990) presented eighth grade close friends with motivational dilemmas that involved choices between schoolwork and other activities, they found that the friends’ decisions were more similar after discussion than prior to discussion. Among African American students, the number of best friends, support from these friends, and the friends’ attitude toward school, all contributed to increased academic achievement (Cauce, 1986). This is counter to the popular school phenomenon called “acting white” where African American high school students chose not to perform academically, because they did not want to be subject to ridicule from their peers, and the few students who chose to resist this maladaptive behavior were ostracized from peer groups (Fordham and Ogbo, 1986). However, peer influence is stronger in urban settings possibly due to single parenthood (Ide et al., 2001) and when aspirations and background are similar in best friends (Ide et al., 1981, and Hallinan and Williams, 1990). According to the literature, positive relationships with peers should positively influence academic achievement.

Parents play a critical role within the social context. They help shape their child’s thoughts, as well as beliefs about themselves and their ability to do mathematics. “The family is the basic institution through which children learn who they are, where they fit into society, and what kinds of futures they are likely to experience” (Stewart, 2007). Research has shown that students perform academically when parents are involved (Bong, 2008; Gill & Reynolds, 1996; Stewart, 2007; Thomas, 2000; Yan & Lin, 2005). Parents positively influence their children’s experiences through participation in parent-teacher organizations that foster relationships with school administration for the purpose of additional monitoring or the shaping of school policy (Stewart, 2007). While parents may volunteer to participate in classroom activities, perhaps the greatest influence comes from discussion. Stewart (2007) found parent-child academic
discussion was significantly associated with academic achievement. Further, the degree to which these conversations took place was important (Yan & Lin, 2005). For example, Pong (1997) found that students of two-parent families discussed academics more than single-parent families and schoolwork discussions had the greatest effect on eighth grade mathematics and reading scores. Moreover, Yan & Lin (2005) asserted racial differences do exist, with African Americans talking the most about high school academic planning.

It is through parent-child discussions that parents convey their expectations to children. These expectations also have an effect on achievement (Bong, 2008; Gill & Reynolds, 1996; Thomas, 2000). Gill and Reynolds (1996) found that African American parental expectations had a “direct immediate effect” (p. 7) on sixth grade mathematics achievement, while Thomas (2000) found African American parents’ expectations moderately correlated to mathematics achievement at the high school level. Due to cultural and historical factors, Korean parents place high academic expectations upon their children. In Bong’s (2008) study of Korean high school students in mathematics, she found “feelings of obligation in the form of thankfulness, guilt, and respect toward parents, perceived emotional support from and feelings of closeness to parents, conflict with parents, and parental academic pressure were all significant predictors of some aspects of student motivation in math” (p. 208). This confirms Yan and Lin’s (2005) assertion that Asian students excel because of high parental expectations; however, Asian students are not the only students who excel because of their parents expectations. “We found that all racial and ethnic groups benefited from educational expectations; for all groups, this was the strongest predictor among the nine composites tested. Educational expectations were associated positively with mathematics achievement…” (p. 123).
Parents’ beliefs about their children are conveyed to the children through conversation, and the children internalize these beliefs as their own as they get older (Bleeker & Jacobs, 2004). Parents’ expectations are shaped by their beliefs about their child. Bleeker and Jacobs (2004) posit that there is a long-term relationship between mothers’ expectations and career choice, and mothers’ early expectations of a child’s successes impact future career decisions.

As expected, the interaction of an adolescent’s gender and a mother’s prediction of her child’s ability to succeed in a math career was a direct indicator of whether a young adult chose a career in physical science–computing, as opposed to a nonscience or life science–business career. In fact, regardless of whether they attended college, female adolescents whose mothers reported low perceptions of their abilities to succeed in math careers were 66% less likely to choose careers in physical science–computing than in nonscience. (p. 107).

Dr. Kimberly Kendricks, an African American female Ph.D. in mathematics, recalled a conversation with her mother. She vividly remembered her mother picking her up from day care as a four-year-old, looking at her, and telling her, “I have no doubt that you can do anything you want to do and be successful at it” (K. Kendricks, personal communication, August 10, 2011). She said that statement still resonated with her to this day, because her mother said it with such conviction. Similarly, my mother told me, “You can do anything you want to do if you want it badly enough,” and “Anything worth having is worth working for.” When I decided I wanted to become a chemical engineer in sixth grade, she believed I could do it. One way she supported me was by making my high school course schedule, which included taking mathematics and science every year. According to the literature, parent involvement through academic conversation, and parent beliefs about their children that are disseminated as educational
expectations through these discussions, should positively influence and promote academic achievement in mathematics education.

**Beliefs about Mathematics and Mathematics Teaching.**

McLeod’s (1992) category of beliefs about mathematics includes beliefs such as math is difficult, it is based on rules, and that math is important. Still others have considered a range of students’ mathematics beliefs, specifically as they relate to fractions (Panaoura, Gagatsis, Deliyianni, and Elia, 2009), problem solving (Schoenfeld, 1985); gender differences (Fennema and Sherman, 1976), race and ethnicity (Strutchens and Silver, 2000), and word problems (Greer, Verschaffel, and De Corte, 2002). Other scholars (Garofalo, 1989; Kloosterman, 1996; Schoenfeld, 1985) have derived lists of mathematics beliefs from their research. The following list of students’ beliefs evolved from Schoenfeld (1992):

- Mathematics problems have one and only one right answer.
- There is only one correct way to solve any mathematics problem, usually the rule the teacher has most recently demonstrated to the class.
- Ordinary students cannot expect to understand mathematics; they expect simply to memorize it and apply what they have learned mechanically without understanding.
- Mathematics is a solitary activity, done by individuals in isolation.
- Students who have understood the mathematics they have studied will be able to solve any assigned problem in five minutes or less.
- The mathematics learned in school has little or nothing to do with the real world.
- Formal proof is irrelevant to processes of discovery or invention. (p. 359).

I will discuss a few of the beliefs and I will follow it with research on students’ beliefs about mathematics teaching.
The first belief to be discussed is that math is based on rules or formulas (Garofalo, 1989; McLeod, 1992; Op ‘T Eynde, De Corte and Verschaffel, 2002; Schoenfeld, 1988). This belief results in students memorizing rote procedures and emanates from the social context, or teachers’ classroom practices. Teachers, who told their classes not to memorize facts, and formulas, often reinforced this student-held math belief because the teacher presented a lesson without errors (Schoenfeld, 1988). “The classroom structure provided reinforcement for memorization, and the reward structure promoted it” (Schoenfeld, 1988). Results of the Seventh NAEP Mathematics Assessment (NCTM, 2000) findings show that at grades 4, 8 and 12, that 63%, 58%, and 55%, respectively, of African American students believe mathematics is mostly memorization of facts. Kloosterman’s (2002) results showed that students think memorization is important to mathematics success, but if a student is not a good memorizer, the student can still learn mathematics if the student tried harder.

Another belief is that math is a gift, and either you have what it takes to succeed or you don’t (Dweck, 2007) or more simply, only geniuses can do math (Garofalo, 1989; Schoenfeld, 1985). This is a prevalent belief and those that believe this to be true “view the teacher and the textbook as the authorities in, and dispensers of, mathematical knowledge” (Garofalo, 1989). These students accept what is presented to them at face value, never question what is taught and students are copiers of what is taught and they believe they cannot produce mathematics themselves (Garofalo, 1989). This belief has gender implications and was substantiated by the gender research of Belenky, Clinchy, Goldberger and Tarule (1997) and Dweck (2007). In *Women’s Ways of Knowing*, Belenky et al. (1997) described five epistemological stages of how women come to arrive at knowledge, truth and authority. In the second stage, Received knowledge: Listening to the voice of others,
…those who think that they receive all knowledge are more apt to think of authorities, not friends, as sources of truth. They equate receiving, retaining, and returning the words of authorities with learning—at least with the kind of learning they associate with school” (Belenky et al., 1997, p. 39).

Becker (1995) applied Belenky et al.’s research to develop Women’s Ways of Knowing in Mathematics. Women who are at the received knower stage would say, “I know that base angles are equal because my teacher says so” (p. 165). Additionally, Dweck’s (2007) research about students’ beliefs about intellectual and mathematical ability found that “girls who believe that intellectual abilities are just gifts do not fare well in math, but those who think they are qualities that can be developed often do just fine” (p. 49). Those who hold this belief are more prone to setbacks and susceptible to stereotypes, and “stereotypes are stories about gifts - about who has them and who doesn’t” (p. 49).

A third belief is that problems are solved in 10 minutes or less (Garofalo, Schoenfeld, 1985; 1988; 1992). This belief also stems from classroom practices of how many homework problems were assigned and how long it took to do each problem. Schoenfeld (1988) asserts that good teaching can lead to disaster and those bad results come to be what students believe about mathematics. Students will solve many problems between kindergarten and twelfth grade, but will not spend much time solving those problems (Schoenfeld, 1988). The message the students receive is, “If you can’t work the exercises within a reasonable amount of time, then you don’t understand the material. That’s a sign that you should seek help” (p. 159-60). Teachers influence students’ beliefs through their practices. For example, suppose a mathematics teacher gave a problem to solve such as $2x - 4(x - 3) = 10$, and asked students to solve the problem and show their work which resulted in the following (Brahier, 2009, p. 267):
2x – 4x -12 = 10

-2x – 12 = 10

-2x = 22

x = -11

The answer is \( x = -11 \), but the teacher graded the problem based on the answer being right or wrong. A teacher that believes mathematics as “either it’s right or it’s wrong” will align his or her assessment to this belief (Brahier, 2009). However, this belief and subsequent assessment perpetuates the student belief that only the answer is important (Garofalo, 1989).

While there is considerable research that addressed teachers’ mathematics teaching beliefs (Thompson, 1992), there is far less research about students’ beliefs about mathematics teaching (McLeod, 1992; Op ‘T Eynde, De Corte, Verschaffel; 2002). Frank (1988) posited that junior high students believe “the role of the mathematics teacher is to transmit mathematical knowledge and to verify that students have received this knowledge” (p. 33). The approach to teaching mathematics that is based on the “Here’s the procedure, here’s a few examples, now here’s some for practice” method cannot but put students in a position to develop beliefs like the ones listed earlier” (p. 504). Higgins (1997) research of effects of year-long middle school students’ attitudes, beliefs and abilities in mathematical problem solving also confirmed Frank’s view. This interview study of 137 student participants was designed to elicit students’ beliefs about mathematics and their problem-solving instruction. The findings supported a direct approach to teaching problem solving, but the reader is cautioned that this instructional strategy promotes the student belief that rules or steps can solve all problems (Higgins, 1997). According to Frank (1988), when teachers cover material well, students should be able to produce correct answers quickly and easily, and verifying correct answers is the way teachers determine students
have received this knowledge. This supports the idea that mathematics teaching practices influence students’ mathematics beliefs. While the *Fennema & Sherman Mathematics Attitude Scales* (Fennema & Sherman, 1976) assess students’ mathematics beliefs, they do not explain how those beliefs are formed or how those beliefs influence action (Kloosterman, 2002). Kloosterman (2002) sought to do just that in his study by assessing the motivational beliefs of 56 high school mathematics students with an interview instrument that was developed from literature related to student effort in mathematics (Fennema & Sherman’s perceived usefulness of mathematics) or likely to affect effort (goal orientation). He found that how hard a student worked differed between students. “For some, working hard simply meant working until an assignment was done with little regard for how correctly and completely an assignment was completed” (p. 255). Many students worked to learn the material and perform as well as their peers, with a small minority completing just enough to meet the minimum expectations. Moreover, students indicated grades were motivators and that how a teacher grades affected what they should learn, a tougher grading scale motivated them to work harder, and putting forth effort made a difference. Kloosterman, Raymond and Emenaker (1996) “define beliefs as the personal assumptions from which individuals make decisions about the actions they will undertake” (p. 39). This suggests that beliefs influence action. Most students in this study thought memorization was significant in learning mathematics, and that belief would indicate where those students would focus their efforts (Kloosterman, 2002).

**Beliefs about Self.**

Self-perceptions consist of attributes an individual believes he or she possesses, how the individual believes others view his or herself, how they measure in comparison to others, and what they think their capabilities are which are and based on previous experience and
achievement (Bong & Skaalvik, 2003). Different self-perceptions influence different levels of school engagement (Bong & Skaalvik, 2003). These self-perceptions, or beliefs about self, are comprised of two major bodies of research: a) self-concept; and, b) self-efficacy. In this section I refer to the research to define self-concept and self-efficacy, discuss their parallelism, and describe how self-efficacy beliefs are related to mathematics achievement, and career aspirations.

Self-concept is a judgment concerned with what abilities individuals believe they have (Bong & Skaalvik, 2003). Shavelson, Hubner, and Stanton’s (1976) definition of self-concept formed the theoretical foundation for self-concept research:

In very broad terms, self-concept is a person’s perception of himself…we claim that the construct is potentially important and useful in explaining and predicting how one acts. One’s perceptions of himself are thought to influence the ways in which he acts, and his acts in turn influence the ways in which he perceives himself (p. 411).

Mathematics self-concept refers to one’s judgment of mathematics ability, answering the question “Am I good at it?” (Skaalvik & Skaalvik, 2009). Skaalvik (1997) describes five key points about self-concept:

1. A frame of reference based on social comparison that serves as the most important source of information.
3. Appraisals from significant others that influence how one appraises oneself.
4. Mastery experiences created from past experiences in a particular domain.
(5) *Psychological centrality* which means that self-esteem is formed from self-assessments of qualities of significant value.

Self-efficacy is also a judgment, but is less concerned with ability, and more concerned with what an individual believes he or she can accomplish (Bong & Skaalvik, 2003). Bandura’s (1977) definition of self-efficacy is as follows:

Perceived self-efficacy refers to beliefs in one’s capabilities to organize and execute the course of action required to produce given attainments…Such beliefs influence the course of action people choose to pursue, how much effort they put forth in given endeavors, how long they will persevere in the face of obstacles and failures, their resilience to adversity…and the level of accomplishments they realize (p. 3)

Mathematics self-efficacy refers to one’s judgment of prior experiences with a mathematics task, answering the question “Can I do it?” (Bong & Skaalvik, 2003; Skaalvik & Skaalvik, 2009). Bandura (1997) describes the following four sources as shaping self-efficacy beliefs:

1. *Enactive mastery experience* that are the past successes with prior experiences with tasks that provide the most reliable source of information to base self-efficacy beliefs.

2. *Vicarious experience* that establish self-efficacy beliefs based on similar others’ performance on tasks.

3. *Verbal persuasion* and communication in the form of feedback from significant others in judging one’s self-efficacy.

4. *Physiological reactions* that lead one to adjust his or her efficacy appraisal.

So, how different are self-concept and self-efficacy, really? The two constructs are usually measured at different levels. Mathematics self-efficacy is measured at the problem specific level (Bandura, 1997) by presenting pairs of problems and asking students to judge their
abilities to correctly solve the problems (Bandura and Schunk, 1981; Hackett and Betz, 1989). Measured at the domain-specific level there is much overlap between the two constructs, but there are also a few differences. Social comparison and reflected appraisals heavily influence self-concept beliefs, while goal evaluation influences self-efficacy beliefs. For example, self-concept is norm-referenced and refers to academic subjects by items such as, “I am one of the best students in my mathematics class,” and self-efficacy is goal-referenced and refers to specific tasks by items such as, “I am sure that I can do an excellent job on the problems in mathematics class” (Bong & Skaalvik, 2003). Self-efficacy looks to the future, is adaptable and predicts motivation, emotion, cognitive and self-regulatory processes and performance, while self-concept looks to the past, is constant, and also predicts motivation, emotion and performance. Given the considerable overlap, Pajares (1996) speculated that self-concept and self-efficacy are parallel constructs at the domain-specific level. But when the goal is to predict performance such as course grades or overall grade point averages, perceived self-efficacy is assessed (Zimmerman, Bandura, and Martinez-Pons, 1992).

Self-efficacy beliefs affect mathematics achievement (Bong, 2004; Chen and Zimmerman, 2007; Hall and Ponton, 2005; Lewis, Ream, Bocian, Cardullo, Hammond and Fast, 2012; Panaoura, Gagatsis, Deliyianni, and Elia, 2009; Zimmerman, Bandura, and Martinez-Pons, 1992). Lewis et al. (2012) sampled 1,456 Hispanic students in the fifth and sixth grade to see if teacher caring affected the mathematics self-efficacy of Hispanic English language learners and Hispanic English speakers. Their definition was based on Noddings (2007) research and was addressed by three questions: (1) “Our math teacher takes a personal interest in students,” (2) “Our math teacher cares about how we feel,” and (3) “Our math teacher listens to what I have to say.” Their findings indicated that teacher caring increased both groups confidence to complete
mathematics problems. The increased self-efficacy impacted and improved mathematics test scores. As a result, teacher caring increased math self-efficacy, which increased math achievement in Hispanic students (Lewis et al., 2012). An international study of 1,701 students, aged 10-14 years old in fifth through eighth grade in Cyprus, researched students self-efficacy beliefs about their use of representation and performance in learning fractions (Panaoura et al., 2009). The researchers reported several important findings. First, there were differences in beliefs among the different grade levels. With regard to general self-efficacy, significant differences were found between grades 5 and 7 - 8 and also grade six and 7 - 8 (Panaoura, Gagatsis, Deliyianni, and Elia, 2009). Grade seven had a lower performance than grade six suggesting that the transition from primary to secondary education impacts student performance and students developed more negative self-efficacy beliefs in tasks where they solved problems about the use of representation (Panaoura et al., 2009). In cases where students had low mathematical performance, students had low self-efficacy beliefs, whereas high mathematical performance translated into high self-efficacy beliefs (Panaoura et al., 2009). The researchers findings confirmed Bandura’s (1986) earlier findings that younger children have high self-efficacy beliefs because they tend to overestimate their abilities and that these beliefs decrease at the secondary level because students compare their mathematics performance to their classmates as well as their own final grades (Panaoura et al., 2009). A cross-national comparison study of mathematics self-efficacy beliefs of 295 middle school American and Taiwanese students in seventh grade mathematics found that “students in both countries decrease their self-efficacy beliefs…as the math items become more difficult” (Chen and Zimmerman, 2007, p. 239). Taiwanese students displayed higher self-efficacy on moderate and high level problems while the American students’ self-efficacy beliefs decreased significantly as they encountered more
difficult items. Taiwanese students were more accurate and better able to assess their own achievement levels and self-efficacy, and reported effort judgments differently. Taiwanese students reported increased effort as item difficulty increased while Americans reported increased effort from easy to moderate, but decreased effort from moderate to difficult items (Chen & Zimmerman, 2007). Bong (2004) researched the academic self-efficacy in mathematics, English, Korean and general school learning of 389 high school Korean girls and found that self-efficacy beliefs vary from subject to subject. Math self-efficacy was the sole predictor of math performance whereas English self-efficacy was the sole predictor of English performance (Bong, 2002). Hall and Ponton (2005) researched the mathematics self-efficacy of 185 college freshmen in Intermediate Algebra and Calculus I and found that Calculus I students exhibited a greater mathematics self-efficacy than Intermediate Algebra students.

Self-efficacy beliefs also influence children’s aspirations (Bandura, Barbaranelli, Caprara, and Pastorelli, 2001) and student career choice (Hacket and Betz, 1989; O’Brien, Martinez-Pons and Kopala, 1999; Waller, 2006; Zeldin, Britner and Pajares, 2006; Zeldin and Pajares, 2000). Bandura et al. (2001) examined how children have perceived self-efficacy and academic achievement affected their career choice, or occupational efficacy. Findings revealed that parents’ aspirations for their children were connected to children’s perceived self-efficacy. Parents’ beliefs about their children impacted children’s beliefs about their career choices, and occupational efficacy, because their actions supported academic achievements. “Children of high perceived scientific and technological efficacy chose career pursuits embracing professorial and creative activities but shunned those involving child mentoring, patient caretaking, and routinized social services” (Bandura et al., 2001). With respect to gender differences, girls of parents who believed that girls were not as capable as boys in mathematics were found to lose
confidence in their mathematics abilities as they transitioned to high school (Bandura et al., 2001). Mathematics self-efficacy was found to have a moderate correlation to mathematics performance and both were significantly correlated to a mathematics-related major (Hackett and Betz, 1989). O’Brien, Martinez-Pons and Kopala (1999) examined the relationship between ethnicity, mathematics self-efficacy, gender and career interests in science or engineering for eleventh grade students and found “that mathematics self-efficacy…is significantly related to science and engineering career interests of adolescent girls and minority-group students” (p. 235). For non-traditional African American college students, Waller (2006) found mathematics self-efficacy and possible outcomes effected the development of mathematics interest.

…if a non-traditional African American student believes they have the ability to successfully perform a math task, they could develop math interest, and if they expect to be successful in math they could also form math interest…Therefore, in order to begin the process to build expected positive outcomes and interests in math, a belief in one’s abilities to do math must be established (p. 545).

Self-efficacy beliefs of successful men and women in STEM careers are different. For women, their self-efficacy beliefs were nurtured by social influences through family, peer, academic or work-related networks (Zeldin, Britner, and Pajares, 2007). Women watched and learned from others through vicarious experiences which, in turn, helped them to believe in themselves, because others believed in them (Zeldin and Pajares, 2000). “Individuals perceptions of their competencies are powerful motivators that affect the choices they make, the effort and persistence they put forth, and the resilience they show in overcoming obstacles” (Zeldin, Britner and Pajares, 2000, p. 1036). For STEM women, significant others played an
important role in the formation of self-efficacy beliefs and facilitated the development of resilience (Zeldin and Pajares, 2000).

Goals and Motivation.

Student self-efficacy beliefs influence goals, motivation and achievement. There are different types of goals, for example, classroom goals, student goals and parent goals. Classroom goals are derived from teachers’ policies and practices that students perceive to influence achievement (Gutman, 2006). Parent goals are communicated to students through conversation and are the expectations parents have for their child’s academic achievement. When setting goals for their child, parents take into consideration their child’s past achievements, but students utilize self-efficacy beliefs and their parents’ ambitions when setting their goals (Zimmerman, Bandura, Martinez-Pons, 1992). Student goals consist of two major goal orientations: mastery goals and performance goals. In this section I will discuss mastery and performance goals, and their influence on student motivation.

If beliefs influence action, then the action taken includes the direction taken to achieve a specific goal. Achievement goals focus on what student beliefs influence those goals and why students want to achieve a goal (Ryan, Ryan, Arbuthnot, and Samuels, 2007). There are two types of goals, mastery, often called learning goals or task goals, and performance, often called ego goals or ability goals (Ames, 1992; Ames & Archer, 1988; Kaplan and Maehr, 1999). Students with performance goals are concerned with proving their ability, while students with mastery goals are concerned with improving their ability (Dweck and Leggett, 1988). Ames and Archer (1988, p. 261) compared and contrasted mastery and performance goals in Table 2.1.
Table 2.1

*Achievement Goal Analysis of Classroom Climate*

<table>
<thead>
<tr>
<th>Climate dimension</th>
<th>Mastery Goal</th>
<th>Performance Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success defined as…</td>
<td>Improvement, progress</td>
<td>High grades, high normative</td>
</tr>
<tr>
<td>Value placed on…</td>
<td>Effort/learning</td>
<td>Normatively high ability</td>
</tr>
<tr>
<td>Reasons for satisfaction…</td>
<td>Working hard, challenge</td>
<td>Doing better than others</td>
</tr>
<tr>
<td>Teacher oriented toward…</td>
<td>How students are learning</td>
<td>How students are performing</td>
</tr>
<tr>
<td>View of errors/mistakes…</td>
<td>Part of learning</td>
<td>Anxiety eliciting</td>
</tr>
<tr>
<td>Focus of attention…</td>
<td>Process of learning</td>
<td>Performance to others</td>
</tr>
<tr>
<td>Reasons for effort…</td>
<td>Learning something new</td>
<td>High grades, performing better than others</td>
</tr>
<tr>
<td>Evaluation criteria…</td>
<td>Absolute, progress</td>
<td>Normative</td>
</tr>
</tbody>
</table>

Ryan et al. (2007) further defined four types of mastery and performance goals: a) mastery approach; b) mastery avoidance; c) performance approach and d) performance avoidance. A student with a mastery approach goal focuses on accomplishing a task, or successfully completing a challenge, usually related to prior achievement. The student is approaching success. An example would be, “[I was] feeling like I was just gonna do good on the math test, and see what happened afterwards” (Ryan et al., 2007, p. 6). A mastery avoidance goal is different from mastery approach in that the focus is avoiding mistakes or preventing an undesired outcome on a task. An example of this would be, “I wanted to do well…[on the math test] Um just to see what I know so I don’t feel like I don’t know anything” (Ryan et al., 2007, p. 7). The performance approach goal shows ability and a judgment of ability, for example, “I want to do well so I can show it to my grandmother for her praise” (Ryan et al., 2007, p.7). The focus is on showing high ability and looking smart to others. Performance avoidance goals are focused
on avoiding negative judgments of ability and avoiding negative judgments of intelligence. “[My math test score means] a lot because if I did bad I would feel really like embarrassed” (Ryan et al., 2007, p.8). From these examples, one can surmise that goals influence patterns of behavior by giving purpose and meaning to the action. Mastery goals influence long-term motivation while performance goals influence short-term motivation (Ames, 1992).

Most of the motivation literature is found in social psychology, and not in mathematics education, but it is certainly applicable (McLeod, 1992). Teacher questions such as how do I get students to do what they need to do and be consistent or why do students of equal skill level differ in performance when they meet with challenge require an understanding of motivation. Motivation contributes to academic achievement and it is a multidimensional construct. For example, self-efficacy beliefs contribute to the choices of tasks and the choices of action to accomplish the task. “As a consequence, self-efficacy is often a critical factor predicting children’s task choices, willingness to try and persist on difficult tasks, and even actual performance in many classrooms,” (Ames, 1990, p. 412) all of which contribute to a student’s motivation. These factors differ with age. Younger children tend to be more optimistic and associate hard work with being smart, while older children see them differently (Ames, 1990). “Trying hard and failing threatens one’s self-concept of ability,” (p. 413) and if a student who does this wants to be perceived as able, then effort and ability cannot be the same (Ames, 1990). Maladaptive patterns of behavior such as avoidance tactics or cheating can result.

They engage in failure avoiding tactics such as not trying, procrastinating, false effort, and even the denial of effort. Why would they do this when these behaviors most assuredly will increase the likelihood of failure? What these behaviors accomplish is
reducing the negative implications of failure. From the students’ point of view, failure without effort does not negatively reflect on their ability (p. 413).

In a study of 443 fifth graders, students who were concerned with proving their ability were least likely to seek help while students concerned with improving their ability sought help the most (Ryan et al, 2007). Bong’s (2008) study of Korean freshmen and sophomore girls in mathematics found “the help-seeking-avoidance tendency was stronger among those who were low in self-efficacy and performance oriented, as opposed to mastery oriented, because these students suffer from stronger fear of failure and are less willing to reveal their weaknesses to others” (208-209). If the student does not put forth the effort, then his/her ability cannot be assessed. The self-concept is saved because failure is not due to lack of ability, but lack of effort. These low-effort children have learned helplessness. However, when students are willing to apply the effort, they must believe the effort will lead to success. Student interest and motivation increases when they believe they have control over aspects of their learning such as choices in tasks or task complexity. This leads to reasons for which students attribute their success or failure.

Causal Attribution Theory.

Causal attribution theory attempts to explain how a person perceives the cause of success or failure of a task. Mathematics education research is concerned with student and teacher perceptions of success or failure on mathematics tasks (Reyes, 1984). Students who do well in mathematics may attribute their success “…to their ability, to having worked hard, to a good textbook, to help received from a teacher or a friend, to luck, or to the fact that the test was an easy one” (Reyes, 1984, p. 173). The locus of causality refers to whether the control is inside or outside the individual and stability refers to whether the parameter varies periodically (Reyes,
1984). Ability and effort are both internal, because the individual determines it; however, effort is unstable because it may vary depending on the situation. Task difficulty is external because it is not controlled by the individual and luck happens by chance and depends upon the task.

Weiner’s model (1974, p. 6) shows two criteria, internal locus of control and stability crossed in a 2 x 2 matrix as shown in Table 2.2:

Table 2.2

<table>
<thead>
<tr>
<th>STABILITY</th>
<th>LOCUS OF CAUSALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>External</td>
</tr>
<tr>
<td>Stable</td>
<td>ability</td>
</tr>
<tr>
<td></td>
<td>task difficulty</td>
</tr>
<tr>
<td>Unstable</td>
<td>effort</td>
</tr>
<tr>
<td></td>
<td>luck</td>
</tr>
</tbody>
</table>

The theory outlined by Weiner has been used to describe gender difference attributions (Dweck, 1978), ethnicity and socioeconomic status attributions (Mooney and Thornton, 1999), and students’ attributional theories (Swinton, Kurtz-Costes, Rowley, and Okeke-Adeyanju, 2011; Vispoel and Austin, 1995; Nicholls, Cobb, Wood, Yackel and Patashnick, 1990). Nicholls et al. (1990) studied second grade students’ beliefs about mathematics success and found that task orientation was related with beliefs that success is dependent upon effort and interest and the ego orientation was dependent upon ability and competition with other students.

In an international study of sixth grade students in the Netherlands, Seegers, Van Putten, and Vermeer (2004) asserted that a students’ goal orientation effected motivation. When a task was accomplished and deemed a success, the student attributed the success to ability, and when confronted with another task that was similar their estimation of competence was high. But when lack of effort could not explain failure, students reduced their self-estimation of confidence. “Student behavior is aimed at stability and protection of self-worth, and students can
be expected to avoid negative information about the self. “To do this, students will apply coping strategies to prevent isolated events from having a strong effect” (Seegers, Van Putten, and Vermeer, 2004, p. 325). In another study of seventh and eighth graders causal attributions related to subject area and grades. Vispoel and Austin (1995) posited that success was attributed to effort the most, and luck the least, while failure was attributed to interest the most and family influence the least, regardless of subject matter. While interest is not one of the four traditional attributions, attributing failure to lack of interest lessens the threat to one’s self-worth, because it also does not suggest a lack of ability (Vispoel and Austin, 1995). With regard to grades, low achievers were more likely to support lack of ability for failure and less likely to endorse ability and effort attributions for success (Vispoel and Austin, 1995). In their longitudinal study of rural African American high school students, (Swinton, Kurtz-Costes, Rowley, and Okeke-Adeyanju, 2011) found stereotypes were alive and well in boys and girls attributions of success and failure in mathematics and English. Their findings included that boys and girls successes and failures became more negative as they progressed from eighth to eleventh grade; boys were more likely than girls to attribute their success in mathematics to ability, but girls saw themselves as less competent than boys before high school (Swinton et al., 2011). Students who attributed low achievement to low ability in eighth grade had low involvement in the eleventh grade. Students were less motivated because they perceived mathematics as a subject that became increasingly difficult as they progressed through high school, which led them to doubt their abilities.

Resilience.

While a student teacher, my cooperating teacher, Mr. James, spoke highly about one of his former students, Keith, who was coming back home from college and planned to visit him. Mr. James told me the story about when Keith was young, he suffered a serious traumatic life
event as he watched his mother be brutally beaten and stabbed by her boyfriend. The boyfriend was convicted of murder and went to jail. Keith and his younger brother were separated and placed into foster care. Now several years later, this African American male who had taken Calculus I while in high school and received AP credit, had graduated from high school with honors, received a full scholarship to MIT, and was working as an intern at Microsoft during the summer. I asked Mr. James what made the difference for Keith that his life turned out for the better, and Mr. James said it was the support of his foster family. I thought that this was extraordinary that Keith managed to overcome these things. There are students like Keith who experience life-altering, traumatic or hurtful events and somehow managed not to just survive, but to thrive. These students may have been given lemons, but they made lemonade. These students are resilient.

Although not considered to be a part of the affective domain, I present literature on resilience because it is related to this research. Condly’s (2006) review of the literature found children who were intelligent, easygoing and had an internal locus of control, and parents who provided guidance and had positive attitudes as factors that contributed to their resilience. Academically resilient students are those “who sustain high levels of achievement motivation and performance despite the presence of stressful events and conditions that place them at risk of doing poorly in school and ultimately dropping out of school” (Alva, 1991, p.19). Resilience varies between individuals and grows or declines. Poor and minority students often face insurmountable obstacles and have to beat the odds to achieve in school. It is these resilient children who achieve despite individual, school or familial factors. Resilient children are therefore created, not born. According to Floyd (1996), academic resilience in African American high school seniors is a character trait that is developed and shaped by: a) someone at home; b)
someone at school; and, c) personality traits such as, perseverance and optimism. Further, these students have a belief that they can do the work, their efforts will pay dividends, and that they can develop and attain their goals. In poor Turkish children high home expectations were found to be the most significant internal factor of promoting academic resilience (Gizir & Aydin, 2009). In Bell and Kolitch’s (2000) study of mathematical distress and resilience, college students who voiced mathematical resilience were not concerned with comparing their ability to others, were less disconnected about mathematical ability and achievement and placed less emphasis on natural talent. The students were less self-conscious about their own ability and were not afraid or intimidated to participate in class. They could take risks and participate without being perfect (Bell & Kolitch, 2000).

Summary

This body of research indicates that there are several factors that influence student self-perceptions in mathematics and explain how these self-perceptions contribute to their experiences, success or failure, in Algebra I. In this chapter I used the affective domain to explain this. Students’ beliefs are formed from the social context, which include parents’ expectations and peers influence. Students’ beliefs about mathematics, beliefs about mathematics teaching and beliefs about themselves influence student mathematics participation, the goals they set, the motivation to achieve their goals, and to what they attribute success or failure. Students’ self-perceptions at the domain level, include self-efficacy and self-concept beliefs. Self-efficacy addresses the question, “Can I do it,” whereas self-concept addresses the question, “Am I able.” Self-efficacy beliefs were found to impact the type of goal, whether mastery or performance, achievement and causal attribution. Further, students become resilient because they have someone at home, someone at school, and personality traits such as
perseverance and optimism. Students who are resilient can overcome obstacles at home or the classroom and achieve academically and mathematically.

The existing research on the affective domain is primarily made up of survey research about majority culture, gender differences, and racial/ethnic differences within the affective domain and within the realm of social psychology. Relatively little research has focused on African American students and the affective domain in mathematics education. Qualitative research is needed to gain a clearer more complete picture of African American student experiences and factors that contribute to their self-perceptions as learners and their success or failure in mathematics. Knowing what influences their beliefs, goals and what motivates them in mathematics may be valuable for designing programs for students that strengthen mathematics skills, while also changing self-efficacy beliefs. It may also impact professional development for teachers that will give strategies to help teachers teach mathematics to encourage African American student participation in mathematics through course taking and majoring in mathematics-related careers.
Chapter 3: Methodology

“The trouble with generalizations is that they don’t apply to particulars.”
*(Lincoln & Guba, 1985, p. 110)*

Theoretical Framework, Revisited

As a high school mathematics teacher, I always engaged in reflective practice. My teaching praxis was driven by the question: Am I teaching the subject, or am I teaching the student? I always sought to teach the student. As a researcher, I also engaged in reflective practice, and so a different question emerged: What is it that I want to know about my students? And from this question, my specific research questions emerged. As a reflective researcher, I made very deliberate choices in selecting my methods. Some of my choices were rather intuitive, such as the selection of several of the interview questions, using the effort rubric, and wanting to write the students’ experience using the students’ voice. Feminist research validates the participants’ perspective by recognizing each participant as an authority of their own experience *(Brayton, 1997)*. I considered myself an authority because of my experiences as a female, mathematics student, and former high school mathematics teacher. I recognized the other participants as authorities being female, and mathematics students, and thought we may have something in common. “As women, both researcher and participant share a common location in the social world on the basis of their gender and can communicate on the basis of this similarity” *(Brayton, 1997, p. 5)*. These experiences gave me some understanding of the dynamics that informed this research.

Other choices, such as utilizing a feminist framework, and selecting a data analysis method, were not so intuitive. I had to discover what makes feminist research feminist. According to Brayton *(1997)*, recognizing the researcher as a participant in the experience, while acknowledging the social location, insider or outsider, is a major tenet of feminist research.
Additionally, I researched prior feminist studies and found a method of analysis that aligned with this research: the voice-centered relational method of data analysis (Brown & Gilligan, 1992). This method of analysis allowed me to continue to be a reflective researcher of my student experiences and teaching experiences while comparing and contrasting these experiences with the girls in my study. The structure of the method allowed me to reflect and tell my story, insert it, and combine it with the other participants’ stories as narratives. I could then find similarities or differences, and tell each story as it was told to me, without reducing to codes.

**Design**

This study was designed to be a qualitative, feminist hermeneutic phenomenological study. The purpose of qualitative research is to “…understand and explain the meaning of social phenomena…” (Merriam, 1998, p. 5). Additionally, according to Koro-Ljungberg, Yendol-Hoppey, Smith and Hayes (2009) the purposes of hermeneutic phenomenological research methodological choices are “to describe the essence of a phenomenon by describing participants’ life worlds, to understand holistically and cyclically participants’ experiences through the interpretation of the phenomenon” (p. 689). This research is a phenomenon because I sought to capture and describe how African American girls perceive, describe, feel, judge, make sense, and talk about their experiences in mathematics (Patton, 2002). The feminist framework aligns with the hermeneutic phenomenological methodology because the gathering of lived experiences through biographies helps to understand the background, decisions, and choices of others (Van Mannen, 1990). Following this methodology, I used mathematics autobiographies and interviews in my data collection. I wanted to hear from students who have experienced this phenomenon under investigation, including (a) what was experienced and (b) how was it experienced? Because of this, the feminist framework lends itself to the emic, or insider,
perspective. My experiences with success and failure as a mathematics student, and having taught students within this district and school, offered insights about the students, their teachers, their ways of knowing, and pedagogy. My story and the participants’ stories will be interwoven and there is no other as the focus of my study.

Van Manen (p. 71) asserts, “Educators want to gain insights in the lives of particular students in order to understand them or help them.” For these reasons I used my own personal mathematics story, my own lived experiences, as both a mathematics student and a teacher, as a catalyst that enabled the participants to voice their own experiences as mathematics students to better understand them. We all have our own personal math stories that make meaning for each one of us, and by presenting my mathematics autobiography, I wanted to help them by changing the perception that being a mathematics teacher or a successful learner of mathematics, does not means one is always good at math or that one does not struggle in Algebra. I also wanted to let them know that each story has relevance, and my story served as a starting point for reflection on our own mathematics success or failure. Within each of us is the power to effectively make change to that story so that it ends with our desired outcome. For me, that outcome was pursuing a mathematics degree in college and becoming a professor at a historically black college or university (HBCU). My desired outcome for the participants was mathematics success, however they defined it. It meant, each of the participants pursuing mathematics because they wanted to, having a positive self-perception of their ability to do mathematics, particularly algebra. Ultimately, it also meant that each participant would not discount themselves from a mathematics-based career based on their self-perceptions at this point of their academic career. Admittedly, these were things I wanted for each one of them, and I hoped that they would want these things for themselves.
Setting and Population

The school was located in a mid-size metropolitan area in the Midwestern region of the United States. Within the last five years, two major automobile and parts manufacturers restructured and many residents lost employment. This distressed the city and school district. Both suffered from decreased population and property taxes because of massive job loss. However, prior to the onset of the economic downturn, the residents voted for new school buildings for the district, and this building was two years old at the time of the study. It was very small compared to the old high school that once stood on the same ground. The academic wing was separated into four pods; 2 pods per floor. The freshman pod was located on the second floor, and was where the two Algebra I teachers’ rooms were located. This was where I conducted my research.

I conducted a qualitative research study during the first and second quarters of the 2009-2010 school year at Benjamin Banneker High School (pseudonym). Banneker was a small high school of about 600 students in 9-12 grades, where more than 90% were Black. This school boasted at least one, and some years more than one Gates Millennium Scholarship Finalist, although it was not the top performing high school in the district. The athletic program was exceptional in football and basketball. The ROTC program received awards every year for their drill performances. During the year this study was conducted, the academic program had shown a double-digit increase in mathematics performance from the previous year. In spite of these successes, Banneker did not meet proficient levels in mathematics, reading, writing, social studies, or science for tenth grade students.

Sampling Method

The sampling technique utilized in this study was a convenience sample. The principal,
Mr. Thomas, was my primary contact. We worked together previously at another high school, where he was a mathematics teacher. Because of our professional relationship and his interest in my research, he provided me with an introduction to both algebra teachers, Mr. Ealy and Ms. Simmons. Although, I already knew Ms. Simmons from my previous employment with the district, she did not know about my research. I explained the purpose of the research to both teachers, and asked them for the opportunity to use their classes to recruit participants, to which they both agreed.

Approximately 175 students were eligible to participate in the study. Eligibility was determined by enrollment in Algebra I. Mr. Ealy taught two sections and Ms. Simmons taught the other five sections of Algebra I. All 175 students were given an opportunity to participate. I addressed the students by explaining the research, and that they, along with their parents, had to give consent to participate. I further explained that their mathematics autobiography was a classroom assignment that had to be completed regardless of their choice to participate in the research. Therefore, from the participants’ point of view, there were no differences between who was recruited for the study. Eighty-five of the 175 students completed the mathematics autobiography for a completion rate of 48.6%, and of those eighty-five completers, six African American females returned consent forms. One student chose to withdraw from the study, and the other was withdrawn by the researcher because she did not attend the initial focus group interview. The study was open to both male and female students; however, the male students did not volunteer to participate by returning consent forms. Because of this, I decided to focus this research on solely on girls.

**Data Collection**

Data for this project were collected during two quarters using student-written
mathematics autobiographies, one non-structured focus group, one structured focus group, and
semi-structured individual student interviews, an effort rubric and an effort and attitude versus
quarter grade graph. Each of these instruments is described below in further detail.

Mathematics Autobiographies.

Students were asked to respond to three prompts in order to document their math attitudes
and history (Appendix E). To assist them in generating ideas, I gave them three prompts to
respond to:

(a) Tell me about your experiences in previous mathematics classes.
(b) Tell me about your experiences with prior mathematics teachers.
(c) Describe your feelings about mathematics.

Focus Group Interview 1.

The first interview consisted of themes that were noted after analyzing the students’
mathematics autobiographies (Appendix F). The purpose of the first focus group interview was
to gain clarification of those emerging themes and trends and to give students an opportunity to
further explain their writing. Because I expected the responses to vary from student to student
there was not a set protocol for these interviews. The interviews was conducted after school in
the teachers’ lounge and lasted approximately one hour.

Individual Interviews.

These questions (Appendix G) were asked of the mathematics students participating in
the study after the mathematics autobiographies and first focus group interview were completed.
I conducted the semi-structured interviews before and after school. These interviews lasted
approximately 30 minutes.

Focus Group Interview 2.
This focus group was conducted on two separate occasions using the Effort and Attitude versus Quarter Grade Graph (Author unknown, 2009) and the Effort Rubric (The Miami Valley School, 2006) (Appendices H and I). These interviews were conducted during class time, but after they completed their work for the day and with the principals’ and teacher’s permission.

**Effort and Attitude versus Quarter Grade Graph.**

Participants were given four fictitious students and asked to interpret data points as they related to the participants’ perception of effort and attitude, and their effect on the fictitious students’ quarter grades. Participants were also asked to interpret their own data point and place it on the graph as well.

**Effort Rubric.**

The effort rubric (The Miami Valley School, 2006) consisted of five behaviors that related to academic effort which included: course preparation, class participation, behavior, seeking help, and making up missed work. The participants rated their effort in these five behaviors based on their perceptions of their own effort in Algebra I.

**Table 3.1 Data Collection Timeline**

<table>
<thead>
<tr>
<th>Name</th>
<th>Mathematics Autobiography (MA)</th>
<th>Focus Group Interview #1 (FG1)</th>
<th>Individual Interview (IN)</th>
<th>Focus Group Interview #2 (FG2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juanita</td>
<td>September 9</td>
<td>October 7</td>
<td>November 20</td>
<td>November 23</td>
</tr>
<tr>
<td>Lil Mama</td>
<td>September 9</td>
<td>October 7</td>
<td>October 14</td>
<td>November 24</td>
</tr>
<tr>
<td>Mane Gurl</td>
<td>September 9</td>
<td>October 7</td>
<td>November 20</td>
<td>November 23</td>
</tr>
<tr>
<td>Dink</td>
<td>September 9</td>
<td>October 7</td>
<td>October 12</td>
<td>*NA</td>
</tr>
</tbody>
</table>

*Student withdrew from the school and research before final focus group interview

**Procedures.**
All students completed the mathematics autobiography; however, not all of the students’ data became part of the data pool. Because of my prior experience assigning mathematics autobiographies in Algebra I at the beginning of the year, I knew of students’ reluctance to complete them. I was prepared to answer questions about why do they have a writing assignment when this was Algebra. This previous experience, and the fact that I was not their regular mathematics teacher, informed my efforts to motivate students to complete the assignment. I wanted all students to put forth their best effort and complete the assignment. To maximize the number of completed assignments, I first talked to both teachers about the grading of the assignment. I knew from experience, if there was no grade, the students would not complete it. I let students know that this was a required assignment for class, even if they chose not to participate in the research study. I volunteered to grade all of the papers if the teachers would agree to count the grade for the quarter, which they did. Both teachers allowed me to address the class by explaining the research (Appendices C, D, and E) and passing out the assignment which included how it would be assessed (Appendix F), and consent forms. I also tried to give the assignment more weight and wanted to provide writing support, by including the two language arts teachers in the assignment. I asked if they would be able to help the students with writing and editing their papers. They both allowed time in class to address students’ questions about the writing process, and one of the language arts teachers said she would give extra credit in her class to any student who completed his or her paper. Students were given one week to complete it, and some were a bit disgruntled that it was assigned over a holiday weekend. I decided to give them a one-week extension, so after two weeks, I graded them.

During those two weeks I received six consent forms from female algebra students.
As I returned their graded mathematics autobiographies, I initiated contact about the first focus group meeting to find a common day and time. At this interview, the girls picked their own pseudonyms, and I interviewed four girls: Juanita, Lil Mama, Mane Gurl and Dink. Two additional girls did not attend the interview. One girl later told me that she changed her mind about participating, and the other girl forgot about the focus group interview so I withdrew her.

**Data Analysis**

I analyzed the data using the voice-centered relational method of data analysis. The voice-centered relational method of data analysis was developed by Brown & Gilligan (1992) in an effort to listen to the voices of women and girls in the field of psychology. Their research attended “to the relational dimensions of our listening, speaking, taking in, interpreting, and writing about the words and the silences, the stories and the narratives of other people” (p. 22) through the development of the Listener’s Guide. Using The Listener’s Guide, we listen to a person's story at least four times. This means active reading of the transcript while simultaneously listening to the audio recording. The goal is to follow the different voices through the interview. This method was selected because it allowed me to analyze data consistent with my research questions, and was aligned with the purpose of this study, the feminist framework and phenomenological hermeneutic methodology. It is “… an analysis that uses concepts from the theoretical framework of the study…” (Merriam, 1998, p.11). Previous feminist research using Brown & Gilligan’s (1992) voice-centered relational method included: Bell & Kolitch, 2000; Mauthner & Doucet, 1998; Paliadelis & Cruickshank, 2008; Rogers,1993; Rogers, 1998. What follow is *The Listener’s Guide* (Brown & Gilligan, 1992) and examples of different listenings and how they were completed. Each focus group session and individual
interview were digitally recorded and transcribed; however, each participant was analyzed as a
separate case and each case was compared for common themes.

Reading #1.

*We listen to the story the person tells to get a sense of what is happening, unfolding of events,*
*listen to the who, what, why, where, when of the narrative by locating speaker in the narrative*
she tells. *This includes recurring words, images, central metaphors, emotions, contradictions,*
inconsistencies in style, revisions, and absences in the story. *Notes are made about our*
reactions to the speaker and their story including the following questions:

**Reflect on the whole story:** *What do I think about what she said?*

For example, I think Juanita wants to do well in Algebra I, but she lacks self-confidence. When I listened to her story, I noticed great variations in her tone of voice, and her self-confidence showed through her voice. When she was very confident her voice was loud and full of emotion. When she was unsure of herself, she used “I don’t know” to avoid answering questions, or she responded softly. Her idea of putting forth more effort means she wants to stop looking off of her classmates’ papers, stop asking her friends for help and instead go to the teacher for help and wanting her mom to help her more.

When I asked her how much self-confidence she had she answered, “I don’t know.” In fact, when I tried to get her to answer the question by rephrasing it, she still could not give me a definite answer. When I asked her if she had to choose between ability and hard work, to what would she attribute her success in mathematics and she answered with “I don’t know’ again. When I probed further, she said she didn’t know because she did not try, she did not work hard, and does just enough to get by in class. I think she could not answer the question because she had no experience to relate it to.
Reflect on the plot/drama: How do I identify with her?

I identified with Juanita because I took Algebra I twice: once in the eighth grade and once in the ninth grade. I did not fail Algebra in the eighth grade, I earned mostly C’s, but I did not think I learned it well enough to take Geometry in the ninth grade, so back to Algebra I, I went. This was a defining moment for me, and it set the stage for my high school mathematics career. I took Algebra II three times, and Precalculus three times! I did not have much difficulty in mathematics until I took Algebra I. Geometry was the only high school math class I took once.

Juanita had a negative experience in 7th grade mathematics, and that experience shaped her. She said that math “got hard” and she “got passed” to the next grade when she didn’t think she should have. Although she did not fail seventh grade math, she did not want to fail in the future and have to retake classes. Her goal was to go to school for a half-day as a senior. This meant she could not fail classes and needed all of her credits to achieve that goal.

Juanita has a mother who is very influential to her. Juanita’s mother was an accountant and was very good in math and she helps her with her homework, and gave her advice. Her mother also paid for a tutor two days a week. She had expectations that Juanita would perform well in Algebra I and expects ‘A’s’, ‘B’s’ and ‘C’s’, but will allow an occasional ‘D’. She motivated Juanita to do well by promising a family trip to Disney Land for Christmas and if her grades were good, she could attend.

My mother was very influential for me, too. My mother was a registered nurse, and she knew that Algebra I was very important for future subjects like Algebra II and Trigonometry, Precalculus, Chemistry and Physics, and other subjects like Molecular Biology and Biochemistry, because she took them in nursing school. She knew I wanted to be an engineer so
these courses were mandatory for my college preparation. Although she could not help me with Algebra I, it had been too long and she did not remember it, she did provide me with a tutor as well. She also had grade expectations of a ‘B’ or 85% or higher. I went to a Catholic high school, and the lowest ‘B’ was an 85%. She thought since she paid tuition, she was not paying for anything less than a ‘B’ average overall. My mother had her own motivation strategy. During my freshman year she put me on punishment for a whole quarter, because I had a ‘D’ or 70%. Each Friday I had either a quiz or a test, and I had to bring home an 85%. If I did, then I got to go out during the weekend, but I had to choose one day only: Friday, Saturday, or Sunday. If I did not make the grade, then I sat in the house all weekend.

Juanita does not accept responsibility for her learning. She did not do her homework and said her teacher was not a good teacher. Instead of deciding to put forth more effort because the work was hard, she decided not to do the work. Task difficulty determined how hard she would work, and I was the same way in high school. I identified the most with Juanita of the four girls in this study.

**Reflect: What's my reaction to this story?**

As a student, I thought Algebra I was hard, just like Juanita. I wanted to give up many times, but I had my mother who gave me strong doses of encouragement and discipline when I needed it. My mother expected that I meet her expectations by taking responsibility for my learning, or I would suffer the natural consequences of my actions. When I became frustrated, I would talk to her and she would give me suggestions about what to do. For example, she suggested that I wake up earlier so that I could get to school earlier to get some extra help before school. She also suggested that I stay a little later to get help after school. She provided a tutor, if I needed it. When I did not meet the expectation then I was put on punishment. I became
motivated to achieve when I was on punishment, but once the extra effort started to pay off, then
the reward of my accomplishment began to take over and further motivate me. I did not hear this
in Juanita’s story. Other than the possibility of not attending the trip, Juanita did not mention
any consequences or repercussions for not meeting her mothers’ expectations.

As my teacher self, the lack of consequences and repercussions for Juanita is not enough.
First, I do not agree with using a trip as motivation for better grades. It was such a long-term
goal that was far into the future, and hard for me to see Juanita keeping track of her progress as
she progressed through the quarter. My punishment was easier to track for me and my mother,
and there was an immediate reward: If I earned an 85% or higher each Friday on the test/quiz, I
was allowed to go out once during the weekend. I did not have to wait an entire quarter to find
out if I earned my reward. I think parents should communicate goals for grades and take an
immediate stand in issuing appropriate consequences when their children do not meet those
goals.

Reading #2.

We listen for "self" - for the voice of the "I". We look at the way the participant spoke about
herself. Listen for words, "I", "me", "my", and shifts from "I" or "me" to "you" or "them". Shifts
indicate how participants’ perceive themselves and how others perceive them.

Juanita (IN): Because it’s worth 30% of your grade. OK, so if you do your homework
then that’ll be 30% and you’ll either receive a A, B, C, D or F. And I like that
because it tells me where I stand in my homework, or if I know what she’s
teachin’ me. If I receive a C, I know I need to work on it…or a D or a F. F…F…you
didn’t really need to do it…but you still get a percentage.

Juanita shifts in voice between first (pink) and second (red) person.
In this passage, the “I” represents Juanita’s level of understanding of what is being taught, while the “you” represents the possible grades she could receive. Juanita equated her letter grade with her level of understanding, and if a grade of ‘F’ is received that means there was not any understanding. Further, no effort should have been made in the first place. She does not distinguish between a zero ‘F’ and a fifty ‘F’. While both are ‘F’s’, one grade can help you to pass the course and the other will can help you to fail the course, or at least significantly reduce your grade. My experience also supports this assertion that high school students do not differentiate between the two ‘F’ grades. They tend to believe an ‘F’ is an ‘F’. But how much credit you receive for that ‘F’ does make a difference in whether you pass or fail.

**Reading #3.**

*We listen for the story about relationships to: (a) teachers and math content; (b) parents; and (c) students.*

**Relationship with her teachers and mathematics content.**

Her relationship with her sixth grade mathematics teacher, Miss J., began in the fifth grade. She said she did not like her teacher initially because she was mean. She said her class used to go to Miss J. when their teacher was absent. However that initial negative experience reversed itself when Juanita engaged in some after school activities with Miss J. and she got to see another side of her. She gets excited and her voice becomes louder as she talks about how Miss J was a “great teacher” because “she taught me how to do math, and fractions and stuff and I liked her and I thought she was the best math teacher ever!” Her voice trails off and gradually softens as she says, “But then she didn’t teach at our school anymore.” She said Miss J. always encouraged her to do well in math. Although Juanita says her teacher liking her does not affect her performance, it is clear that Juanita liking her teacher motivates her to perform.
Now in the ninth grade and taking Algebra I, Juanita does just enough to get by in class, and says that it is because math is hard for her. It started in seventh grade when it “got so hard” and she did not do her assignments. She said she got passed [emphasis added], but did not understand how she could pass the class and not do the teacher’s work. Juanita saw the math in seventh grade as a struggle. Instead of deciding to work harder than she had in the past because the work became harder, she chose not to do her work. Her behavior in class led her to distract other students and put her in the principals’ office many times over the course of the year. She said she thought she could have done better if her teacher gave her more help, or actually taught the class.

Reading #4.

*We listen for cultural contexts and social structures (i.e., her experiences within a broader context of cultural norms, values of society, moral voices, gender, class, nation, region, race/ethnicity, age, sexuality, state, work, and family).*

In this reading the girls’ mathematical voices were analyzed within the epistemological stages set forth in *Women’s Ways of Knowing* by Belenky, Clinchy, Goldberger, Tarule (1986). The five stages described how women come to know truth and knowledge. Belenky et al. (1986) describe the stages as follows:

1) *Silence* is the “absence of voice” (p. 24). There is a lack of dialogue with others and with themselves. Their language does not represent experience and unaware of the power their language has. A silent knower relies on authority for information and direction, because she does not have an opinion of her own.

2) *Received Knowledge: Listening to the Voices of Others* as the stage where women listen to other peoples’ voices, particularly those of authority for the truth. Women
are recipients, not sources, of knowledge.

3) Subjective Knowledge stage has two parts:
   a. The Inner Voice is the stage where truth is intuitive, and authority is now
      internal. These women listen to their gut feelings or intuition.
   b. The Quest for self is the stage where women reject “the claims of others…and
      begin to assert their own authority and autonomy” (p. 77).

4) Procedural Knowledge stage has two parts:
   a. The Voice of Reason develops as a result of experiencing cognitive dissonance,
      because their old ways of knowing were challenged. Women at this stage think
      before they speak. They speak with the voice of reason and in measured tones.
   b. Separate Knowing represents critical thinking. They assume that everyone-
      including themselves- may be wrong, and Connected Knowing “builds on the
      subjectivists’ conviction that the most trustworthy knowledge comes from
      personal experience rather than the pronouncements of authorities” (p. 112-3).

5) Constructed Knowledge: Integrating the Voices occurs where women come to the
    realization that knowledge is constructed from their experiences. Truth is derived from
    the context in which it was experienced. These women become passionate knowers,
    through constant examination and listening to themselves. “…Passionate knowing is
    the elaborated form connected knowing takes after women learn to use the self as an
    instrument of understanding” (p. 141).

Juanita’s mathematical voice within the epistemological stages set forth in Women’s
Ways of Knowing by Belenky, Clinchy, Goldberger, Tarule (1986), suggested that she oscillated
between being a Silent Knower and being a Received Knower. Juanita looked for an authority to
listen to, and there existed a hierarchy of authority figures to her: 1) Mother; 2) Classmates (in class) and friends (outside of class); 3) Mathematics Teacher; 4) Tutor. Becker (1995) applied the stages of knowing to mathematics learning and described the silent knower by saying “an inner voice expresses awareness that teachers think base angles are equal” and the received knower by saying, “I know that base angles are equal because my teacher says so” (p. 165).

**Reflexivity**

My social location as a biracial female of African American and Caucasian descent, who identified as black, grew up middle class, and attended an urban high school allowed for some common ground between me and the girls. I also had prior experiences as a mathematics student who struggled learning Algebra I, just like they did. However, our common ties do not end there. I later became a mathematics teacher, who taught at my old high school. My old high school later transitioned to their high school (became a new building), and I also taught in that same new building. So I had professional experience working with some of the girls’ teachers, for example, one of the language arts teachers and one of the Algebra I teachers. While this allowed for a plethora of common experiences, it also allowed the potential for bias. All of these experiences were intricately woven into the fabric of my teaching, and my journey as a student and teacher was revealed in this study in order to shed light and understanding to that of my students’ lived experiences, and how my experiences paralleled or differed from those of my students. But because of these experiences, we have an intersectionality of race, gender, school experiences, and mathematics experiences that gave me a unique perspective into each girl’s particular experience. It is also my in-depth awareness of the students, students’ knowledge, mathematics teaching, and the building culture, situations, routine, and organization without which would not have enabled me to give such a valid account. “Feminist researchers have
expanded the notion that personal experience is an asset. They make it a necessity or a source of 
legitimacy” (Reinharz, 1992, p. 263). So I disclose my personal experience, both objective and 
subjective in concert with each other, so my research does not appear fragmented or deceptive.

Limitations

Qualitative research is the research of language that describes a person’s experience (Yeh 
& Inman, 2007). This allows for the breadth and depth of discussion that may not otherwise take 
place in quantitative research. This is advantageous to the qualitative researcher because of the 
questions the researcher has and the nature of the research. While generalization may not be the 
focus in qualitative research, particular-ization could be. With the focus on the particular, rather 
than the general, specificity within a particular sample increases. The focus of this qualitative 
project was on what was particular to my sample and offers perspective, rather than prediction 
(Patton, 2002).

Each Algebra I student was required to complete the mathematics autobiography, and 
given consent forms prior to turning in the assignment. I was “unable to identify the particular 
characteristics of the individuals or groups from whom the data was collected” (Frankel & 
Wallen, 2003, p. 182). This reduced data collector bias and allowed randomness, by allowing 
the study to be open to all students.

In spite of these efforts, my sample size was small. I lost two subjects at the beginning of 
the study, and one before the last focus group interview, which further limited my sample. This 
subject mortality had the possibility to introduce bias if the two girls who were lost responded 
differently from the remaining girls (Frankel & Wallen, 2003). This threat was reduced because 
the remaining girls were similar in age, gender, ethnicity, and enrolled in the same Algebra I
course, and had the same teacher (Frankel & Wallen, 2003). The small sample size allowed me
to go into greater depth than I would if I had a large sample size.

My personal experiences as mathematics student and teacher were an asset throughout
this project, but I did not want to exert undue influence on the girls with my experiences,
especially during the sharing of my mathematics autobiography. I initially wanted to share it at
the beginning of the study as an exemplar for all of the students to write their own stories. I
thought it would be motivational for them to see my struggle with mathematics and how I
persevered. But with so many struggles prevalent in my story, it may have had the opposite
effect and resulted in a negative influence upon them instead of a positive one. To further limit
the potential for bias in this study, we discussed the girls’ mathematics autobiographies first and
then discussed my mathematics autobiography at the end of the first focus group interview. I did
not want to influence their writing and their speaking about that writing.

During both focus group interviews, I had to direct questions to specific girls. Mane
Gurl and Dink were not as vocal as Juanita and Lil Mama. I was not sure they were totally
comfortable saying what they thought in front of the other girls. It is also quite possible that my
nonverbal cues influenced their responses as well. By the time of the second focus group, it was
difficult to get all of the girls together at the same time before or after school due to illness and
conflicts within their schedules. However, Juanita and Mane Gurl had the same algebra class, so
I asked the principal first and the substitute teacher second, if they were finished with their work,
could I interview them one last time. Both indicated their agreement to this arrangement. I
interviewed Lil Mama separately, because she had a different class period, and by this time, Dink
had withdrawn from school. During this interview, I asked them to rate their effort versus their
attitude to predict their first quarter grade. None of the participants knew their quarter grade,
because their regular teacher was out ill, and incomplete grades were recorded on their report cards. Although still out on sick leave, the teacher submitted grades shortly after the quarter ended. I asked the principal for permission to access their grades for the purpose of the study, because the girls needed to know for their own information and for the purpose of this study. He granted this request. I needed to be able to ask each participant how they perceived their effort and attitude reflected in their quarter grade, and for each girl to reflect on her efforts and how it translated into her quarter grade.

To enhance the credibility of my interview data, I also had to be careful to actually listen to what they had to say without making judgments based on my prior experiences as a student and mathematics teacher. Listening and analyzing the data was an iterative process rather than a linear one. As I listened, I wrote my initial thoughts and responses in the margins of the interview. “The voice-centered relational method provided a process for acknowledging the researcher’s perceptions and reactions to the data” (Paliadelis & Cruickshank, 2008, p. 1447). Although, I listened to each interview with each girl at least four times, I found myself listening more than four times, and pondering the different interviews of each girl. Because of the focus group interviews, I pulled out each girl’s response and separated them from the group to hear what she said. This assisted with me with listening for each girl’s voice, and also with checking my perspectives. I also brought my analysis of Juanita and Lil Mama to the doctoral research group to initiate discussion about my analysis and solicit their thoughts about the interpretation of the analysis. Direct quotes from the interviews were included to ensure credibility of the analysis wherever possible.
Chapter 4: Findings

“Not everything that can be counted counts, and not everything that counts can be counted.”

Albert Einstein

When I started this research, my focus was to find out what attitudes and beliefs do African American students have about themselves as learners of mathematics. I wanted to share my experience in hopes of motivating and transforming their mathematics identities. I wanted them to know, “If I can do it, you can too.” By the end of my data analysis, I saw common themes amongst our experiences, but more importantly I saw aspects of my experiences in every one of these girls. I do not know what impact I had on them, but I do know what an impact they had on me. I saw them as elements of the “teenage girl” me, while I am the “adult female” me. While the teenage girl struggled with mathematics, and especially algebra, looking to the future, the adult female overcame that struggle and received a mathematics degree. So the message from the teenage girl is, “Don’t count me out of a mathematics-based career, or rigorous mathematics classes because my grades may be average. I am capable despite what you see in me right now.”

More recent studies focused on African American student mathematics success (Borum, 2010; McGee, 2009; McGee & Martin, 2011) and a whole body of research exists about student failure. However, I did not restrict this study to the successful mathematics students or the mathematics failures. I hoped for participants with a plethora of both success and failure experiences that would give me more insight into how both types of experiences helped the participants’ negotiate their mathematics beliefs. What I discovered was that the participants had experiences similar to my own. I wanted to know what motivated them to do their homework, what beliefs they held about themselves as mathematics learners, how their parents supported them, how much effort they put into learning mathematics, and what experiences impacted their
attitude toward mathematics. All of these ideas were primarily motivated and influenced by my own mathematics experiences both as a high school student and as a high school teacher.

There are four African American female students profiled in this chapter. All four were ninth grade students taking Algebra I for the first time. There were similar and different themes across the different cases. Students discussed a variety of experiences that motivated them, how their families supported them, goal setting, and putting forth effort to achieve their class grade.

One of the limitations of the data is that I did not explicitly discuss issues of race, class, or gender. However, if the participants initiated the discussion on race, class or gender issues, then I was willing to explore it. Another limitation is that there were only female participants. Since the study was open to male participants, I did not initially design this to be a study specifically about girls’ attitudes, beliefs and experiences in mathematics. Finally, the absence of observations did not allow for triangulation for the participants’ self-ratings about their effort.

This chapter is organized into four narratives, one for each participant. Each narrative begins with a brief profile of the girls who were interviewed. The narratives are organized by the five themes that emerged from the data analysis. Those themes are:

- Perceptions of mathematics experiences and teachers
- Parental support
- Beliefs about the importance of mathematics
- Personal goals and motivation
- Beliefs about mathematical ability and effort

and how these align with their self-perceptions and their first quarter Algebra I grade.

**Juanita: “I Don’t Like Math”**

Juanita is a ninth grade student who lives with her parents and younger siblings.
Of the two parents, her mother is the most influential when it comes to mathematics help and advice. Her mother is an accountant and Juanita describes her as a math genius. Juanita said she likes math less than her friends, because it is hard [emphasis added]. Nevertheless, she chose her friends because they can help her with her math. When I listened to her interview, I noticed great variations in her tone of voice, and her self-confidence showed through her voice. When she was very confident in her responses, her voice was loud and full of emotion. When she was unsure of herself, she used “I don’t know,” or she responded softly.

**Perceptions of mathematics experiences and teachers.**

Her relationship with her sixth grade mathematics teacher, Miss J., began in the fifth grade. She said her class used to go to Miss J. when their mathematics teacher was absent, and she did not like Miss J. initially because she was mean. However that initial negative experience reversed itself when Juanita engaged in some after school activities with Miss J., and she got to see another side of her. Juanita gets excited and her voice becomes louder as she talks about how Miss J was a “great teacher” because “she taught me how to do math, and fractions and stuff and I liked her and I thought she was the best math teacher ever!” Her voice trails off and gradually softens as she says, “But then she didn’t teach at our school anymore.” She said Miss J. always encouraged her to do well in math. Although Juanita said her teacher liking her does not affect her performance, it is clear that the reverse, Juanita liking her teacher, motivated her to perform.

Now in the ninth grade and taking Algebra I, Juanita does just enough to get by in class, and says that it is because math is hard for her. She said it started in seventh grade when it “got so hard” and she did not do her assignments. She said she got passed [emphasis added], but did not understand how she could pass the class and without doing the work, and struggled in
seventh grade mathematics. It was the first time she experienced a serious challenge. The task difficulty increased and instead of deciding to work harder than she had in the past because the work became harder, she chose not to do her work. She said her behavior in class led her to distract other students and it put her in the principal’s office many times over the course of the year. Juanita said she thought she could have done better if her teacher gave her more help, or actually taught the class. TR: So it started in 7th grade because that’s when math got really hard for you?

Juanita: Uh huh.

TR: So instead of deciding to work harder because it was hard, you decided not to do the work?

Juanita: (silence, shook her head to say yes )

TR: So how did that make you feel when you decided not to do the work?

Juanita: Like while everybody else was doing their work I’d just sit there and distract other kids, and that’s not cool because they’re tryin’ to do their work but I’m not doin’ mine.

TR: So…what do you think your teacher could have done perhaps to get you to do your work? Or is there anything she could have done?

Juanita: I don’t know, because I think that I wouldn’t have did it anyway.

TR: So you think it comes more from within you? In other words, that you have to have the internal drive and motivation to want to do it and to get the work done and that there’s not too much of anything your teacher could have done to make you want to do it?

Juanita: (silence, shook her head to say yes)

TR: Do you think she could have worked with you more perhaps or…
Juanita: Yes! (Really loud) Because she just…she wasn’t a good teacher ‘cause she just said…like she gave us the work and she just let us do it. (Loud) She didn’t teach…I don’t remember her teachin’…I don’t know. (Loud at first and then gradually softer) Maybe I was so bad and I was always in the principal’s office. I don’t know…I don’t even think she taught. (Very soft) But my friends said that they did their homework, I never did my homework. (Soft)

Her idea of learning is that her mathematics teacher will pass on knowledge to her. While the teacher is the source of knowledge; the student is the receiver of this knowledge (Belenky, Clinchy, Goldberger, & Tarule, 1986). When the teacher requires originality, the result is confusion and the student perceives that her teacher is not correctly teaching her (p. 40) rather than thinking, “What can I improve my efforts to make sure I learn this?”

**Parental Support.**

Juanita has a great deal of parental support. Her mother is an accountant who is able to help her with her algebra homework, and her father also helps occasionally. Juanita cannot understand why she has so much difficulty with math when her mother is so good at it. Her mother gets upset with her about her grades sometimes. She describes her mother as “a genius at it” and wondered, “Why I don’t like math and my mother’s an accountant?” Her father helped her too, but her mother understands more than he does. Her mother explained problems to her, and “she breaks it down and she teaches me on my level how to do it.” Her mother also provided a tutor for her, and Juanita met with her tutor on Tuesdays and Thursdays, although she did not really like to go to tutoring. When she lost her focus, her mother redirected her to get her back on task. “My mama she makes sure I sit down and there and listen like when I be playin’ with my nails and stuff she be like, “Juanita!” and I be like “OK”. In spite of her dislike of
tutoring, she admitted that she is glad her mother got her a tutor, and the tutor helped her to understand algebra better.

Cause she don’t just say “Here’s the answers.” She makes…she do one…she do a problem that we don’t have to do, and then I do a problem that we have to do, and then she tells me “OK, you missed a step” or “That’s not right, do it all over.” And she makes me write it out instead of just puttin’ the answer.

Juanita said this increased understanding has resulted in an increase in her self-confidence in her ability to do algebra.

**Beliefs about the Importance of Mathematics.**

Juanita did not see the relevance of mathematics in the real world, because she did not see any adults using it. She said,

Like I don’t see older people, like adults usin’ this stuff that we do in class like…I see ‘um do like addition and multiplication, dividin’ and subtractin’ fractions and um that’s it but I don’t see ‘em doin’ like algebra and stuff like that to succeed in life.

In spite of this, she did see math as being important. Juanita wanted to be either a nurse or a doctor and she acknowledged that she needed to know math.

TR: Um, do you need to take a lot of math to do well in either of those careers. I mean have you researched it?

Juanita: Yes. Because you can’t…if you don’t know what’s ¼ and all that stuff equals to…whatever it is um…then, how would you know? You could overdose…

TR: You know you’re right. My mother is an RN. She works at Miami Valley in the ER and she has to make IV’s. So she has to mix liquid medication you know, and saline solution in the IV bag and it is based on a person’s weight. So you’re right about that…
However, in the next interview she contradicted herself.

TR: OK. Think of yourself after high school. How do you see yourself using math?
Juanita: I see myself usin’ math ‘cause I wanna be a OB/GYN and um and I guess you use math to give…know how many centimeters and stuff for part of delivering the babies or some kind of stuff like that. But yeah, I don’t see myself using math and numbers.

**Personal Goals and Motivation.**

Juanita had both short-term and long-term goals. The most immediate short-term goals were classroom goals. She wanted to get A’s and B’s in her math class, but the absolute minimum is a C. She did not want to fail any classes, because that would not allow her to achieve another long-term goal which was to graduate on time, and go to school for a half-day during her senior year. Her mother was influential in helping her to set these goals, because her mother expected her to make good grades. She was willing to provide external support by helping Juanita herself, and by paying for a tutor. But her parents also provided external motivation to help Juanita set her classroom goals.

Juanita: …My parents, they…they really don’t bribe me, but they bribe me. But like if they just say…like on Christmas I’m supposed to go to Disney World if I get my grades together so if my grades are not together then I’m not going to Disney World. So right there that should tell me, “You need to do your work and stuff so that you can go to Disney World but…

TR: So what do they mean by “get your grades together”? I mean, do they give you a definite grade to work toward or…
Juanita: Yeah, like my mom says I shouldn’t bring no D’s or F’s in her house. She say she not happy with C’s but she fine with ‘em. So I’m only allowed to bring A’s, B’s and C’s in her house. If I bring one D in there it’s OK, but not like three D’s.

TR: How do you think your effort affects your grade?

Juanita: It affects my grade a lot…’cause if I ain’t put in the effort, then I’m a have bad grades.

Since her long-term career goal was to become a nurse, she said her mother tried to motivate her by reminding her that, “If you want to become a nurse, nurses doesn’t get these kind of grades and they won’t accept you to any place with those kind of grades ‘cause they look back on that stuff.”

I gave her the following two choices of mathematics teacher homework policies to see which one would motivate her to complete her homework:

TR: “Teacher A says that she’s going to grade homework every day with letter, A, B, C, D, F or percentage grades 100, 90, 80 and so on. She says that homework counts as 30% of the quarter grade. Teacher B says that students are to spend no more than thirty minutes per night on homework, that homework will be graded as satisfactory or unsatisfactory instead of A, B, C, D, F, and that students can redo and correct their work and that your homework counts for 10% of your quarter grade” (Ames, 1990). So which homework policy, Teacher A or Teacher B would motivate or influence you to do your homework?

Juanita: Teacher A.

TR: Why teacher A?
Juanita: Because it’s worth 30% of your grade. OK, so if you do your homework then that’ll be 30% and you’ll either receive a A, B, C, D or F. And I like that because it tells me where I stand in my homework, or if I know what she’s teachin’ me. If I receive a C, I know I need to work on it…or a D or a F. F…a F…you didn’t really need to do it…but you still get a percentage.

Ames (1990) posited that Teacher B’s policy will elicit more motivation to complete homework from students who avoid challenging tasks than Teacher A, because it is less stringent. Juanita’s motivation for completing homework under Teacher A’s policy was the higher percentage homework placed on the overall class grade. Her motivation is extrinsic, rather than intrinsic, and “students’ reasons for learning have important consequences for how they approach and engage in learning” (Ames, 1990, p. 411). Further, her idea of getting an ‘F’ means that she did not need to complete the assignment in the first place. She does not take into account that there is a difference between a zero percent ‘F’ and a fifty percent ‘F’. According to Belenky, Clinchy, Goldberger, Tarule (1986), with received knowers there are no shades of gray, it is all or nothing. “If a thing is partly wrong, it is worthless” (p. 41).

Beliefs about Mathematical Ability and Effort.

Juanita’s confidence in her math ability was dependent on task difficulty. If the task was easy, she perceived that she has more math ability. If the task was hard, she perceived less math ability.

TR: OK. How much math ability do you think that you possess? I want you to rate it from 1 to 5 with 1 being not very much math ability and 5 being a great deal of math ability. So where do you think you fall between 1 not being very much and 5 being a great deal of math ability?
Juanita: I’d say a 3.

TR: Why 3?

Juanita: Because sometimes I give my all, sometimes I don’t. Sometimes like if I do one problem and it doesn’t…OK…if I look at the problem and then it don’t look like I know how to do it then I’ll just give up. Other times I’ll look at it and I’ll be like “Oh I know how to do it” and then when I do it I don’t know what I’m doin’ so I give myself a 3.

When I asked her if she perceived her math success was due to ability or hard work, she said she did not put forth the effort she knows she is capable of and did not make the determination between the two choices. Because of this, she did not seem to have a frame of reference or experience to base this determination, because she could not recall a time where she put forth extra effort.

TR: OK. If you had to choose between ability and hard work to what would you attribute your success in math class, ability or hard work?

Juanita: I don’t know?

TR: Why not?

Juanita: Because I don’t think that I try…I don’t think that I do as well as I know that I can do. I, I just do it to get by, and pass. But I’m gonna try to work on that. I’m gonna give it my all.

Her description of “give it my all” refers to the duration of time spent working on math. For Juanita, putting forth more effort in studying for math equated to spending “about an hour or two” or “at least thirty minutes a problem.” The quality of engaged time, not the quantity, is most important (Ames, 1990). Belenky, et al (1986) described the received knower as one who listens to other peoples’ voices, particularly those of authority for the truth. Becker (1995)
described the received knower using the following math statement as an idea of how received knowers think mathematically: “I know that base angles are equal because my teacher says so” (p. 165). Being a received knower, she sought authorities for help during her engaged time. There exists a hierarchy of authority figures to her: (a) mother; (b) classmates and friends; (c) mathematics teacher; and, (d) tutor. Juanita said she wanted to improve her effort (seeking help) by asking her teachers more and to stop asking her friends and students in class. Juanita admits that her tutor helps her to understand algebra and says it helps increase her self-confidence with the subject, but instead of her tutor having a higher rank on her authority figure list, her tutor ranks last on the list.

Juanita: I don’t like tutoring!

TR: Even when you need help, you don’t like it?

Juanita: No! It’s boring to me but…I have a tutor myself and she boring. But she makes me understand it.

When it comes to effort, Juanita admits that she has room for improvement. After having looked at the effort rubric, she said she thought that students who made A’s, exhibited all five behaviors at the “five” level most of the time. She also thought she was capable of exhibiting these effort behaviors at the five level most of the time. However, she rated herself as a five out of ten in self-efficacy, her own belief that she is capable of performing in a certain manner to attain certain goals. According to Zimmerman, Bandura, and Martinez-Pons (1992), “Self-efficacy influenced not only students’ setting of academic goals for themselves, but also their achievement of these goals.” It is unlikely she would work at the “five” level of the effort rubric given her lower self-efficacy rating.
After having placed “herself” on the effort and attitude versus quarter grade graph, she concluded effort and attitude have an effect on the quarter grade.

TR: …Do you think that if you have a positive attitude and better effort that it translates into a higher grade?

Juanita: Uh huh.

She wanted to improve her effort by paying attention more in class (class participation), and to stop looking off of other students’ papers (seeking help). She acknowledged that she can be easily distracted in class when other classmates are off task, or when the work becomes too difficult. The effort rubric (The Miami Valley School, 2006) defined effort as five behaviors: course preparation, class participation, behavior, making up missed work, and seeking help. Her interviews contradicted her self-ratings on the effort rubric in four of the five categories. Her behavior in the course preparation is aligned with the “Avoidant” category and her class participation, seeking help and making up missed work align to the “Average” category. Her general behavior is the only self-rating that is not contradicted and aligns with the “Good” category.

TR: …so what you’re telling me is that your behaviors, those five behaviors and your grade match up with just being a C and average?

Juanita: Uh huh.

As it turned out, her first quarter Algebra I grade was a 74%, ‘C.’ It was consistent with the effort behaviors her previous interviews aligned to, but not how she rated herself with the effort rubric in the final interview. There was a definite disconnect between how she perceived her own efforts and what she described in her previous interviews. Additionally, she perceived her
effort and attitude v. quarter grade to be average; therefore, she placed her point “u” in the center of the graph. She said, “I have a ‘C’ and all my stuff is in between.”

Juanita had a negative experience in seventh grade that affected her self-confidence, and she continued to struggle in ninth grade in Algebra I. She accurately predicted her first quarter grade was a “C” because she did not put forth consistent effort. However, she identified appropriate effort behavior that would improve her grade, but her self-efficacy rating did not suggest she would maintain that effort behavior. She did have supportive parents, who provided external support and motivation. She also had short-term class grade goals for Algebra I and long-term college and career goals. Although she was surrounded by people who could help her, such as her mother, friends and a tutor, she did not like math. Her dislike of math stemmed from the difficulty she experienced with the content, her negative experiences with her teacher, and her perception that Algebra is hard. These factors parallel Lil Mama’s experiences and attitudes as well.

Lil Mama: “My Teacher Didn’t Teach Me Nothin’”

Lil Mama lived with her parents and older brothers. She said her friends are crazy about math, but she isn’t crazy about it, because math just confused her. She admitted she did not ask her friends for help much, or her classmates, but prefers to ask her brothers because they were all in college and could help her.

Perceptions of mathematics experiences and teachers.

Her perception of and connection to the math content has been shaped and developed by her experience with her teachers. While she says it is not important for her teacher to like her to perform mathematically, she does need validation from her teacher. She described experiences with her teachers as early as the fourth grade and explained that the fourth grade teacher is the
only teacher who really taught her anything between fourth grade and eighth grade. This was the only good math teacher she has experienced so far.

And then my only good teacher I had was my 4th grade teacher where I can actually say I learned math...she helped me with anything I had, you know, trouble with; she was always there by my side. We was testin’ for like the proficiency test, but like we had like practice tests and if I didn’t get something I would go to her and help her, I mean ask her, and she would help me. Like if there was anything I needed help with, or if I needed to stay after school and get help if I didn’t understand something, she would stop what she was doing and even if she was at lunch or gettin’ ready to go home, she would stop and help me.

She also described a humiliating experience with her sixth grade teacher with whom she described as her worst teacher. She was not validated by this teacher like she was with her fourth grade teacher and this affected her learning. Lil Mama described her as her worst teacher because of how she was treated in the class, and called the teacher a racist. When asked why she thought her teacher was racist she said, “…me and my friend would compare our work and we’d have the same answers and because she was white she would get a A and because I was black I would get a F.” The scenario of students comparing work she described was fairly common. Students constantly compared themselves and their work in my mathematics classes, so I felt the need to probe further and asked what else made her think her teacher was racist and she said,

It was one day we was sittin’ in class and I asked her a question, and I don’t remember what question it was, but I know it was a math question and she just got real upset and called me black and said the only thing I could do is work at McDonald’s and ask [sic]

“Do you want fries with that?
When I asked her how she felt about her teacher’s comment she said,

It made me feel horrible, but I mean, ‘cause I was like dang, I just asked you a question
and I didn’t expect the response that you gave me, and then it kind of made me mad.

‘Cause I was like “What are you doin’ here in my school if you racist like this?” Then it
made me think about all my past grades and they were all probably all A’s like, made me
feel real bad, ‘cause like, dang like, I didn’t think…like I really thought I didn’t know
math like that, and here it is, you racist and I’m trying to learn and you never helpin’ me,
made me kind of think about the kids back in the day when black and white was
separated, like this is probably how they felt when they had to get teached.

She said she told her mother and her mother talked to the teacher, but it ended up with the
teacher “hating her mom” and the teacher “hating her.” She described her math teacher as
having a lot of power. So much so, “the principal and other teachers were afraid of her.”
Because of this, the teacher did not allow her to go out for recess, or participate in graduation and
no one intervened on her behalf.

Lil Mama had such degrading mathematical experiences with her teachers that she could
not develop her voice in school, because her experiences limited her self-confidence (Belenky,
Clinchy, Goldberger, Tarule, 1986).

TR: OK. How much confidence do you have in your ability to do math?

LM: I…I mean there’s some confidence but it’s not a lot probably from other things
that happened in the past and every time I get my hopes and my expectations
way up there, I get knocked back down to reality, to where I really am at.

In the sixth grade, her attitude about mathematics and her perception of herself as a learner of
mathematics was shaped and developed by her experience with her teacher through the
constraint of race. This is where she began to seriously doubt herself and her abilities. She perceived her teacher as limiting access to her, the authority, for help with learning because of her race.

… it was just horrible for me in math because she would teach the other kids stuff, but when it came to me asking for help, or needing something, or trying to help her or learn something you know I couldn’t do it because I was black.

As a result, she did not receive the validation she needs and she was humiliated by her teacher. Her negative experience in sixth grade eroded her self-confidence and was the beginning of her negative self-perception and belief that “I’m not very good in math.”

**Parental Support.**

Lil Mama’s parents were not supportive when it comes to mathematics. Her parents did not talk to her about her grades. When they saw interim or report card grades, they did not offer suggestions to improve her efforts, such as staying after school for extra help. She said they do not encourage her to do well, and that it was her responsibility to motivate herself. She said,” I have to do it myself. I have to expect myself to do better than what I did last year.”

Although her mother did go to the school to follow up on Lil Mama’s complaints and concerns about her sixth grade math teacher, it took several attempts of Lil Mama talking to her mother before her mother went to the school. Her mother did not believe the teacher was racist, but instead believed Lil Mama was making excuses about her low grades and was not doing her work. She said she kept telling her parents and “finally I guess I got on my mom’s nerves,” before her mother went to the school.

**Beliefs about the Importance of Mathematics.**
Lil Mama saw herself using math a lot after high school, and believed it would help her to run her business. She said, “I see myself doing a lot of math.” She had not confirmed the type of business, but suggested a cosmetology school. Math is important to her:

“Cause I’m gonna need math in my whole life. I just don’t wanna be one o’ them types of female…or person that’s gone through high school and can’t graduate because they couldn’t pass the math part of the OGT.”

**Personal Goals and Motivation.**

Although Lil Mama said she had not picked a career yet, she said her long-term goal was to own a business. Her parents did not encourage her to set goals, or set minimum class grade goal expectations. Her Algebra I grade goal, which was “a ‘D’, maybe a low ‘C’” for first quarter. She said that either one of those grades was good for her, because she knew she was trying her best. Lil Mama has both low self-confidence and low self-efficacy. Self-efficacy was described in the following way:

TR: Self-efficacy is the belief that you are capable of performing in a certain manner to attain certain goals. It is the belief that you have to be capable of a course of action required to manage a situation. What do you think your sense of self-efficacy is when it comes to math? And remember this is different from whether you think you’re smart or not when it comes to math. It’s the belief that you have a goal, and maybe the goal is to get a B, maybe the goal is to get an A…what have you, but you can attain that goal. So what do you think your level of self-efficacy would be? Would it be high like if we had to rate it on a scale of 1 – 10? Would it be a 10 or closer to 1, which would be the low?

OK. What’s your sense of self-efficacy? High, medium, low?

LM: Mine would be a medium.
TR: What number?

LM: Maybe, like 5 ½.

TR: OK. Why?

LM: Um…’cause…like I put myself…like she [Juanita] said to do like…high but I always keep myself on reality so I’m not sayin’ that I can’t reach the goal but that I keep myself in reality and not become this fantasy person.

TR: So, do you reach your goal most often, or not?

LM: It’s iffy…I mean there are times I have reached my goal and there are times that I’ve reached just a little bit below my goal.

I presented Lil Mama with the same two homework policies and she replied that she saw positive aspects of both Teacher A and Teacher B homework policies. But choosing a policy that motivated her to do her homework did not rest solely on her ability to get her work done. She also considered her brothers’, the authority figures, ability to help her, and therefore improve her grade.

And A, it counts 30% of your grade which means I can go home and get help from my brothers who help me and they can teach me how it’s done, and I can be like “OK, that’s how you do it” and I can get a good grade on my homework for a couple of days and that counts 30% of my grade and then, hey, my grade gets bumped up.

**Beliefs about Mathematical Ability and Effort.**

Lil Mama was not confident in her own ability to complete her homework, and placed a great emphasis on her teacher or her brothers being able to help her with algebra. She relied heavily on her authorities and when she perceived that they are not helping her to the degree she
needs, then her perception becomes “My teacher didn’t teach me nothin,’” instead of, “What can I do to make sure I learn this material?” She defers her responsibility for learning to her teachers. When I asked her to rate her mathematics ability she said,

I’d say it’s about a 2 ½. That’s not very good because like I said my last teacher that I actually learned from and who taught me was my 4th grade teacher. And I’m all the way in 9th grade.

In discussing effort, she thought her teachers did not acknowledge the effort that is put into “trying hard” in class. She wanted her teacher to realize this and give her credit for the effort she put into the class. She also did not think that effort affected her grade much, and defers much of this responsibility to the teacher in terms of what grade the teacher will give her, instead of what grade she will earn. Also, received knowers do not associate increased effort with higher grades.

I wouldn’t say it affects it a lot, because a lot of teachers don’t go on the effort you put – it’s if you got the answer right or wrong – even though they should look and see…you know… “I see well she’s workin’ hard. Let me give her that extra point because she did try.” They don’t see past that, so I don’t know if it affects my grade at all.

She saw effort as just “tryin hard” and giving it “her all.” However, she knew she does not put forth much effort and said,

I need to put more effort into what I do…just more of it…’cause like I said before I don’t like…”’cause I know I’m not very good in math so I don’t see why I have to put the effort into it if I don’t know it. And I need to start putting my effort all into it.

Giving it “her all” equates to spending “thirty minutes per problem” or “however long it takes ‘til I can get there and sit there and say when I come back to class, I actually did my best on it
and I understood it.” Like Juanita, putting forth more effort to Lil Mama to study math referred to spending more time (quantity of engagement), but not how the time was spent (quality of engagement). For me, it worked in the reverse: the greater the amount of effort resulted in an increase in knowledge, which resulted in an increase in my achievement.

Lil Mama’s mathematical voice within the epistemological stages set forth in *Women’s Ways of Knowing* by Belenky, Clinchy, Goldberger, Tarule (1986), suggest that she is a *Received Knower*. *Women’s Ways of Knowing* (1986) described a received knower as one who relied on authority for direction and as one who listens to other peoples’ voices, particularly those of authority for the truth. Lil Mama has a hierarchy of authority figures: (a) teacher; (b) brothers because they are in college; and, (c) calculator. She does not like asking for help, because she wants to see how much she knows first. She recognizes that she is not a strong student in Algebra, and she will only ask people she perceives as an authority for help with her Algebra. She does not think of her classmates as authorities.

**TR:** What about getting some extra help?

**LM:** (long pause) hmm…I would have to see about getting extra help because…

**TR:** Well I know you said you didn’t like depending on anybody or…or asking people for help, but that’s a part of this behavior right here…seeking help.

**LM:** Uh huh.

**TR:** And it says for the five or exemplary level “appropriately proactive and engaged with suggestions”. So that’s a five. Four says “responds effectively to written and spoken suggestions”, and three says “requires reminding or inconsistently responds to suggestions”. Two says “after repeated suggestions still does not implement needed changes”, and number one says “avoids seeking needed help from those willing to
assist”. So if you don’t like seeking help and you don’t want to do that, are you really at a four?

LM: I mean…that’s what I was thinking of because I don’t like to get help so I was like, I probably could be at a one, but if somebody just comes up and tells me how to do it…I mean I’ll respond and I’ll listen to ‘em. But like as far as me just goin’ over and to ask for somebody to help, I don’t like doin’ that ‘cause I wanna see if I could do it first. And then if I can’t do it, then I’ll go ask for help, but other than that I won’t try to ask for help…

She admitted she she would ask for help after thirty minutes of trying to find the answer herself. She defined effort as the length of time spent doing problems and the number of correct homework answers. “They think that grades should take the form of hourly wages: The longer you work, the higher the grade” (Belenky, Clinchy, Goldberger, Tarule, 1986). She sees herself in the “Good” category of each of these behaviors with the exception of class participation which she rates herself as “Exemplary.” Her interview contradicts her self-ratings in at least four of the five categories. She does not prepare for class by keeping up with her assignments, she does not actively participate in class, she does not respond effectively to suggestions, and she does not initiate appropriate contact with teachers at the “Good” level. What she describes in her interview is behavior that is consistent with being “Avoidant” in course preparation; “Avoidant” in class participation; “Inadequate” in seeking help; and “Average” in making up missed work. Three out of five behaviors on the effort rubric are less than “Average.” Her first quarter Algebra I grade was a 63%, ‘D,’ which is more consistent with the effort behaviors she aligns herself with, as her interview suggests.

Lil Mama had a negative experience with her sixth grade mathematics teacher. This was
a racially motivated experience that still affects her self-confidence and her perception of her ability as freshman in Algebra I. Her parents do not encourage and motivate her, and she has to do this for herself. She had low short-term class grade goals, and no clearly defined long-term career goals. Her perception of her own effort was disconnected from her prediction of her first quarter Algebra I grade. She shifted responsibility to her teachers when her perception of her effort did not result in the grade she expected, unlike Mane Gurl who took responsibility for her learning and grades.

**Mane Gurl: “Maybe They Just Don’t Have Goals Set for Themselves”**

Mane Gurl is in the ninth grade and lives with her mother. She said she likes math more than her friends. Her friend Bianca hates math, and she encouraged her to try harder. At first, it seemed difficult to reflect on what she said, because she did not actually say much during the focus group interviews. In fact, I had to prompt her to speak. Unless I asked her specifically, she agreed with the other three participants’ responses or she said nothing at all. I looked for the ‘quantity’ in her responses, but it simply did not exist. I had to shift to the ‘quality’ of her responses. She was very quiet, not emotionally expressive about her experiences as were the other three participants, but when she did say something it was meaningful. I thought maybe the reason for her lack of detail was because she did not have negative experiences or strong feelings about her experiences to share as the other girls did.

**Perceptions of Mathematics Experiences and Teachers.**

She did not have a high need to be validated by her teacher. In fact, she talked about one teacher and described a brief, but positive experience with him in the sixth grade. She did not remember any specific words of encouragement because she “really couldn’t talk to him like that…” If she perceived that her teacher did not like her, she said it did not affect whether or not
she was willing to ask the teacher for help. She was very confident in her ability to complete her work, and placed a greater emphasis on her teacher and tutor to help her with Algebra I, than her friends. She did not say her teachers are “not good teachers” or say “they didn’t teach me nothin’” when she had difficulty. She just kept trying until she understood it. In her mathematics autobiography she wrote,

With prior mathematics teachers they would teach a lot. When they gave directions on how to do a problem I would understand it at first, but then forget it the next day. I would let my math teacher know what I was struggling with, and they would help me understand the best way they could. Sooner or later I would get it.

**Parental Support.**

Her mother was very supportive. She inquired about her homework assignments, and encouraged her to “stay with the books” and to frequent tutoring sessions so she could improve her grades. She gave Mane Gurl praise when she saw good grades and said, “You doin’ a good job,” or if she was not doing well her mother told her, “If you need help, just tell me.” My mom she tells me, “Stay with the books da-da-da. Um…she says she wants me to go to tutoring so I can be better.”

**Beliefs about the Importance of Mathematics.**

She believed math was important, but she had not found the relevance math had to her career.

TR: OK. Um, think of yourself after high school. How do you see yourself using math?

MG: Um, I think I might be usin’ it a lot ‘cause like I wanna like be a homicide detective and a crime investigator or whatever.
When I asked her if she researched her career and the amount of math or kind of math needed for her career, she responded that she did not find out much. I asked her if she watched the television show, *Numbers*, on Friday nights. She said she did not watch it, but watched other shows such as *CSI Miami* and *Criminal Minds*. I informed her that the show is about two brothers, one a mathematician, and the other an FBI agent. I told her she should “…check that show out ‘cause they use a lot of math in that show. “

**Personal Goals and Motivation.**

Mane Gurl set her long-term career goal on being a homicide detective, and her mother supported her in that decision. Her mother reinforced the effort Mane Gurl puts into school by telling her, “It’s like a lot to be in criminal justice. To be in criminal justice you have to do a lot.” Her short-term Algebra I grade goal was a ‘B’ for first quarter, and she said this was a good grade for her. She spoke first and confidently when she rated herself as a nine out of ten in self-efficacy. In fact she described her proudest math moment in her mathematics autobiography in which she demonstrated high self-efficacy. In it she wrote:

My proudest math moment was about four months ago. I was in tutoring and I needed help with a subject on math. I asked my tutoring teacher if she could help me but she told me the truth and said ‘I don’t want to lie to you, I don’t know how to do it myself.’” She suggested I go ask someone else who knew about math. But I spotted a book that could help me with my problem. I ended up taking that book home and studying it. I came back to tutoring the next day and I found out how to do the subject I needed help on. I was so happy and glad that for a change I helped myself.

I presented her with two teachers’ homework policies to see which one would motivate her to complete her homework and she initially chose Teacher A, and then changed her response
to Teacher B. She also said that being able to re-do the homework and it not being graded with letter grades, versus satisfactory or unsatisfactory, grades were not a factor in choosing Teacher B.

MG: Mmm, ‘cause most of the work you really do is in class and then homework for at home is like…I mostly do my work um…at school than at home…and then at home if I like get homework, I just try to do it at home.

Because the work assigned was assigned in class, and she got class time to complete it, she did not see the assignment as “homework,” but more like “classwork.” The motivating factor for her was that the “homework” was only worth ten percent of the overall grade, since she did not have much “homework” in the first place.

TR: OK. Do you do your math homework regularly?

MG: Um….sometimes.

TR: Why do you only do it sometimes?

MG: ‘Cause…I don’t really have homework. I do like my homework at school…I don’t really have homework.

TR: But if you had homework though…

MG: Yeah.

TR: Do you do it on a regular basis.

MG: (silent, shook her head to say yes)

TR: You do?

MG: (silent, shook her head to say yes)

TR: OK. And why do you do your homework?

MG: So I can get more points and better grades and like that.
Beliefs about Mathematical Ability and Effort.

Mane Gurl spoke first again when she said she has “a lot” of self-confidence and believes that she works hard to achieve mathematically; however, she only sees herself as average in her math ability.

TR: How much math ability do you think that you possess? I want you to rate it from 1 to 5 with 1 being not very much math ability and 5 being a great deal of math ability. Where do you think you fall?

MG: I’d say a 3.

TR: Why 3?

MG: ‘Cause like I don’t…I try to do more…I try to get good grades…um, I do…I try to study when I get home and try to get like…what problems I didn’t get right I try to do ‘em over again and try to see if I can get ‘em right again and …like that.

TR: OK. So if you had to choose between ability and hard work to what would you attribute your success in math class?

MG: Could you repeat that?

TR: If you had to choose between ability and hard work to what would you attribute your success in math class?

MG: Hard work.

Hard work does include the amount of time she spends on a problem. She says she spends about thirty minutes per problem.

Her mathematical voice within the epistemological stages set forth in Women’s Ways of Knowing by Belenky, Clinchy, Goldberger, Tarule (1986), suggest that she is Received Knower. Belenky, et al. (1995) describes the received knower as one who listens to other peoples’ voices,
particularly those of authority for the truth. Her hierarchy of authorities to listen to are: (a) teacher; (b) tutor and (c) mother. Unlike Lil Mama, she has no problem asking for help. Unlike both Lil Mama and Juanita she has no problem with confidence or self-efficacy. She believes she can do it, and says, “Sooner or later I would get it.”

She rated herself as “Avoidant” in Course Preparation, “Good” in Class Participation, “Exemplary” in Behavior, “Average” in Seeking Help, and “Good” in Making Up Missed Work using the effort rubric. Her ratings were “Average” (requires reminding, or inconsistently responds to suggestions) and “Good” (initiates appropriate contact with teachers, completes work in timely fashion), respectively. However, these ratings combined give her an 85% effort grade, but her first quarter average was a 71%. These ratings do not align to the Algebra I grade that she received. She wanted to improve her grade and thought that it would improve, if she improved her concentration. She admitted she needed more rest. She said she did not get enough sleep, because she goes to bed at eleven o’clock at night. After reading the effort rubric, she thinks that her overall grade of a “C” would improve to at least a ‘B’ if all five of her behaviors were at the “Good” level.

Mane Gurl mentioned a positive experience with her sixth grade mathematics teacher. She said he encouraged her by telling her, “You [sic] doin a good job.” Unlike Juanita and Lil Mama, she did not mention negative experiences that affected her self-confidence or her perception of her mathematics ability. Her mother supported her and encouraged her to do well and to get a tutor, in addition to supporting Mane Gurls’ short-term class grade goals and long-term career goals. Mane Gurl took responsibility for her learning and set goals for herself and worked toward meeting those goals. She and Dink were very confident and had high self-efficacy perceptions in mathematics.
Dink: “I Love Math”

Dink clearly took responsibility and ownership for her learning. Her entire mathematics autobiography expressed a voice of mathematical resilience and mathematical connection. She communicated this voice of resilience through her positive attitude toward learning math and her persistent efforts to learn mathematics despite her negative experience with her mathematics teacher. Her voice of connection was expressed through her feelings about math and working with her friend to understand and work through math problems. This direct quote is an excerpt from her mathematics autobiography.

My Math [sic] feelings would have to be great. I say this because I never thought I could do so good in Math. I’m just glad I’m really getting an “A” in my math class. I would have never thought I would be at the top of the class. I want to be able to pass my math class with an a+ [sic]. That would make me so happy. I would have to step My [sic] game up a little bit. I love doing math, and will always love doing It [sic]. I will never stop doing math.

Perceptions of Mathematics Experiences and Teachers.

Dink described her experiences with previous mathematics teachers as encouraging. She, like Juanita and Lil Mama, had a negative experience with one of her math teachers. Although she had fun in his class, and loved doing the math, she expressed a voice of injustice because he did not grade her work fairly.

…he would fail me when me and my friend gets [sic] the same answer. I always thought he didn’t like me…he just got attitudes with me and my sister for no reason sometimes and just didn’t grade what he was supposed to grade right.
She said this process continued until the middle of the school year. By that time her teacher started grading her papers fairly, and her grade improved to a ‘C.’ Like Lil Mama, Dink thought, “I could have been getting an [sic] B or A this whole time?”

She does not have a high need to be validated by her teachers, because she did not let this experience deter her from putting forth effort in class or change her positive attitude about mathematics. In her mathematics autobiography she wrote,

My prior experience with my old math class was fun. We got to do all kinds of things.
We even got to build things because of math. My old math class was fun because once I knew how to do the math I just loved it.

Her teacher also encouraged her to put forth more effort. Dink said her teacher told her “…the more I do it and practice it and study then the higher our grade gets and the better I do.” She described a positive experience with her current Algebra I teacher. She said,

Um, me and Miss Simmons we get along real good. She’s a…she can explain anything.
She’s a good explainer and she helps everybody with their work and that’s how I got my good grade, from Miss Simmons.

**Parental Support.**

Her parents are supportive. They support her by talking to her teachers about her grades and give her encouragement. Her father talked to the principal about her eighth grade teacher and that is why Dink said her grades began to change. They give her praise when they saw good grades and would say things such as “Keep up the good work.” If she is not doing well they tell her, “You need to work on it.” She did not mention whether her parents supported her choice of career; however, from their above comments, they clearly expected her to take responsibility for her work and to take action to make the grades that she is capable of making. Dink did not
mention whether her parents set class or grade point average goals, but she sets the bar high for herself. Her parents reinforce this by saying to her, “Do your best.”

**Beliefs about the Importance of Mathematics.**

She sees herself using math “a lot” especially in her career as an Emergency Medical Technician (EMT).

**Personal Goals and Motivation.**

Dink picked a career as an EMT, and set her own Algebra I grade goals for first quarter. She said, “I expect a A or a B. I don’t want no C.” Dink has high self-confidence and high self-efficacy. She rated herself as having “a lot” of self-confidence and as an eight or nine out of ten in self-efficacy. I described self-efficacy and asked her to rate herself, she said, “Mine would be like a 8 to a 9 because I set myself to do very good and once I do that and I see that I done good, then I keep it up.” She has asked for help in order to reach the goal of getting her homework completed. Her Algebra I teacher was out of the building due to surgery so she asked the substitute teacher for help. She said he told her, “He didn’t teach math, he taught social studies and science. I asked somebody next to me, they kinda knew about it, and I asked her to help me with it and she helped me with it.”

I presented her with the same two homework policies to see which one would motivate her to complete her homework and she chose Teacher A. With Teacher A, time is not a factor if you have your homework the next day and because it is “twenty percent more of your quarter grade than Teacher B.” She said she completed her homework when it was assigned.

**Beliefs about Mathematical Ability and Effort.**

Dink was confident in her own ability to complete her homework, but she preferred to
work with her friend. Both worked the problems and compared answers. She said they usually got the same answers. She took responsibility for her own learning and clearly believed in her own math ability. She perceived herself as having a rather high level of math ability.

TR: OK. How much math ability do you think that you possess? I want you to rate it from 1 to 5 with 1 being not very much mathematical ability and 5 being a great deal of mathematical ability.

Dink: I would have to say four-and-a-half.

TR: Why four-and-a-half?

Dink: Um, I don’t know I just don’t think it’s like all the way there just a little bit off.

TR: OK. If you had to choose between ability and hard work to what would you attribute your success in math class?

Dink: Um, can you like explain that? I really don’t understand that.

TR: Well, do you think that you have a natural ability or talent for doing math or do you think it’s more that you put in work and effort?

Dink: It’s more the work and effort.

Her mathematical voice within the epistemological stages set forth in *Women’s Ways of Knowing* by Belenky, Clinchy, Goldberger, Tarule (1986), suggests that she is *Received Knower*. Belenky, et al. (1995) describes the received knower as one who listens to other peoples’ voices, particularly those of authority for the truth. Her hierarchy of authorities are: (a) teacher; (b) notes; (c) friend; and (d) older sister.

Dink had a negative experience with her eighth grade mathematics teacher, but she did not let that overshadow her overall experience in the class or change her attitude toward the subject. She said that she had fun and loved mathematics, because of the things they did in that
class. She did have a support system in her father, older sister and her friend. She and her friend supported each other by working problems together and checking solutions. Dink had high class grade goals and a career goal that motivated her efforts. She said her success in math was due to hard work and effort, but she perceived herself as having a high level of mathematics ability also.

Summary

In this chapter I presented findings for the perceptions of the participants as mathematics learners and how these perceptions contributed to their experience, success or failure, in Algebra I. The findings are summarized here by theme and also in Table 3.

Perceptions of mathematics experiences and teachers

Everyone, except Mane Gurl, had negative experiences with mathematics teachers during middle school. Juanita (grade 7), Lil Mama (grade 6), Dink (grade 8), and me (grade 8) had experiences that continued to affect our beliefs about ourselves and our ability to do mathematics into Algebra I. These experiences negatively impacted our self-perceptions as mathematics learners.

Parental support

Our parents did several things to support our mathematical endeavors. They tried to help us with the Algebra themselves, paid for tutors, and encouraged us to seek help from our teachers, and advocated on our behalf when talking to mathematics teachers. Our parents influenced our beliefs and help set expectations that assisted us with setting goals that impacted our achievement.

Beliefs about the importance of mathematics

All of us thought mathematics was important and would be used in our careers.
However, only Juanita could give an actual example of how mathematics would be used in her career, but she did not see Algebra as useful in everyday life.

**Personal goals and motivation**

Juanita’s goals were to graduate on time, become a ½ day Senior year, get A’s, B’s, maybe C’s. This related to lower self-efficacy and mastery avoid-performance approach with regard to personal goals and motivation. Dink & Mane Gurl’s goals were to get A’s and B’s, and to be eligible for ROTC and track, respectively. This related to high self-efficacy, and mastery approach-mastery avoid goals. Lil Mama’s goals were to pass her mathematics graduation test and get a C or higher, which related to lower self-efficacy, performance avoid goals. My goals were to get A’s and B’s, be eligible for Del-Teens, and go out on the weekends. This related to lower self-efficacy, mastery avoid-performance approach goals.

**Beliefs about mathematical ability and effort**

All of us attributed mathematics success to hard work (effort), except Juanita, rather than ability. Working hard and putting forth effort meant duration (quantity) of engaged time not the quality of engaged time.
Table 3

Summary of the Girls and Findings

<table>
<thead>
<tr>
<th>Name</th>
<th>Attitude Toward Mathematics</th>
<th>Attribution of success</th>
<th>Parental Support</th>
<th>Prior Mathematics Experiences</th>
<th>Self-efficacy Level</th>
<th>Goals</th>
<th>Resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dink</td>
<td>Positive</td>
<td>Effort</td>
<td>Yes</td>
<td>Positive</td>
<td>High</td>
<td>Mastery-approach/Mastery-avoid</td>
<td>High</td>
</tr>
<tr>
<td>Mane Gurl</td>
<td>Positive</td>
<td>Effort</td>
<td>Yes</td>
<td>Negative (8\textsuperscript{th} grade)</td>
<td>High</td>
<td>Mastery-approach/Mastery-avoid</td>
<td>High</td>
</tr>
<tr>
<td>Juanita</td>
<td>Negative</td>
<td>Effort: Did not know, Task Difficulty</td>
<td>Yes</td>
<td>Negative (7\textsuperscript{th} grade)</td>
<td>Medium</td>
<td>Mastery-avoid/Performance approach</td>
<td>Medium</td>
</tr>
<tr>
<td>Me</td>
<td>Negative</td>
<td>Effort &amp; Task Difficulty</td>
<td>Yes</td>
<td>Negative (8\textsuperscript{th} &amp; 9\textsuperscript{th} grade)</td>
<td>Medium</td>
<td>Mastery-avoid/Performance approach</td>
<td>Medium</td>
</tr>
<tr>
<td>Lil Mama</td>
<td>Negative</td>
<td>Effort</td>
<td>No</td>
<td>Negative (6\textsuperscript{th} grade)</td>
<td>Low</td>
<td>Performance Avoid</td>
<td>Low</td>
</tr>
</tbody>
</table>
Chapter 5: Discussion

“Without struggle there is no progress.” Frederic Douglass

In the preceding chapter I provided an analysis of the data that addressed the two research questions that guided this research. Based on my analysis the following themes emerged from the data: (a) parental support; (b) beliefs about the importance of mathematics; (c) beliefs about mathematical ability and effort; (d) personal goals and motivation; and (e) perceptions of mathematics experiences and teachers. These themes respond to my research questions: (a) What are African American students’ perceptions of themselves as learners in mathematics?; and, (b) How do these self-perceptions contribute to their experiences, success or failure, in Algebra I?

The findings represent the nature of qualitative, feminist research, which looks at the whole person through his or her narrative. I discovered that these five themes are intertwined and inseparable. They supported the research questions collectively, rather than independently. The research supports the intersectionality of beliefs, goals, motivation, causal attribution, resilience and the impact on mathematics achievement. The findings were particular to this project and not intended for generalization; however, extrapolation may be appropriate. According to Patton (2002), “Extrapolations are modest speculations on the likely applicability of findings to other situations under similar, but not identical, conditions” (p. 584). This study adopts the feminist perspective that knowledge begins with the individual, then as Damarin (1995) and Shultz and Cook-Sather (2001) assert, we can gain new insight by listening as they speak about their experiences. In this chapter I summarize the findings, discuss their implications and conclude with suggestions for future research.

Findings

Dink and Mane Gurl struggled in Algebra I periodically. They had positive attitudes and
were connected to mathematics, because they both liked it. They were extremely optimistic about their own mathematical abilities and self-efficacy. Each one attributed her successes to hard work and effort, although they were a bit misguided as to what behavior was more influential: duration of engaged time or the quality of engaged time. Once Mane Gurl saw the effort rubric, and the behaviors were in “black and white”- a light bulb came on for her. Maybe all she needed was a little more guidance about behaviors that support effort and achievement.

Both girls set and worked toward their own goals with little parental intervention or mediation of their class grade goals; however, their parents strongly supported them when they needed it. Each girl sought help from others and created a support system that included teachers, friends, relatives or tutors to help them when the task complexity became difficult. Although their Algebra I grades were not A’s, they had attributes that could help them achieve at that level. They were the most academically resilient girls, and needed the least amount of external support.

Juanita and I were girls who struggled a great deal more than Mane Gurl and Dink. We were less positive and optimistic. Our attitude toward mathematics depended on who our teacher was, whether we liked him or her, and whether we thought they supported us. We looked for and needed teacher affirmation. If the teacher supported us, we did well. When the teacher did not give the support we needed then we struggled greatly. Our achievement also depended upon how hard we perceived the mathematics task to be. If it was easy, then we liked math, but if it was hard, we hated it. Unlike Mane Gurl and Dink, our mothers were very involved and supported us. We needed the mediation and intervention of class grade goals and tutoring, respectively, to motivate us to make the grades that our mothers expected of us. While we did not take the initiative to create our own goals or support system, our mothers’ strongly influenced us and mediated what did need to occur. “You need to see your teacher before
school, after school, or both, you better not come home with anything less than a B,” was one of things my mother told me. Although our grades, too, were average, we still had attributes that would help us to achieve at higher levels and become more academically resilient. While we both chose STEM-related careers, perhaps exposure to and mentoring from women in those careers might have given us an extra support. Perhaps having our mothers, an accountant and a registered nurse, who knew what it took to succeed in their careers and academically, and who were willing to go above and beyond the call of duty to help us succeed in ours, was enough. Of course, for me, I know that to be the case. My mother made my class schedule based on my career goal. She said, “If you’re going to be an engineer, you have to take a lot of math and science.” My mother’s involvement compensated for my low self-efficacy and attitude. However, as I got older and then went to college, I continued to take more mathematics, and I also continued to struggle. But, I became more resilient in that process and still progressed in my mathematics skills. I came to embrace that struggle, instead of run away from it, and I looked for ways to overcome it. Since changing my career goal of becoming an engineer was not an option, and the math was only getting harder, I figured I had to work harder to make the grade. Working harder meant spending time rewriting notes, sitting in the front of the class so I would pay attention, seeing my professor if I had trouble, memorizing definitions and theorems from note cards I created from my notes, reworking missed problems on tests and comparing solutions and strategies with classmates, and listening to music for motivation. Songs like Mariah Carey’s “Make it Happen” motivated me to do whatever it took to make the grade.

While Juanita vacillated between being a silent knower and a received knower, looking back to high school, I, too was a received knower. I clearly looked to my mother as the authority. I worked to impress her with my mathematics grades. However, as a college student
and as I progressed through my own struggles with mathematics, I also progressed further through the stages of knowing. There were two experiences that created a cognitive dissonance within me that helped me move to the subjective knower stage. I transferred in my senior year from an HBCU to a predominantly white university as part of a 3-2 program. I neither felt supported nor successful in the mathematics and engineering courses at the new university. I withdrew from all of my courses in the middle of the semester and informed my mother after the fact that I was changing my major from engineering to mathematics and returning to the HBCU. It was the first time that I began to trust my gut instincts about myself and what I needed to be successful. My mother vehemently disagreed with this decision, but I rejected her authority about what was best for me and my career. The second experience occurred after I graduated with my mathematics degree. I substitute taught for a mathematics teacher, and was responsible for giving a test that day. I saw the apathy among the students who went to sleep and threw away their tests. I remembered how I felt when I was in their place, and thought that I could make a difference by becoming a mathematics teacher, because I knew what it was like not to understand. So I enrolled in a master’s degree program so I could attain my degree and a teaching certificate. My procedural stage of knowing began during my first year of teaching. I taught my students as I had been taught, and was not finding much success. The district math supervisor paid me a visit, and she asked me a crucial question. She said, “Are you teaching the subject or are you teaching the student?” I answered that I was teaching the subject. However, I found myself asking this critical question to myself over and over throughout my years of teaching, and came to realize the difference between the two. That question always drives my teaching. The culminating experience that pushed me to evolve into a constructed knower was my quest for national board certification. I started it as a fourth-year teacher and it took me three
years to achieve it. This process involved constant reflection on my teaching practices based on
my experiences and integrated my mathematics content knowledge. It was through this
experience, that I recognized how much I knew, how much I did not know, and still wanted to
know. I also recognized that my knowing was different because my experiences were different.
This led me to make different decisions about my teaching. I started my doctoral degree during
the third year of my national board experience. It was through my dissertation experience that I
used myself as an instrument of understanding my own experiences and these girls’ experiences.
Through the completion of my dissertation I became a passionate knower.

    Lil Mama struggled the most with mathematics. She did not have a positive attitude
toward math, and said she did not like it because it was hard. Her negative prior experiences
with her teachers were significant and greatly influenced her attitude and her lack of optimism
about Algebra I. For example, all of the girls had class grade goals, but Lil Mama’s goals were
to get a “C or higher” and pass the proficiency exam. She was the only girl who started with her
lowest grade of ‘C’ and went higher, whereas the other girls said, “I want A’s and B’s.” They
started at the highest grade and went down to the lowest grade. Unlike the other girls she did not
connect her current grades to her future career goal, but by passing the mathematics proficiency
exam she would be able to graduate. Lil Mama neither mentioned going to college, nor a
STEM-related career. Further, she was the only one who did not have the support or
encouragement of her parents. Her perspective is a girl who had strong unaffirming encounters
with teachers that had a negative impact on her overall mathematics experiences, resulting in
lower self-efficacy and less resilience than the rest of us. Unless there were significant
interventions that supported cognitive dissonance in her mathematics experiences, I think she is
the least likely to choose a math-related career and perform at higher achieving levels. I do not think that higher mathematics achievement is likely to happen for her without parental support.

As a teacher, I struggled with my Algebra I students doing their homework. I found if I was going to assign homework, I better grade it. In the beginning of my teaching career I had a Teacher A-type homework policy, but by the end of my classroom teaching career, I developed a Teacher B-type policy. Regardless of the policy, the grade was not motivation enough for the majority of my Algebra I students. On any given day, and I assigned homework regularly, at least fifty percent of my students did not do their homework. Ames (1990) posed the question, “How can a teacher set homework policy so that students complete the homework and still maintain their interest in the material?” (p. 409). And so, I asked the girls to choose between Teacher A’s and Teacher B’s homework policies. According to Ames (1990), the less stringent policy of Teacher B would motivate students to meet both criteria. However, my results did not align to this research. I thought that students having the opportunity to revise homework problems, which Teacher B’s policy allowed, would motivate the choosing of this policy, but it did not. I discovered we all did our homework, but for different reasons. I did my homework because I wanted to master the material, so that I could do well on the test, and impress my mother, so I could achieve my goal of going out on the weekend. Looking back at my “teenage girl” self, I realized that I was a little more mastery goal-oriented and so my motivation for learning was different than that of Juanita and Lil Mama. I liked learning for leaning sake, and I wanted to know more and have an understanding of the material. I was in competition with myself to improve my grades, not other students in my class, because my mother cared about how I did, not what other students did. I sought to prove my ability to myself and my mother. My motivation for learning was more intrinsic than extrinsic. Mane Gurl seemed less motivated
by how much the homework was worth but Dink, Lil Mama and Juanita were clearly motivated by the grade.

This is a goal of a different type – a performance goal. Mastery goals and performance goals have different motivation. Thus students have different motivations for learning and these can result in different outcomes (Ames, 1990; Dweck & Leggett, 1988). “A student who works for extrinsic rewards such as grades is likely to engage in very different thought processes and behaviors compared with the student who wants to learn something new about the subject matter or improve a skill” (Ames, 1990, p.411). As a teacher, I wanted my Algebra I students to be mastery goal-oriented. I wanted students to improve their mathematics ability rather than prove their ability. This was a difficult task, because my students constantly compared themselves to each other. No matter what lengths I took to make social comparison unlikely, the students would exchange papers and look at each others’ tests, and then ask me questions about their answers. As a teacher, I wondered if it was possible to change this behavior, because they were conditioned to behave this way long before they got to high school and Algebra I class.

Implications

There are several implications that can be addressed here. Parents are critically important in helping to develop students’ beliefs about mathematics and mathematics teaching. Positive and affirming experiences in the classroom impact the development of mathematics beliefs, students’ self-efficacy beliefs, influence goals, motivation and levels of effort which impact academic resilience. Each of these findings has important implications regarding student mathematics participation and achievement.

Parental Support.
All of the girls, except Lil Mama, had parents that conveyed encouragement, support and high expectations. Lil Mama’s parents did not express their expectations at all. Thomas (2000) found that African American parents’ expectations moderately correlated to mathematics achievement at the high school level. High achieving girls will work hard in mathematics and want to live up to their parents’ expectations as well as their own expectations (Howe & Berenson, 2003). African American students whose parents had significantly higher grade point averages in high school adopted mastery goal expectations for them (Gutman, 2006). Parents are highly influential in helping their child achieve mathematics success. Parents influence students’ beliefs and set expectations to help their children set goals that impact achievement.

**Beliefs about the Importance of Mathematics.**

All of us thought mathematics was important to us and would be used in our careers, but only Juanita could give an application of math in her chosen field of nursing. Juanita’s belief in the importance of mathematics in her career was contradicted by her observation that she did not see any adults using algebra “to succeed in real life.” So while she thought mathematics was important, she did not see it as useful. Lil Mama thought mathematics was important because if she did not pass the graduation test, she would not graduate. Although Dink and Mane Gurl could not give specific examples of how they would use mathematics in their careers, they thought it was important and were confident that they would need it. This finding supported the prior research that African American students did not perceive mathematics as being useful nor did they see how it applied toward future schooling and careers (Matthews, 1984; Stiff & Harvey, 1988; U.S. Department of Education, 1995).

**Beliefs about Mathematics Ability and Effort.**
All of us attributed mathematics success to hard work, except Juanita, who admitted a maladaptive pattern of avoidance tactics. The causal attribution theory literature says that girls are more likely to attribute hard work to success than ability (Dweck, 1978). All of us, except Juanita, thought that we worked hard and that putting forth effort meant spending more time doing mathematics. However, effort means more than the duration of time. It’s the quality of time spent and the activity conducted during that time. The girls were made aware of the five behaviors: a) class participation; b) course preparation; c) behavior; d) seeking help; and, e) making up missed work, that contribute to effort. Higher levels of effort can lead to a development of high self-efficacy. “Telling them that effort is responsible for their successes conveys that they are developing skills and that they can continue to perform well with hard work” (Schunk, 1984). Giving student’s effort feedback clarifies the quality of engaged time and aligns that hard work to an academic grade. This feedback impacts persistence and planning and leads to academic resilience (Schunk, 1986).

**Personal Goals and Motivation.**

Students’ self-efficacy beliefs influence goals, motivation and achievement. Both Mane Gurl and Dink had self-reported high self-efficacy beliefs, and both girls had grade goals of ‘A-B’. Although Juanita and I did not have high self-efficacy beliefs, we wanted an ‘A-B-C’, but Lil Mama wanted ‘C’ or higher. When it came to homework, Dink, Juanita and Lil Mama worked for the grade, and the impact a 30% homework grade would have on their overall Algebra grade, rather than placing a value on learning the content. According to Ames and Archer (1988) the girls would have a performance goal for completing homework.

**Perceptions of Mathematics Experiences and Teachers.**
Everyone, except Mane Gurl, had negative experiences with mathematics teachers during middle school. Juanita (grade 7), Lil Mama (grade 6), Dink (grade 8), and me (grade 8) had experiences that continued to affect our beliefs about ourselves and our ability to do mathematics into Algebra I. Middle school grades are crucial to the development of mathematics achievement because they prepare for higher levels of math and impact future career decisions (Chen & Zimmerman, 2007; Reynolds, 1991). It was during this time that Juanita, Lil Mama and I developed several beliefs. We believed that math was hard (McLeod, 1992). We believed that we needed to work hard and put forth more effort and grades were motivators for us (Kloosterman, 2002). But, we also believed that our teachers were not affirming and our classroom context was not a positive mathematics culture, and so we developed maladaptive patterns of behavior, such as not trying, procrastinating, and lack of effort (Ames, 1990). We attributed our success to working hard, if we failed, then we looked to fault our teacher, in order to save our self-concept. This partially aligned to Vispoel and Austin (1995) who asserted that seventh and eighth graders attributed success to effort and attributed failure to interest. These maladaptive behaviors affected our self-efficacy beliefs, because we looked to our enactive mastery experiences with mathematics (Bandura, 1997), which were few, and the lack of successful experiences heavily influenced our low self-perception and lack of effort. These experiences also contributed to lower levels of resilience in mathematics class.

Mane Gurl and Dink differed in their experiences slightly. Mane Gurl had positive experiences with both teachers and mathematics throughout her academic career. Dink had positive experiences with mathematics and her teachers until the eighth grade, but she did not let her experience with her teacher affect her love of mathematics. Both of the girls believed math was hard, but they also believed putting forth effort made a difference which aligned to
Kloosterman’s (2002) study of motivational beliefs of high school mathematics students. Each girl self-reported high self-efficacy beliefs in mathematics. Both of the girls placed a high value on learning mathematics and sought out help with teachers, tutors or friends. Both girls sought to improve their understanding and believed hard work and effort resulted in higher grades. Dink said, “I want to be able to pass my class with an a+ [sic]...I would have to step up my game a little bit,” implying she needs to work harder. This suggests that Mane Gurl and Dink align to the achievement goal analysis research by Ames and Archer (1988). When they were successful, it was because they worked hard. When Dink did not do well, it was because she did not work hard enough. Mane Gurl believed she could improve her grade through increased effort, but she admitted she needed more sleep so she could concentrate in class. Both girls took responsibility for their learning. Both girls were perseverant, optimistic, had supportive parents and teacher support and this suggests that they aligned to Floyd’s (1996) assertion of academic resilience in African American high school students.

Conclusions and Suggestions for Further Research

This study focused on our self-perceptions and how these self-perceptions contribute to our experiences, success or failure, in mathematics. While Dink and Mane Gurl had high levels of self-efficacy, Lil Mama, Juanita and I had lower levels of self-efficacy. This research was not longitudinal so I am not aware of how the girls’ current mathematics experiences will impact future self-perceptions, goals, motivation or resilience. However, I can reflect on my experiences. Self-efficacy, the belief that you have the ability to accomplish a goal, is critical to student success in mathematics. My self-efficacy improved as I got older, because I had more success with mathematics. My research indicated a need to look at how teachers help to foster
self-efficacy in the mathematics classroom and what critical decisions do teachers make that support student self-efficacy?

Teachers make crucial choices in terms of what they teach and more importantly how they teach it. Teachers’ pedagogical choices greatly affect learning that takes place in a mathematics classroom. For me, this addressed the question, “Am I teaching the subject, or am I teaching the student?” The National Mathematics Advisory Panel (2008), “found that 62% of Algebra I teachers reported working with unmotivated students is the single most challenging aspect of teaching Algebra I successfully.” This was true for me when I started teaching. It is the choices teachers make that will engage and empower students to feel as if they have control over their learning, to like learning mathematics and more importantly believe they can do mathematics. Suarez (2007) maintained that allowing students to be involved in making choices, such as choosing questions of different task difficulty, called tiered instruction, makes a difference in student motivation. It allows students to select the level of challenge, without learning becoming overwhelming for them. More studies of tiered instruction and how it impacts student motivation in Algebra I are needed.

In making decisions in the classroom, teachers may have beliefs that do not allow them to support or encourage the average or failing students. So teachers must make the decision to support all students regardless of their personal beliefs. NCTM’s (2000) equity standard says that teachers need to look at their attitudes and beliefs, and challenge them and/or change them. NCSM (2010) said, “Know that equity requires that educators reflect on their individual beliefs about intelligence and whether or not they believe that all children can learn mathematics” (p. 1). The high school mathematics department chair did not believe that I could pass geometry and she recommended to my mother that I take Fundamental Geometry. Her belief was based on my
meager performance in Algebra I. I struggled to earn C’s, and at the end of third quarter when scheduling took place for the next school year, I had a 70% (D), which was one percentage point shy of an ‘F’. My mother disagreed and told her that she would be closing doors on my future by putting me in the Fundamental Geometry class. My mother had to sign a waiver that if I failed geometry it was not the school’s fault. I not only passed that geometry class, I was the ‘most improved student’ by the end of fourth quarter. I went from an 80% (C) first quarter to a 92% (B) fourth quarter. ‘C-D’ students are likely to be discounted by their mathematics teachers. When I became a teacher, I had to fight these beliefs within myself because it was easier to look at just the grade. If teachers set their own beliefs aside and looked at the whole picture, they may see other attributes in their students that could still help them to achieve mathematically.

There are students who have high levels of self-efficacy by the time they arrive in Algebra I, but my experience as a student and a teacher has been that many students do not. What comes first, self-efficacy or resilience in learning mathematics? Do high levels of self-efficacy help create high levels of academic resilience or does high academic resilience help foster high levels of self-efficacy, or do they co-exist, and if so, how? I think about my experience, my self-efficacy and resilience, and I am sure there must be shades of gray. What can teachers do to support the development of self-efficacy and resilience in the classroom?

Further questions for future research would be, if one factor that supports resilience is missing, for example school support, will parental support compensate for the missing school support? Or what different types of resilience exist for students C-D students in mathematics, than A-B students? As suggested by McGhee (2009) there exists academic resilience and life resilience that allows students to meet life challenges, but not perform in mathematics.
Understanding why some students can transcend challenges in mathematics, as I did, and others cannot requires additional research. Also, what factors contributed to their resilience and if there is a specific resilience, academic, life, as suggested by McGhee (2009), or other type of resilience that contributed to their transcendence of that struggle needs to be investigated. My struggle with mathematics may not be totally unique. However, I believe if there are others with experiences similar to mine, they are probably few in number. Future research could study these average mathematics students and their early educational experiences and career trajectories to determine what roles self-efficacy, parental support and resilience played for them.

Summary

This study was a qualitative investigation of the perceptions students have of themselves and how these perceptions contribute to their experiences, success or failure, in mathematics. A mathematics autobiography assignment was given to all students in seven Algebra I classes. Interviews and focus groups were conducted with students who agreed to participate. Data from the autobiographies, and interviews were examined with the intent of discerning themes that emerged and told their story as it contributed to their perceptions and their experiences. The findings of this study conclude that their various beliefs about mathematics, goals and motivation, parental involvement, and self-perceptions result in varying levels of academic Resilience that may explain mathematics success or failure and further participation in mathematics-related careers.
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Appendix A

Letter to Principal

July 21, 2009

Principal
Address

Dear Principal,

My name is Tamra C. Ragland and I am currently a doctoral candidate at the University of Cincinnati in the College of Education. This letter is written to you to describe the nature of my research and to request permission to conduct this research study in your school.

The purpose of my research is to explore African American students’ beliefs, and perceptions about their mathematics experiences, relationships with their teachers, and teaching strategies from the lens of the students’ experience, using the students’ voice. This qualitative study uses data collection tools that include mathematics autobiographies, two focus group interviews, and individual student interview to generate data that will be analyzed for emerging themes and patterns as to how the students see themselves as learners of mathematics. The participants are Algebra I students who will participate for the duration of one quarter. The information collected will possibly aid in the development of mathematics professional development for urban districts. There are no risks for students to participate in this study. A possible benefit would be that the students’ might understand their own beliefs and feelings about math.

Please be aware that the only person that will be able to identify their answers and experiences is the primary investigator of this research study; otherwise, confidentiality of participation will be maintained. Data collection methods will be to insure that specific data cannot be linked to specific subjects.

If you have any questions or concerns about this research study, you should contact Tamra Ragland at (937) 694-0617 or raglantc@email.uc.edu. Or, you may contact Dr. Helen Meyer at 513-556-5115 or helen.meyer@uc.edu. The UC Institutional Review Board – Social and Behavioral Sciences (IRB-S) reviews all non-medical research projects that involve human participants to be sure the rights and welfare of participants is protected. If you have questions about students’ rights as a participant or complaints about the study, you may contact the Chairperson of the UC IRB-S at (513) 558-5784. Or, you may call the UC Research Compliance Hotline at (800) 889-1547, or write to the IRB-S, 300 University Hall, ML 0567, 51 Goodman Drive, Cincinnati, OH 45221-0567, or email the IRB office at irb@ucmail.uc.edu.

I have read this information and have received answers to any questions I asked.
I give permission for Tamra C. Ragland to conduct this research study in my school. I will receive a copy of this signed and dated Principal Cover Letter and Permission form to keep.
Principal’s Name (please print) ______________________________________________

Principal’s Signature __________________________________________ Date _____________

Signature of Person Obtaining Permission ___________________________ Date _____________
Appendix B

Recruitment Letter to Parents & Students

Dear Parent/Student,

My name is Tamra C. Ragland and I am currently a doctoral student at the University of Cincinnati in the College of Education. My program of study is in Curriculum and Instruction with an emphasis in teaching and learning in mathematics.

By participating in the research you are allowing the UC person to write about your mathematics experiences and share your experiences with other teachers and college educators. Being involved in the research will not change anything you do in class. Participating in the research will not change what you learn in class, or how you are graded.

If you are willing to participate in the research you must return two forms to me. The first is your “assent form.” This is a form you sign that says YOU are willing to be part of the research. In addition to this form, a parent or guardian must give permission for you to participate in the research. This permission letter will explain to your parent or guardian what the research is about and what will be required of you. It also has phone numbers for your parent or guardian to call if they have questions. In order for you to participate in the research you must return BOTH your signed assent form and your parent or guardians signed permission form to me, your teacher, by ________.

If you do not want to be part of the research you will still participate in all parts of your math class. You can just throw away the assent and permission forms when you get home.

Sincerely,

Tamra C. Ragland
Appendix C

Youth Assent form

Title of Study: If I Were the Teacher: African American Students’ Perceptions and Attitudes in Mathematics

Introduction:
You are being asked to be in a research study. Please ask questions about anything you do not understand.

Who is doing this research study?
The person in charge of this research study is Tamra Ragland.

What is the purpose of this research study?
The purpose of this research study is to hear students’ voices about their beliefs and attitudes about their math experiences. This research information will be written for other educators to read.

How many people will be in this research study?
About six (6) people will take part in this research study. You may be in this research study if you and your parent sign and return the parental consent form and student assent form.

What will you be asked to do in this research study, and how long will it take?
You will be asked to write a math autobiography. This math autobiography asks you to write about your experiences in math. You will be interviewed three times. The interviews ask you questions about your attitudes, beliefs, effort, and motivation in math class. It will take about one quarter for all of the research to be completed. The research will take place at your school.

Are there any risks to being in this research study?
There are no risks to being this research study.

Are there any benefits from being in this research study?
Possible benefits are that you might understand your own beliefs and feelings about math.

Will you have to pay anything to be in this research study?
No, you do not have to pay anything.

What will you get because of being in this research study?
No, you will not receive anything.

Do you have choices about taking part in this research study?
If you do not want to take part in this research study you do not need to return the consent or assent form. However, this does not mean you are excused from participating in the writing of the mathematics autobiography.
How will your research information be kept confidential?
Information about you will be kept private by a password-protected hard drive file and hard copy materials will be kept in a locked file cabinet. Once the research study is completed the materials will be destroyed. Consent forms will be stored in a secure place for three years after the end of the research study and then will be destroyed. Agents of the University of Cincinnati may inspect study records for audit or quality assurance purposes.

What are your legal rights in this research study?
Nothing in this assent form takes away your rights.

What if you have questions about this research study?
If you have any questions or concerns about this research study, you should contact Tamra Ragland at (937) 694-0617 or raglantc@email.uc.edu. Or, you may contact Dr. Helen Meyer at 513-556-5115 or helen.meyer@uc.edu.

Do you HAVE to take part in this research study?
NO ONE HAS TO BE IN THIS RESEARCH STUDY. You will not get in any trouble if you say no. You may start and then change your mind and stop AT ANY TIME. To stop being in the research study, you should tell Tamra Ragland.

Agreement:
I have read this information. I want to be in this research study.

Your Name (please print) ____________________________________________

Your Date of Birth ________________ (Month / Day / Year)

Your Signature ____________________________________________ Date __________

Signature of Person Obtaining Assent ___________________________ Date__________
Appendix D

Parent Consent Form

Title of Study:  If I Were the Teacher: African American Students’ Perceptions and Attitudes in Mathematics

Introduction:
You are being asked to allow your child to take part in a research study. Please read this paper carefully and ask questions about anything that you do not understand.

Who is doing this research study?
The person in charge of this research study is Tamra Ragland of the University of Cincinnati (UC) Department of Teacher Education.

What is the purpose of this research study?
The purpose of this research study is to hear students’ voices about their beliefs and attitudes about their math experiences.

Who will be in this research study?
About six (6) children will take part in this study. Your child may be in this research study if your child returns the parental consent form and student assent form.

What will your child be asked to do in this research study, and how long will it take?
Your child will be asked to write a math autobiography. This math autobiography asks students to write about their experiences in math, and what is their vision of the math classroom they would like. Students will be interviewed three times. The interviews ask your child questions about their attitudes, beliefs, effort, and motivation in math class. It will take about one quarter for all of the research to be completed. The research will take place at your child’s school.

Are there any risks to being in this research study?
There are no risks to being in this research study.

Are there any benefits from being in this research study?
Possible benefits are that your child might understand their own beliefs and feelings about math.

Will your child have to pay anything to be in this research study?
No, your child does not have to pay anything.

What will your child get because of being in this research study?
Your child will not receive anything extra for participating in this study.

Does your child have choices about taking part in this research study?
If you do not want your child to take part in this research study he or she does not need to
return the consent or assent form. This does not mean your child will be excused from participating in the writing of the mathematics autobiography.

**How will your child’s research information be kept confidential?**
Information about your child will be kept private by the researcher and will be stored in a password-protected hard drive file and hard copy materials will be kept in a locked file cabinet. Once the research study is completed the materials will be destroyed. Consent forms will be stored in a secure place for three years after the end of the research study and then will be destroyed. Agents of the University of Cincinnati may inspect study records for audit or quality assurance purposes.

**What are yours and your child’s legal rights in this research study?**
Nothing in this consent form waives any legal rights your child may have. This consent form also does not release the investigator, the institution, or its agents from liability for negligence.

**What if you or your child has questions about this research study?**
If you or your child has any questions or concerns about this research study, you should contact Tamra Ragland at (937) 694-0617 or raglantc@email.uc.edu. Or, you may contact Dr. Helen Meyer at 513-556-5115 or helen.meyer@uc.edu. The UC Institutional Review Board – Social and Behavioral Sciences (IRB-S) reviews all non-medical research projects that involve human participants to be sure the rights and welfare of participants is protected. If you have questions about your child's rights as a participant or complaints about the study, you may contact the Chairperson of the UC IRB-S at (513) 558-5784. Or, you may call the UC Research Compliance Hotline at (800) 889-1547, or write to the IRB-S, 300 University Hall, ML 0567, 51 Goodman Drive, Cincinnati, OH 45221-0567, or email the IRB office at irb@ucmail.uc.edu.

**Does your child HAVE to take part in this research study?**
NO ONE HAS TO BE IN THIS RESEARCH STUDY. Refusing to take part will NOT cause any penalty or loss of benefits that you or your child would otherwise have. You may give your permission and then change your mind and take your child out of this study AT ANY TIME. To take your child out of the study, you should tell Tamra Ragland. Your child will be asked if he or she wants to take part in this research study. Even if you say yes, your child may still say no.

**Agreement:**
I have read this information and have received answers to any questions I asked. I give my permission for my child to participate in this research study. I will receive a copy of this signed and dated Parent Permission form to keep.

You Child's Name (please print) __________________________________________
Your Child's Date of Birth _______________ (Month / Day / Year)

Parent/Legal Guardian's Signature ______________________________ Date ________
Appendix E

Mathematics Autobiography Assignment

Task: Write an autobiography about your math experiences. It should be written in paragraph form, using complete sentences and correct grammar. It will be scored with a writing rubric. There is a 2-page length requirement, and the paper should address ALL of the following prompts:

Prompt #1: Tell me about your experiences in previous mathematics classes.
Prompt #2: Tell me about your experiences with prior mathematics teachers.
Prompt #3: Describe your feelings about mathematics.

Some ideas for prompts 1-3 include:
- your proudest math moment
- your most embarrassing math moment
- last year’s math grades
- describe why you are successful in math
- describe why you feel that you are not successful in math
- how do you feel about math and why
- how do you think math will affect you in your future profession
- consider and explain any goals you have for improving your math skills
- describe your favorite math teacher and what made them memorable
- if you attended school in another country, please explain any differences in the way math was taught in your homeland vs. here in the United States
- tell us how we could best help you be successful in math class

Audience: The audience for your story is Mr. Early, Ms. Simmons, Ms. Ragland.

Purpose: To focus on and communicate prior individual math experiences.

Procedure: 1. Two pages, typed, 12 font, double-spaced, in narrative form
-OR-
Two pages, handwritten, single spaced, neat and legible

2. Correct use of grammar and spelling
3. Ideas and content interest the reader
4. Organization makes sense
5. Writing is thoughtful and reflective
6. All instructions were followed
### How you will be graded:

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4 Advanced</th>
<th>3 Proficient</th>
<th>2 Basic</th>
<th>1 Below Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>First paragraph has a &quot;grabber&quot; or catchy beginning.</td>
<td>First paragraph has a weak &quot;grabber&quot;.</td>
<td>A catchy beginning was attempted but was confusing rather than catchy.</td>
<td>No attempt was made to catch the reader's attention in the first paragraph.</td>
</tr>
<tr>
<td><strong>Focus on Assigned Topic</strong></td>
<td>The entire autobiography is related to the assigned task and allows the reader to understand much more about the author.</td>
<td>Most of the autobiography is related to the assigned task. The autobiography wanders off at one point, but the reader can still learn something about the author.</td>
<td>Some of the autobiography is related to the assigned task, but a reader does not learn much about the author.</td>
<td>No attempt has been made to relate the autobiography to the assigned task.</td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>The autobiography is very well organized. One idea or follows another in a logical sequence with clear transitions.</td>
<td>The autobiography is pretty well organized. One idea or may seem out of place. Clear transitions are used.</td>
<td>The autobiography is a little hard to follow. The transitions are sometimes not clear.</td>
<td>Ideas seem to be randomly arranged.</td>
</tr>
<tr>
<td><strong>Requirements</strong></td>
<td>All of the written requirements (Prompts 1, 2, and 3) were met.</td>
<td>Most (Prompts 1&amp;2, 1&amp;3, 2&amp;3) written requirements were met.</td>
<td>One prompt addressed</td>
<td>Prompt was not addressed at all</td>
</tr>
<tr>
<td><strong>Paper Length</strong></td>
<td>2 pages typed or handwritten</td>
<td>1.5 – 2 pages typed or handwritten</td>
<td>1.0 - 1.5 pages typed or handwritten</td>
<td>0 – 1 page typed or handwritten</td>
</tr>
</tbody>
</table>
Appendix F

Focus Group Interview #1 Protocol

The first interview consisted of themes that will be noted after analyzing the students’ mathematics autobiographies. The purpose of the first focus group interview will be to gain clarification of those emerging themes and trends and to give students an opportunity to further explain their writing. Because I expected the responses to vary from student to student there is no set protocol for these interviews.
Appendix G

Individual Interview Protocol

Questions about your perceived mathematics classroom experience
1) Describe your relationship with one math teacher you remember.

2) Do you remember receiving encouragement from any math teacher to do well in math or study more math in the future?

3) Who gave this encouragement to you and when did it occur?

Questions about attitudes about mathematics
1) Compared to your friends, do you think you like math more, less, or the same? Can you give me an example?

2) What kind of comments do your parents make to you about math (i.e., when they are looking at your report card)?

3) Think of yourself after high school. How do you see yourself using math?

Questions about ability and effort
1) How much mathematical ability do you believe you possess? Rate your ability from 1 to 5, with 1 being ‘not very much mathematical ability’, and 5 being ‘a great deal of mathematical ability’.

2) If you had to choose between ability and hard work, to what would you attribute your success in math class?

3) Consider the following teachers and their homework policies:
   Teacher A’s policy says that all homework will be graded daily with letter or percentage grades, and that homework counts as 30 percent of the quarter grade.

   Teacher B’s policy says that students are to spend no more than 30 minutes per night on homework, that homework will be graded as satisfactory or unsatisfactory, that students can redo and correct their work, and that homework counts for 10 percent of the quarter grade.

Which homework policy, Teacher A or Teacher B, would motivate or influence you to complete your homework?

4) Do you do your math homework regularly?
Appendix H

Focus Group Interview #2 Protocol

Task: Students will interpret data points as they relate to the students’ perception of effort and ability and its affect on the students’ quarter grade.

Please take a look at the “Effort & Attitude” v.s. “Quarter Grade” Graph. Each comment below is represented by one of the points in the graph. Label the four points with the names Alex (A), Kaneisha (K), Daviante’(D), and Cierra (C) using the comments about them. Make up a report card comment for the remaining point (U).

Alex (A) has been extremely lazy all quarter, leading to a very low quarter grade.

Kaneisha (K) is a very capable student, as her grade clearly shows, but her concentration and behavior in class are very poor. With more effort, she could do extremely well in this class.

Daviante (D) has worked hard and deserves an excellent quarter grade. Great job!

Cierra (C) has worked reasonably well this quarter and has achieved a decent quarter grade.
If Point ‘U’ is “you,” what does this points’ location on the graph mean to you?

How will this affect your work in mathematics?

Why is this important to you?

What are you learning from this?

What insights does this give you?

What would you rather see happening with your own effort in your mathematics class?

How do you think your effort affects your grade?

Think about this graph in terms of you being the teacher. If you were the teacher, what types of things would you do to get students to put forth more effort in Algebra I?
Appendix I

Effort Rubric

1) Think about your effort in Algebra I over the quarter, your behavior and your class participation. Choose your level of effort for each of the five categories.

2) How cooperative have you been?

3) How responsible have you been?

4) What improvements could you make?
<table>
<thead>
<tr>
<th></th>
<th>Course Preparation</th>
<th>Class Participation</th>
<th>Behavior</th>
<th>Seeking Help</th>
<th>Making up Missed Work</th>
<th>Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exemplary</strong></td>
<td>Consistently and thoughtfully prepares for class, makes connections beyond the classroom</td>
<td>Personifies genuine and engaged curiosity with course subject matter, seeks balance between participating and reflecting upon contributions of others</td>
<td>Models and inspires exemplary behavior, respects self and others</td>
<td>Appropriately Proactive and engaged with suggestions</td>
<td>Consults resources (syllabus, peers), then devises and executes own plan to promptly complete assignments</td>
<td>Exemplary, Excellent, Inspired, Commendable, Engaged, Independent, Enthusiastic, Inventive…</td>
</tr>
<tr>
<td>Exemplary</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>Prepares effectively for class, keeps current with class assignments</td>
<td>Contributes in a genuine manner, shows interest</td>
<td>Demonstrates Good behavior, Respects the rules</td>
<td>Responds effectively to written and spoken suggestions</td>
<td>Initiates appropriate contact with teachers, completes work in timely fashion</td>
<td>Good, Expected, High Quality, Conscientious, Fine Reliable, Diligent, Qualified, Responsible…</td>
</tr>
<tr>
<td>Good</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>Satisfactory preparation, completes assignments</td>
<td>Superficial engagement, “going through the motions”</td>
<td>Follows the rules</td>
<td>Requires reminding, or inconsistently responds to suggestions</td>
<td>Eventually completes missed work, requires prompting</td>
<td>Average, Nominal, Satisfactory, Adequate, Uninspired, Superficial…</td>
</tr>
<tr>
<td>Average</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidant</td>
<td>Inconsistently completes assignments, requires repeated prompting, exhibits little comprehension of the value of the work</td>
<td>Either dominant in class or reclusive in participating, even when encouraged to do otherwise, and/or frequently absent</td>
<td>Sometimes disrupts the learning environment, occasionally late to class</td>
<td>After repeated suggestions, still does not implement needed changes</td>
<td>Inconsistently completes missed work, often late, requires repeated prompting</td>
<td>Avoidant, Annoying, Insufficient, Deficient, Detracting, Disengaged, Lacks Responsibility, Disingenuous…</td>
</tr>
<tr>
<td>Avoidant</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate</td>
<td>Shows little or no regard for preparing outside of class</td>
<td>Actively undermines learning environment</td>
<td>Regularly disrupts the learning environment, repeatedly late to class</td>
<td>Avoids seeking needed help, or those willing to assist</td>
<td>Does not complete missed assignments</td>
<td>Unacceptable, Deplorable, Destructive, Unsatisfactory, Damaging, Absent, Irresponsible…</td>
</tr>
<tr>
<td>Inadequate</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix J

My Mathematics Autobiography

As a middle and high school student, I hated Algebra I. If you looked at my high school transcripts, you will also see that I took Algebra I twice, once in eighth grade and again in ninth grade. I was originally scheduled to take Geometry as a freshman. I went to one Geometry class and felt very intimidated by the subject. I did not fail Algebra in the eighth grade, I just did not think I learned enough of it to do well in Geometry. So I asked my mother to change my schedule, and back to Algebra I, I went.

By the third quarter of the school year, the math department chair recommended to my mother that I take the Fundamental Geometry class instead of the regular Geometry class, because I barely made a low ‘C’ average. However, my mother looked in the student course selection book and determined that decision would create a snowball-effect that would impact the rest of my high school and college career. She saw that if I took the Fundamental Geometry class, I would have to take Fundamental Algebra II which did not include Trig; therefore, I would not be able to take Chemistry, because Algebra II and Trig were co-requisites. Further, I would not be able to take Physics, because I had not taken the prerequisite, Chemistry. When my mother refused to allow the school to track me into Fundamental Geometry, the math department chair asked my mother sign a waiver releasing the school from responsibility if I failed the regular Geometry class. All of this was based on my Algebra I grades. I was not failing the course, but I was close. At the end of third quarter I received a 70%, and a 69% was an ‘F’. My mother signed a waiver, and I was scheduled for regular Geometry. I loved that class, and my teacher. She was fresh out of college, and she cared about whether I learned the material. She was always available to help me before or after school. There was something about the subject, too. I mean, I loved solving proofs. I was very good at it, but I hated solving
equations. By the end of my sophomore year, I won the award for most improved student in my Geometry class. I went from an 80% ‘C’ first quarter to a 92% ‘B+’ fourth quarter. I loved my teacher so much, I wanted to stay with her next year, but she taught Honors Algebra II. The honors class was accelerated and this meant I had to go to a local community college to take a college algebra course to be able to enroll in her class in the fall.

Again, if you looked at my high school transcript, you will also notice that I struggled with Algebra II. I had to catch up, because the Honors Geometry students were ahead of me, and the Honors Algebra II class I wanted to take was actually the beginning of Pre-Calculus. Despite taking the class at the community college, it did not take long before I fell behind. Although I made a ‘C’ at community college, my skills were just not where the Honors students’ skills were. By the end of the second quarter, I was failing and so I transferred into the math department chair’s regular Algebra II class. I was there for four days before I took the first test in her class, and failed it. I have never forgotten the huge ‘43% F,’ along with the words, “You should know this already,” written on my test in red ink. My self-esteem took a huge beating, and once again I asked my mother to transfer me this time into the Fundamental Algebra II class. Again, I took a short five question quiz the first week, and received a seventy percent which was the lowest ‘D’ and again I felt like a failure. My frustration with mathematics grew and I had enough of the struggling and failing grades. This time I asked my mother to withdraw me from the Catholic high school, because I could not find any success with mathematics. It did not matter if it were an honors, regular or fundamental course, I was failing or barely passing them all.

In the urban public high school I transferred to, I finally found success in Algebra II and Trigonometry, and received an ‘A.’ However, Pre-calculus was a totally different story. I worked a great deal of late evenings and I fell asleep in class as a result. Again, I fell behind in
class. I cut class on the day of my Pre-Calculus exam, because I thought taking it was a total waste of time. I accepted the fact that I had an ‘F’ long before the exam, and taking the exam was not going to change anything. I ended up taking Pre-Calculus three times if you count my first semester of college. I barely passed with a ‘D’ and my college math placement test placed me right back into it again. What people really do not know about me is that Geometry was the only class I never had to retake and I completely understood the first time around. It was my favorite class as a student and that is probably why it is my favorite subject to teach.

Once I started teaching my own classes, I noticed my students consistently exhibited avoidant and resistant behaviors, such as cutting class, not completing assignments, not bringing necessary supplies such as a book, pencil or paper to class, not asking for help when they need it, and their grades suffered because of it. I also noticed that my own experiences as a student still impact my teaching praxis. First, I do not use red ink if I can avoid it when grading papers, especially tests. Second, I do not put negative comments on student papers. I realize that sometimes the grade by itself is enough. I do not want to kill a students’ self-esteem in mathematics. One of the ways I decided to combat this is to allow various types of test corrections for partial credit. As a graduate student in an Educational Research and Statistics class, my professor allowed a retake for each of his four exams. The tests were not the same, but it was just that the opportunity was given that made an impact on me. For the first time in my academic career I was allowed a second chance to improve my grade. So I give my students this same opportunity, because I want them to improve their grades. Third, if I am bored with what I am teaching, I figure my students are too, and I try to change my instructional delivery. The taking notes and lecture method did not work for me, but that was how I was taught in high school and in college. I recognized as a teacher reflecting on my experiences that lecture or
direct instruction seems easier to plan and to teach, but I did not learn best this way. So I figured my students probably will not learn best this way either. So I had to find other ways to teach mathematics to them.
Tamra C. Ragland

Doctoral Candidate, Ed.D., Curriculum and Instruction
University of Cincinnati, Cincinnati, Ohio, June 8, 2012
Dissertation title: Don’t count me out: A feminist study of African American girls’ experiences in mathematics

M.Ed., Classroom Teacher: Secondary Certification
Wright State University, Dayton, Ohio, 1993-1994

B.A., Mathematics
Kentucky State University, Frankfort, Kentucky, 1987-1992

CURRENT POSITION
Assistant Professor, Mathematics Education, Central State University, August 2009 – present

FUNDED GRANTS


Ragland, T. (2011, Mar 8). Title III Faculty Development Proposal, $1,163.00.

Ragland, T. (2010-2011). If I were the teacher: African American students’ classroom perceptions and attitudes in mathematics, ADVANCE: LEADER Internal Mini-Grant, $3,134.00.

Ragland, T. (2010, Summer). If I were the teacher: African American students’ classroom perceptions and attitudes in mathematics, University Research Council Graduate Student Research Fellowship Program Grant, $3,000.00.

PUBLICATIONS
INVITED BOOK REVIEWS


Ragland, T. C. (1998). How to use cooperative learning in the mathematics class [Review of the

**OTHER RELATED PUBLICATIONS**


**REFEREED PRESENTATIONS**


Ragland, T. (2011, April). *If I were the teacher: African American girls’ classroom perceptions and attitudes in mathematics*. Presentation at the University of Cincinnati Spring Research Conference, Cincinnati, Ohio. (Also presented at the Central State University College of Arts and Sciences Colloquium, April, 2011).


**INVITED PRESENTATIONS**


**CONSULTING**


McBeath, G. and Ragland, T. (Nov. 1999). Identified, evaluated, the needs of students in the Cleveland Ohio State Young Scholars program as needing significant mathematics remediation.

**ACADEMIC HONORS, AWARDS, AND SCHOLARSHIPS**
University of Cincinnati Graduate Scholarship, 2002 – 2010
Lillian C. Sherman Scholarship, University of Cincinnati, 2009 – 2010
National Science Foundation GK-12 Fellowship, University of Cincinnati, 2002-2004
Priscilla Bolds Scholarship, Wright State University, 2000
Radioshack/Tandy Scholars: Outstanding Math Teacher, Colonel White High School, 1999
Western Ohio Education Association Scholarship, Wright State University 1995
Superintendent’s Award for Excellence, Dayton City Schools, 1995

TEACHING
NATIONAL BOARD CERTIFICATION
Adolescent and Young Adult Mathematics (ages 14-19)

LICENSURE
Lead Professional, Mathematics (grades 7-12)

UNIVERSITY TEACHING
Central State University
Curriculum and Instruction: Math & Science (ECE 3315), Spring 2010, Fall 2010, Spring 2011, Fall 2011; Spring 2012

Mathematics Methods (Grades 7-12; EDU 3362), Fall 09; Spring 2010; Fall 2010; Spring 2011; Fall 2011. Spring 2012

Math & Science Methods (Grades K-12, EDU 3775), Co-taught with Science Education professor: Fall 2009; Spring 2010; Fall 2010; Spring 2011; Fall 2011

Mathematics Methods for ECE (Grades PK-3), Spring 2012

Geometry for Teachers (MTH 3000), Spring 2010; Summer A 2012

Wilberforce University, Wilberforce, Ohio
Methods of Research and Analysis (OM 320) June 2009

Antioch McGregor (nka Antioch University Midwest), Yellow Springs, Ohio
Methods of Secondary Education: Curriculum, Teaching, and Assessment-Mathematics (AYA 541), Fall 2006, Fall 2007

Methods of Middle Childhood Education: Curriculum, Teaching, and Assessment-Mathematics (MCE 541), Fall 2007

Educating Diverse Students, (ECE 522-05), Fall 2007

University of Cincinnati, Cincinnati Ohio
Instructional Planning, (SEC 511), Autumn 2002

Wright State University, Dayton, Ohio
Elementary Algebra (MTH 105), Fall 1997, Fall 1998

Sinclair Community College, Dayton, Ohio
Math in the Modern World, (MAT 108), Fall 1994

PUBLIC SCHOOL EMPLOYMENT
Belmont High School, Dayton, Ohio, Algebra I 2008-2009

Algebra I, Algebra II, Precalculus

Fairview Middle School, Dayton, Ohio, Mathematics Coach, 2006 - 2007
▪ Trained teachers to use OAT data to inform their classroom instruction which led to a 15% improvement in 8th grade test scores and a 10% improvement in 7th grade scores within one year
▪ Co-lead facilitator training eighth grade mathematics teachers district-wide to teach the Connected Mathematics Program and modeled appropriate teaching strategies as the in-house Mathematics expert
▪ Facilitated math committee work at school/district level
▪ Wrote the district curriculum guide for eighth grade mathematics using the Connected Mathematics Program

State of Ohio & Dayton Public Schools 2005 - 2006
Teacher on Loan
▪ Co-lead facilitator to implement mapping mathematics curriculum to Ohio Academic Content Standards
▪ Trained mathematics teachers in content and pedagogical strategies as a Geometry OMAP facilitator
▪ Trained teachers to use OGT data to inform their instruction

Meadowdale High School 2004 - 2005
High School Curriculum & Instruction Coach
▪ Analyzed and interpreted data to inform intervention strategies for teachers for the Ohio Graduation Test that resulted in the school moving from ‘Academic Emergency’ to ‘Continuous Improvement’ status by meeting Academic Yearly Progress
▪ Assisted educators with using data to make thoughtful pedagogical decisions and model appropriate teaching methods
▪ Encouraged teachers to reflect on their practices, take risks, and grow professionally
▪ Motivated colleagues to move from a directive teaching model to one that values authentic dialogue with students
▪ Facilitated adolescent literacy training for teachers to improve reading across the curriculum

Approved 2-year leave of absence for education from Dayton City Schools 2002 - 2004

Belmont High School 2001 - 2002
Mathematics Teacher: Algebra I, Transition to College Math
Mentored pre-service and in-service teachers as a cooperating instructor for the University of Dayton and Dayton Public Schools, respectively
Trained Algebra teachers at the district level in content and pedagogical strategies

**Fairfield City Schools**  
**Fairfield Senior High School**  
*Mathematics Teacher: Integrated Math II, Algebra IA, Geometry B, Algebra IIB*

2000 - 2001

**Kettering City Schools**  
**Kettering Fairmont High School**  
*Mathematics Teacher: Plane Geometry, Algebra II*

1999 - 2000

**Colonel White High School**  

1997 - 1999

Mentored pre-service teachers as a cooperating instructor for the University of Dayton
Developed teacher improvement plan utilizing feedback surveys and audio/videotapes

**Dayton Power and Light**  
*Generation Dispatcher*

1996 - 1997

Managed computer system for optimal regional electrical output

**Dunbar High School**  
*Mathematics Teacher: Algebra I, Geometry*

1994 – 1996

**SERVICE**
**PROFESSIONAL**
Book Reviewer, NCTM, 1998-2003
Coordinator, Wright STEPP Program, Wright State University, 1994 – 1998

**UNIVERSITY**
Member, Task Force for Praxis I (PPST), Fall 2011
Coordinator, Adolescent and Young Adult Mathematics Program, Spring 2011-present
Committee Chair, Adolescent and Young Adult Mathematics Education Committee, Spring 2011
Advisor, Mathematics Education Student Association, Spring 2011
Member, Curriculum Committee, Spring 2011
Member, Honorary Doctorate Degree and University Calendar Committee, 2010-2011
Member, Central State University Campus Climate Committee, 2010
Pre-Professional Skills mathematics test training for students, Fall 2011, Spring 2011
Principles of Learning and Teaching training, Spring 2011

**COMMUNITY**
Dayton Business Technology School, member of the Board of Directors
Bernard Harris/Exxon Mobil Webinar, Nov. 15, 2011
Dayton Regional STEM School Power Lunch, Nov. 9, 2011
Delta Sigma Theta Sorority, Inc., Empowering Males to Build Opportunities for Developing Independence (EMBODI), Co-chair & Member, 2010-present
Wright State TRIO panelist for Career Day, May 2010

PROFESSIONAL MEMBERSHIPS
National Council of Teachers of Mathematics
Ohio Council of Teachers of Mathematics
Psychology of Mathematics Education-North America
American Education Research Association