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Mathematically Talented Black Women of Spelman College, 1980s-2000s

Morgin Jones Williams

ACCEPTANCE

This dissertation, MATHEMATICALLY TALENTED BLACK WOMEN OF SPELMAN COLLEGE, 1980s–2000s, by MORGIN JONES WILLIAMS, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Philosophy, in the College of Education and Human Development, Georgia State University.

The Dissertation Advisory Committee and the student's Department Chairperson, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty.

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Morgin Jones Williams

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MATHEMATICALLY TALENTED BLACK WOMEN
OF SPELMAN COLLEGE, 1980s–2000s

by

MORGIN JONES WILLIAMS

Under the Direction of Dr. David W. Stinson and Dr. Stephanie Behm Cross

ABSTRACT

Women of color in general and Black women in particular who pursue undergraduate and graduate degrees in mathematics are nearly invisible in the mathematics education research literature (Borum & Walker, 2012). The majority of research published in the mid-to-late twentieth century that explored the mathematics education of women was limited not only by failing to explore the unique mathematical experiences of women of color but also by employing quantitative methodologies in positivist frames (see, e.g., Benbow & Stanley, 1980; Fennema & Sherman, 1977; Hyde, Fennema, Ryan, Frost, & Hopp, 1990). Therefore, the purpose of this narrative inquiry project was to come alongside Black women who earned an undergraduate degree in mathematics and conduct an inquiry into their mathematics teaching and learning experiences. Specifically, the study explored the life and schooling experiences of mathematically talented Black women who attended Spelman College from the 1980s to 2000s.

While theoretical and methodological elements from both Black feminist standpoint theory (e.g., Collins, 1986) and womanist theory (e.g., Phillips, 2006) have framed my thinking, in the end, both theoretically and methodologically, narrative inquiry grounded the project, affording my participants (and me) the opportunity to tell stories of their (our) mathematical experiences. Initially, three central questions guided the research: (1) What were the life and schooling experiences of Black women who pursued their undergraduate degree in mathematics

at Spelman College from the 1980s to 2000s? (2) How did larger socio-historical and -cultural contexts and life experiences (on and off campus) affect their image of themselves as mathematicians? and (3) How did relationships with other Spelman students, faculty, and staff influence their short- and long-term goals in the field of mathematics? As I employed narrative inquiry and developed my research puzzle, I focused on particular moments in my participants' mathematical lives—their sacred stories—identifying common threads across experiences. I share my participants lived experiences in the hope that readers will engage in "resonant remembering" as they "rethink and reimagine" relationships and "wonder alongside" my participants and me (Clandinin, 2013, p. 51). My participants' stories highlight the importance of familial support and influence on education, the role and academic experience of Black women mathematics majors, and mentorship of caring faculty and staff and positive peer relationships. Implications for mathematically talented Black women are discussed.

INDEX WORDS: Black women, mathematics, undergraduate education, undergraduate mathematics education

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DEDICATION

I would like to dedicate this dissertation to my loving husband, Samuel, and my children, Jaiden and Samantha. Thank you all for your inspiration, patience, and taking this journey alongside me. I would also like to dedicate this dissertation to my family. I am truly grateful for your guidance and support. And to my beloved mother, thank you for being my guardian angel.

LIST OF TABLES

CHAPTER 1
BEING BLACK AND WOMAN IN MATHEMATICAL SPACES

This chapter describes stories of my past personal and academic experiences and how they have led me to inquire about the undergraduate education of mathematically talented Black women. I write about personally historic moments in my life that have shaped and shifted my thinking, and filled me with a passion to conduct research related to Black women's mathematical experiences. In my narrative account, I reveal stories from my undergraduate tenure at Spelman College and graduate student experiences at Hampton University and University of Maryland, Baltimore County (UMBC). These academic stories show the peaks and valleys of my educational journey, and complexity of being a Black woman mathematician. My narrative account then details stories of my experiences entering and leaving the field of teaching, and beginning my second doctoral program at Georgia State University (GSU). In what follows, I discuss the significance and impact my graduate school experience had on my conceptions of Black women's pursuit of mathematics. By sharing stories of my mathematical experiences, my hope is that readers understand why I am drawn to research involving mathematically talented Black women and realize the need for more inquiry projects such as the one presented here.

From the moment I arrived on the campus of Spelman College, I knew I'd come to the right place at the right time in my life's journey. After losing my mother at the age of 16 to a rare autoimmune disorder, I developed a strong desire to attend a majority-Black institution outside my home state of Virginia. Having been raised by parents who graduated from historically Black colleges and universities (HBCUs), and heavily influenced by my sister who shared the same experience, I knew, at an early age, I would also seriously consider attending. Because my father

and sister's alma mater, Hampton University, was a short drive from our family home, we attended their football and basketball games for as long as I can remember. I particularly enjoyed watching the school's marching band perform during halftime and on the sidelines, and seeing all the Black sorority and fraternity members wearing their paraphernalia and scores of people sporting their newly purchased Hampton apparel. Because my parents exposed me to the culture of HBCUs throughout my adolescent years, I looked to forge my *own* path at a majority-Black institution. But because there were too many memories of my mother and me in the Hampton Roads area, I hardly wanted to attend an in-state college. Being afforded the opportunity to participate in the Early College Program at Spelman College the summer before my senior year helped me discern exactly what I was looking for in an undergraduate instiution. My family told me they knew Spelman was a clear frontrunner from the very beginning, especially during application season. Upon receiving formal confirmation of my acceptance, my decision was solidified. There was no doubt it would become my new home away from home.

Even with fear of the unknown, I ventured 500 miles south of my family, friends, and accustomed lifestyle to begin the undergraduate phase of my academic journey. My decision to deviate from the norm and attend an out-of-state institution couldn't have been more satisfying; it was at Spelman that I discovered my intense passion for mathematics. Focusing my time and energy on learning and understanding mathematics helped me cope with the grief related to my mother's death. My undergraduate student experience at Spelman aided me in attending to and overcoming my feelings of sadness and pushed me to start living again. I remember, for example, the very day I became a Morehouse College Cheerleader. I exuded happiness and self-confidence that day—emotions I had not felt in quite some time. Making the cheerleading squad as a freshwoman meant so much to me because it was my mother who first introduced me to the

sport. She put me in cheerleading along with my older sister at a young age. Because I wanted to do everything my sister did, I stuck with it; I even cheered a couple of years in high school. I loved cheerleading because of the camraderie with other squad members. After my mother died, I realized how much I wanted that camraderie again. I never thought I'd actually make a college cheer team, but I thought to myself, there was no harm in trying out. When I found out I made it, I was completely overjoyed. I no longer felt like I was resting in sadness all the time. Becoming a Morehouse cheerleader prompted me to take positive steps forward and live life with passion and excitement.

As an undergraduate mathematics major, I remember feeling a strong sense of belonging in the department, and in my peer group in particular. I was fortunate, in that I was always made to feel like a valued member whose contributions were appreciated. I worked tirelessly alongside my peers to make sense of difficult mathematical concepts in upper-division courses. There were times when we stayed up all night to finish our problem sets and prepare for quizzes and end-of-course examinations. When we became upper classwomen, the majority of us served as tutors in the Math Lab. We were such a tightly knit group that we studied and talked mathematics even when we were not scheduled to work. The Math Lab was a place where we shared highs and lows. I remember several instances, when we all studied hard for an examination, but still received a failing grade in return. Individually and collectively, we were devastated. We were baffled by our examination score, and wondered how we might support each other, academically and emotionally, to push through to the end of a very tough semester. Thinking about the ongoing camaraderie amongst my peers back then, and the ways we encouraged and cared for one another throughout the duration of our undergraduate program makes me incredibly proud, but a bit misty-eyed at the same time. I miss my close friendships

with the ladies in my peer group because I never felt in competition with anyone, and I know that's a rarity. I have sadly come to realize that it is not that way everywhere. We truly believed in lifting each other up and keeping each other focused on completing our bachelor's degree.

During my tenure at Spelman, I became very acquainted with professors in my department. Because I changed my major from biology to mathematics with a pre-medicine concentration at the end of my freshman year, I remember scheduling several advising appointments to discuss the best course of action regarding completing the remaining course requirements for my degree. Professors' enthusiastic support and guidance showed me they were interested in and cared about my academic pursuit. They wanted me to complete my undergraduate coursework as much as I wanted to become a successful mathematics major. I was never afraid to ask faculty for advice, and almost always consulted them any time problems or issues arose. It seemed like, the more I confided in them about personal and academic matters, the more I allowed their wisdom to guide my thoughts and actions during my undergraduate career.

I cannot accredit my professors, however, for my total individual and academic transformation. They were instrumental in my development but other situations, too, represent a bit of a defining moment for me as well and have helped to mold my personal and professional knowledge landscapes (Connelly & Clandinin, 1995). One such moment stirred up my passion for mathematics—I am speaking of when I learned I would become a mother during my junior year at Spelman. Although I'd come to appreciate its rewards, I recognized that it would be one of my life's most challenging experiences. So after completing my junior year, I decided to take a leave absence from school for both my unborn child and to rededicate myself to my studies. While I was away from school for that year, I took time to reevaluate my current situation,

refocus for that which was possible in the future, and, ultimately, realize that I could, in fact, still become a highly successful mathematician—only if I believed in my own capabilities and strength of mind.

When I returned to school, I experienced yet another shift in my personal and professional identities. My goal then was to be the best mother I could be to my son Jaiden (who by this time was in Atlanta with me), complete my undergraduate mathematics degree, and use my experiences to motivate others. At the close of my senior year, I realized that despite having overcome several odds, there was still more to do; so after graduating in 2006, I applied to a master's program in Applied Mathematics at, ironically, Hampton University (HU)—my entire family, was, of course, ecstatic, and convinced that I really wanted to graduate from Hampton all along.

While at Hampton, I worked as a graduate research assistant at the HU Center for Fusion Research and Training studying controlled thermonuclear fusion and nonlinear dynamics, which was supported by the United States Department of Energy. I conducted fusion research for my master's thesis under the direction of Dr. Alkesh Punjabi. My first impression of Dr. Punjabi was that he was highly intelligent and knowledgeable, especially when it came to this area of research, but I wondered if he could guide and support my learning throughout my graduate tenure, being that I didn't have any expertise or extensive research experience. Looking back, I guess I was skeptical of his ability to "break down" difficult to understand fusion concepts. But my skepticism ended the moment we sat down to discuss his research. The very first time we met, I was comforted by Dr. Punjabi's enthusiasm with regard to advising me and the challenging work that lied ahead. He demonstrated a willingness to elaborate on every aspect of controlled fusion research, and assured me that once I learned the basics, we'd work very hard,

both collaboratively and independently to further the center's research efforts. From then on, I knew he and his closest collaborator, Dr. Halima Ali, were there to support me, and keep me energized and focused on my master's research project. Once Dr. Punjabi loosened his grip on and allowed me to take some control over my research project, I became increasingly confident in my ability to conduct scientific research and make a contribution to the field. I felt amazingly fortunate to be working alongside them.

Because my graduate program was relatively small, I found myself spending the majority of my time with two master's students who worked at the center. They too, were pursuing their degree in applied mathematics and being taught and mentored by Drs. Punjabi and Ali. I can still recall taking all my graduate-level courses with them, and teaming up to complete homework assignments and prepare conference presentations; but most of all, I remember the days we spent together in the center's small computer lab adjacent to Dr. Punjabi's office, writing Fortran code and running programs to advance the work on our final thesis project. The invaluable skills and lessons learned at the center expanded my thinking and eventually prompted me to consider pursuing a Ph.D. degree.

While enrolled in Hampton's master's program in applied mathematics, I was fortunate enough to attend the 2007 Infinite Possibilities Conference (IPC) in Raleigh, NC. It was there that I met Dr. Susan Minkoff, a professor who worked in the Department of Mathematics and Statistics at UMBC. I happened to make her acquaintence at a conference session packed full of interested attendees. She was standing quite some distance from me, on the other side of the room, but I managed to make my way over to her, introduce myself, and talk a bit about my master's work. I could tell from our conversation that afternoon, that she took an interest in my future in the field of mathematics, and, for that I will be forever grateful. After the IPC, Dr.

Minkoff and I were in constant contact with one another and soon afterwards I began the application process at UMBC. My decision to apply to a doctoral program did not come easy—I had to take into account my son, not to mention the fact that I'd be leaving an incredibly dedicated support system back home—still, I decided the best move for me, and ultimately Jaiden, would be to continue my studies and become apart of the UMBC family.

When Jaiden and I relocated after my master's graduation, I thought we would be living with close family friends in Columbia, Maryland for several years due to my decision to pursue a doctoral degree. From the moment I arrived on UMBC's campus, I was convinced that I'd join an elite group of Black women who have earned their doctorate in mathematics. Although I had not attended a predominantly White institution (PWI) before, I believed the University's faculty, staff, and students would aid me in navigating my first year as a doctoral student. But much to my surprise, my doctoral student experiences at UMBC were exceptionally difficult for reasons I did not expect. I was the only Black woman pursuing a Ph.D. degree in applied mathematics. Unlike my HBCU experiences, I was constantly confronted with issues of injustice and treated differently than my White counterparts. I remember being particularly angered one day around the time my peers and I were frantically trying to finish up a problem set before class. We were all crowded around one mid-sized table in the hallway, each trying to find space to write down step-by-step explanations of our solutions. As we worked diligently to complete our homework, my White male classmate who'd already finished his homework approached us. He began to question why we were "struggling" and pointed out issues with our homework. The majority of us simply acknowledged his presence and proceeded to pack up our belongings. But before I could gather all my belongings scattered about the table, this White male student turned to me and said, "You can't 'do' mathematics." I was completely stunned. I stood motionless in the

hallway for what seemed like a lifetime. I did not have the words to articulate my emotions or express my distaste for his comments. After that unexpected encounter with him, I always felt like an outsider looking in. There was an obvious disconnection from my department, and Ph.D. program in particular. Looking back, I can see now that this was one of the central stories of my academic history I was telling others, and myself, and this became a story to live by. Although it was a deeply disturbing experience, it continues to offer me insight into the treatment of Black women in the mathematical arena.

By the end of my first semester, I had mentally checked out. Upon returning home for the winter holiday, I spoke to my father about withdrawing from graduate school—but he coaxed me into staying the entire academic year. When we spoke, he reminded me of a lesson he taught me as a youngster. Whenever I wanted to quit a sport or activity, my father would always tell me, "Quitting is not an option." He prompted me to remember this lesson in that moment because he didn't want me to regret my decision later; he didn't want me to give up on myself. He fully expected me to return to school and finish what I had started.

When I returned that spring semester, I made a valiant effort to negotiate my unjust teaching–learning situation at UMBC, but to no avail. After my classmate made that hurtful comment, I severely doubted my mathematical talents. I always felt like I was perceived as inferior to those around me. And I realized, I did not have the time or energy to prove my worth. It became very apparent to me that it'd be much too difficult to continue my doctoral studies at UMBC. Because I felt doubtful about my future at the school, I began having serious conversations with family back home regarding my options. I considered both withdrawing and taking a leave of absence. Because a leave of absence meant I could retain my graduate student status if I changed my mind (which I never thought would happen, but you can never be too

sure), it seemed like the best option for me. After my leave of absence form was filed, it was official. My stint in Maryland had come to a halt.

After completing one academic year at UMBC, I moved back to Atlanta with Jaiden, who was now 4 years old, to join my then soon-to-be husband, Samuel. Once we were back in town, I immediately began teaching undergraduate mathematics courses at Spelman. I taught at my alma mater for 4 years on both a full- and part-time basis. While there, the mathematics faculty helped me cope with and try to make sense of what I experienced at UMBC by offering a listening ear and sharing their own stories of experience. There were particular members of the faculty who thought it was imperative that I continue my pursuit of a doctorate degree. They hoped I would embark on another doctoral journey. Although it was unspoken, I knew faculty members didn't want me to get too comfortable in my teaching position. I would like to think it was because they really wanted me to pursue a Ph.D. degree and less about their reputation. I remember faculty urging me to apply to graduate school. Once I researched doctoral programs and made the decision to leave teaching, I suddenly became overanxious and fearful. Leaving the teaching profession was among the most difficult decisions I ever had to make because of all the financial, emotional, and educational risks, but indeed, the time had come for me to move on. I just hoped graduate school would better suit me "the second time around."

I chose to continue my doctoral training at GSU. I pursued my Ph.D. in the Teaching and Learning with a concentration in Mathematics Education degree program. My decision to attend graduate school was important because it affected my family. Fortunately, they enthusiastically championed my efforts. My husband, Samuel, has always been, and still is, my biggest supporter. When I first mentioned I was considering graduate school again, he expressed his belief that he was confident I'd achieve my dream of obtaining a doctorate degree. His words of

encouragement inspired me, and ultimately pushed me toward that dream. Jaiden, my son, always showed he cared by offering me love and affection. They were a dynamic duo, for sure.

Looking back, it seemed my family's confidence in me was far greater than the confidence I had in myself. I leaned on them heavily for support during my first semester at GSU. Because I hadn't taken any graduate courses since my stint at UMBC, I was incredibly nervous. I was particularly nervous about an online course that required me to engage course material and take a 10-question quiz each week. My first low score sent me into a panic. It prompted me to ask myself whether I was ready to embark on a new doctoral journey. Feelings of inadequacy flooded my mind. I thought if I am already failing a 10-question quiz, there was no way I would survive coursework. But I soon realized I just needed to calm down and continue listening to my family's encouraging words. Those quiz errors were not indicative of my overall performance in the program. It took time, but my family convincingly reassured me that leaving Spelman and pursuing my academic dreams at GSU was indeed a smart idea.

I shared my affinity for my alma mater with all those who'd listen upon arriving on the campus of GSU. After much talk about my undergraduate (and graduate) experiences during my first and second year in the program, I believe Dr. Stinson, my doctoral advisor, and cohort peers began to realize how special Spelman and its accomplished undergraduate mathematics program really was. Sharing stories of my academic experiences incited questions, and those questions helped me hone in on my dissertation topic focused on mathematically talented Black women. I remember, for example, a specific conversation with Dr. Stinson that really aided me in conceptualizing my dissertation research project. In that conversation, he explained why he felt I wanted to conduct research on Black women in the undergraduate mathematics arena. He told me this research project meant so much to me because I not only wanted to examine the

experiences of Black women who graduated with their bachelor's degree in mathematics, but also wanted to find the language to talk about what happened to me at UMBC. And he was right.

Throughout my doctoral education, I delved further into the social science research process, studying the role of theory and methodology. In the midst of coursework and "trying out" different qualitative methodologies, I began to read deeply into the literature on Black feminist standpoint theory. I was drawn to the theory because, according to Collins (1989), it attends to the incessant triple oppression in Black women's lives. The intersectional nature of Black women's oppression highlights the great complexity of their experiences and identities (Harnois, 2010). And at the time, I looked for a theoretical framework that could explain the complicatedness of Black women's pursuit of mathematics, especially my pursuit of a Ph.D. degree at UMBC. In my dissertation research project, I had hoped to employ a framework that valued Black women's experiences, regarded them as knowledge producers (Collins, 1986), and challenged the master narrative regarding their participation in mathematical spaces. Much like Banks (2009), I believe that "Black women undergraduates are intellectual authorities on their diverse school experiences, and their input is necessary to combat the inequities faced in their college lives" (p. 10). I have always been of the belief that Black women occupy a unique standpoint from which they share wisdom and understanding of the world around them, and ironically; this is one of Black feminist standpoint theory's core tenets.

I thought then that I had found the most appropriate framework for my dissertation research. Employing Black feminist standpoint theory seemed as if it would allow me to focus my research on the experiences of Black women who pursued their undergraduate degree in mathematics and add to the body of mathematics teaching and learning literature at the same time. Although I wasn't convinced that there was a single Black feminist ontology and grappled

with the fact that there were multiple ontologies as it relates to Black women, I fully intended to conduct qualitative research that revealed truth about their academic lives (Kirsch, 1999).

Around the time I took my comprehensive examination, one of my committee members, Dr. Joyce King, introduced me to another theoretical framework for Black women called womanism. When I began immersing myself in the literature, I was drawn to the way Phillips (2006) defined womanism:

> Womanism is a social change perspective rooted in Black women's and other women of color's everyday experiences and everyday methods of problem solving in everyday spaces, extended to the problem of ending all forms of oppression for all people, restoring the balance between people and the environment/nature, and reconciling human life with the spiritual dimension. (p. xx)

After breaking down and gaining better understanding of her definition, I almost could not believe that this social theory also recognizes the wisdom embedded within Black women's experiences. It speaks to the capacity of Black women to enact change in their communities and improve social conditions for all humanity. I remember being filled with excitement because that was the kind of lasting impact I had hoped my dissertation research project might inspire. Phillips used some distinguishing characteristics to describe womanism that resonated with me, including "antioppressionist," "nonideological," and "spiritualized." Because the womanist perspective is concerned with liberating all people despite the pervasiveness of oppression in the social world and operates without a fixed set of theoretical constructs, I felt encouraged that this framework might align with my research project, too. I particularly liked that it is deeply connected to the spiritual realm. But, I thought, "Which one should I choose, Black feminist standpoint theory or womanism?"

In the literature, scholars have compared Black feminist and womanist theories. Phillips (2006) claimed that the two perspectives were fundamentally different with regard to issues of oppression. It was said that Black feminism highlights particular dimensions of oppression experienced by Black women such as race, class, and gender, whereas the womanist perspective places an emphasis on all aspects of women's oppression (Phillips, 2006). Moreover, Collins (2001) argued that Walker, a Black woman writer of poetry and novels who originated the term "womanist," offered two different definitions of the word. She said: "Walker clearly sees womanism as rooted in black women's concrete history in racial and gender oppression," but also "implies that black women are somehow superior to white women" (p. 10). Collins claimed the latter sentiment is what actually sets Black feminism apart from womanism, suggesting that "black women are 'womanist' while white women remain merely 'feminist' " (p. 10). She believed Black Nationalist ideals shaped Walker's interpretation of the womanist perspective. However, Phillips emphasized and maintained that, although womanism is rooted in the experiences of Black women, any person can take on the womanist perspective providing one's cultural and ethnic background are brought to the fore. After initially making those comparisons, I felt like completely abandoning Black feminist standpoint theory because it seemed to me that womanist theory considered women's oppression in a holistic way and was accessible to scholars and lay people alike. I worried that if I employed Black feminist standpoint theory in my research, it might be frowned upon in certain scholarly circles because of its ties to Hegel and Marx. This tension left me in a state of complete confusion. I had much difficulty choosing one theoretical framework.

After some time, I finally made the decision to employ an "eclectic" theoretical framework (Stinson, 2009) consisting of Black feminist standpoint theory and womanist theory

to understand the undergraduate experiences of mathematically talented Black women. I came to this decision after conversation with Dr. Stinson. I believed combining elements from both Black feminist and womanist theories in conjunction with a methodology might provide fertile ground for my participants' storytelling. Although I had reservations about employing Black feminist standpoint theory because of its historical connections, I believed it would help me make sense of Black women's life and schooling experiences.

As a Black woman scholar, I did not feel completely comfortable challenging the Eurocentric agenda by using an eclectic theoretical framework. According to Collins (1989), "African-American women academicians who persist in trying to rearticulate a Black women's standpoint also face potential rejection of their knowledge claims on epistemological grounds" (p. 753). For this reason, I believed it was a real possibility that the stories of Black women's experiences in mathematics might undergo the same intense scrutiny. But I was firm in my decision to use a more interpretive framework, instead of a positivist approach to research.

While I was writing my doctoral dissertation prospectus, I began meeting regularly with a group of eight doctoral students and two early-career professors interested in conducting a narrative inquiry into the experiences of pre-service teachers participating in a multi-year teacher residency program. I joined this research team initially because I have a relationship with one of the early-career professors, Dr. Stephanie Behm Cross (who eventually became co-chair of my dissertation), but after we started meeting, I developed a curiosity for narrative inquiry methodology. I wanted to know more about the methodology because it held human experience in such high regard.

Coming together as a research team was far from seamless, but I made the decision to commit myself to the group. If I am being totally honest, I had concerns about becoming a group

member and conducting narrative research. Part of my uneasiness came from the fact that I didn't know the group's expectations of me, nor did I fully embrace the methodological approach at the time. Thinking back, I was reluctant to buy-in because of its personal nature. Narrative inquiry is considered to be a highly relational methodology, and I really like to keep my personal life private. It seemed to me that taking on this methodology meant crossing those lines. That being the case, I wondered, why I wanted to be part of this collaborative research venture, what we were actually there to do, and how this project coincided with my own research interests.

Ironically, after I delivered my prospectus presentation, my methodologist, Dr. Jennifer Esposito, suggested that I employ narrative inquiry in my dissertation research. I initially pushed back against the methodology, and was almost successful in convincing myself it was not a good fit for my work. But the more I discussed narrative inquiry with research team members and thought about how it might frame my study, the more I gravitated toward it. I did not want to admit it, but I knew I'd found the most appropriate methodological framework for my research wonderings… … … …

The complexity of the life and schooling experiences of Black women in pursuit of mathematics are rarely acknowledged or discussed in the literature. Using narrative inquiry to incorporate Black women's stories of their experiences into the mathematics teaching and learning literature might break the "silences" (Collins, 1991, p. 374), and reverse their invisibility in the field. Their capacity to "produce independent, specialized knowledge," not to mention "a different view of themselves and their world" (Collins, 1989, p. 750) ought to be realized and put forward. Their stories ought to be told authentically. Although there have been quite a few Black feminist and womanist scholars who have informed my thinking and impacted

my own academic experiences, I do not intend to use these theories as a lens through which to analyze my participants' mathematical experiences. These frameworks, as I've shared above, are a part of my story of experience—my journey to and through this dissertation—but do not drive this study. Instead, employing narrative inquiry made me realize that my participants' stories—our stories—in and of themselves, are enough. In the next chapter, I share the research backdrop, which is important for readers as we consider, together, stories of experiences of Black women at Spelman. In chapter 3, I then return to narrative inquiry, explaining it as both a narrative theory of experience and a methodology. Chapters 4 through 6, the heart of this dissertation, are my participants' stories of experience. I end the dissertation with a chapter on resonant threads across my participants' stories and a few "so whats" for the reader. As with all narrative inquiries, however, I leave the reader to consider what parts and pieces of this work really resonate … … …

CHAPTER 2
BLACK EDUCATION, MATHEMATICS TEACHING AND LEARNING, AND BLACK WOMEN IN MATHEMATICS

My dissertation research project inquired into the undergraduate experiences of Black women who majored in mathematics at Spelman College from the 1980s to 2000s. I provide research context for my project by chronicling historical moments related to Black girls and women's schooling and unpacking the complexities of their multi-layered teaching and learning experiences in the mathematical arena. Although my dissertation research focuses mainly on major moments of inquiry that have emerged in the American school system since the mid-to-late 20th century, it is of the utmost importance that the history of Black education be traced back to the antebellum period and discussed to highlight the stark reality for Black people living in slavery. In this review of literature, I examine the following four strands of literature: (a) the consequences of slave education, and the emergence and significance of the public education system and missionary-funded schools, (b) historic moments of mathematics education in the United States (U.S.) including the theoretical and methodological trends that have emerged since the 1960s, (c) the mathematics teaching and learning of Black women in higher education institutions, and (d) the establishment and development of Spelman and its decades-old mathematics department.

History and Experiences of Blacks in Education

The breadth of scholarship focused on Black education depicts transformative moments of inquiry in the history of Black people (see, e.g., Anderson, 1988; Vaughn, 1974; Watkins, 2001; Williams, 2005). I recount those moments beginning in the early part of the 19th century—as it was a period of time when "two contradictory traditions of American education emerged"

(Anderson, 1988, p. 1). On the one hand, there was a tradition of affluent White Southern children, afforded a multiplicity of educative opportunities and encouraged to develop strong literacy skills; on the other hand, there was a tradition of enslaved Black people, forbidden from not only participating in the education process, but also becoming proficient readers and writers (Anderson, 1988). Enslaved Africans were forced instead to engage in tiring, laborious work without compensation, which in turn produced an enormous amount of capital, boosting the nation's growing economy (Watkins, 2001). Because slave labor had such an impact on the South's economy during this time, formal education was practically nonexistent for people of African descent.

To ensure the pervasiveness of illiteracy amongst enslaved Africans, Southern lawmakers passed legislation with steep consequences to penalize those who were noncompliant (Anderson, 1988; Vaughn, 1974; Williams, 2005). Vaughn (1974) claimed, "Although every Southern state except Tennessee prohibited the instruction of slaves, many whites ignored these proscriptions until the 1830s" (p. 1). Engaging enslaved Africans in reading and writing instruction was not considered a high-risk threat by White Southern slaveholders initially because they thought it would increase productivity; likewise, missionaries believed it would acquaint enslaved Africans with the teachings of the Bible (Vaughn, 1974). However, once slave owners realized the ramifications of educating enslaved Black people, the majority "made every attempt to control their captives' thoughts and imaginations" (Williams, 2005, p. 7). Slave owners feared that if the enslaved became literate, they might initiate a revolt against them (Vaughn, 1974).

Restrictive laws did not dissuade Black people from pursing literacy opportunities within their slave communities. A number of enslaved Africans learned to read and write at "illegally operated private schools" (Vaughn, 1974, p. 2). Due to the severity of the sanctions imposed by

most Southern states, enslaved Blacks' literacy efforts largely remained invisible to their masters (Williams, 2005). Vaughn (1974) claimed, however, there were some instances when White slave owners still chose to aid enslaved Africans in their struggle to become literate. He maintained, the ways in which enslaved Blacks honed their literacy skills included the following: "some were taught by their masters or their master's children; others learned through contact with and observation of whites; some learned from other slaves whose achievements were unknown to their masters; and some taught themselves" (p. 2).

The Beginnings of Public Education

It was not until after the Emancipation Proclamation that significant strides were made in Black education in the South (Woodson, 1933/1996). In the years prior to the issuance of the proclamation, Anderson (1988) claimed, "a majority of the states had established public school systems, and nearly half of the nation's free children were already getting some formal education" (p. 2). Because the institution of slavery had impeded the progress of Black people in the educational arena, they had not yet experienced school in a free society. However, after the signing of the Emancipation Proclamation, those who remained steadfast to education began forging ahead. Emancipated slaves made a strong attempt to acclimate themselves to a bondage-free, capitalist world and gain equitable access to public education (Anderson, 1988). Their continued efforts were indicative of their commitment to the pursuit of empowering learning opportunities in formal settings.

In the midst of all the South's major changes due to the Emancipation Proclamation, "freed African Americans vehemently demanded schools for themselves and their children" (Thomas & Jackson, 2007, p. 359). After assuming political power in the early stages of the Reconstruction era, freed enslaved Blacks worked "with the uneducated poor whites in bringing

about certain much-desired social reforms, especially in giving the South its first plan of democratic education in providing for a school system at public expense" (Woodson, 1933/1996, p. 16). The plight of Blacks in the South instigated the formation of the Freedman's Bureau, a federally funded agency that worked in close cooperation with northern aid organizations to establish schools for thousands of children whose parents were former slaves as well as freed Black men and women who aimed to improve their quality of life (Anderson, 1988).

Northern Missionaries' Involvement

The influence of missionary organizations on the education of Black people became apparent during the Reconstruction period. Many of these aid organizations flocked to southern communities, under the impression that their presence was a necessity for newly emancipated slaves. Watkins (2001) stated, "Missionary societies were uniquely situated to provide the foundation for a system of Black education" (p. 15). Missionaries offered financial assistance and educational (and vocational) guidance to further the progress of the South's public schools, and to perpetuate their Eurocentric views and ideas. They traveled from the New England region "with the preconceived idea that the slave regime was so brutal and dehumanizing that blacks were little more than uncivilized victims who needed to be taught the values and rules of civil society" (Anderson, 1988, p. 6). In other words, northern missionaries were of the opinion that ex-slaves ought to engage in learning about Eurocentric-inspired norms and ideals as part of their educative experience. They firmly believed providing educational support of this kind would give them power to assert their authority over freed Blacks (Williams, 2005). But despite what missionaries originally thought, "former slaves were not passive, degraded human beings who simply sat awaiting enlightenment" (Williams, 2005, p. 42); instead, they emerged as proactive,

forward-thinking individuals whose mission it was to create educational opportunities for themselves.

Although freed Blacks aspired to drastically change their oppressive circumstances in the post-Civil War years, the South's political landscape considerably restricted their educational mobility (Watkins, 2001). It had been made increasingly clear that "they lacked the resources to achieve either education or their larger freedom" (Watkins, 2001, p. 22). Blacks were forced to accept the unjust hierarchical structure of southern society that left them void of resources—whether they agreed with it or not. While southern Whites possessed all the power and influence at the top of the hierarchy, former slaves found themselves trapped near the bottom. Williams (2005) claimed, "many southern whites…[looked] to 'teach' black people that emancipation had not freed them from perpetual roles as laborers" (p. 180). And indeed, this sentiment played out in reality as "industrial education" came to the forefront of Black education.

Missionary-Funded Schools

Northern missionary organizations financed the two most recognized industrial training schools designed to educate Black people (Allen & Jewell, 2002; Ihle, 1986a). Booker T. Washington, a staunch advocate for industrial education, established Alabama's Tuskegee Institute after General Samuel Chapman Armstrong, a highly skilled soldier and proponent of industrial training, founded Hampton Institute in Virginia during the last half of the 19th century (Allen & Jewell, 2002; Ihle, 1986a, Norman, 1961). These missionary-funded institutions shaped what teaching and learning looked like in schools for Black students. Hampton was referred to as a "manual labor school" (Watkins, 2001, p. 48); it sought to "provide instruction suitable for adjusting blacks to a subordinate social role in the emergent New South" (Anderson, 1988, p. 36). Washington's belief in the value of the Hampton model emboldened him to lead the same

kind of training program at Tuskegee. His endorsement of industrial schools not only helped to further missionaries' educative support of Black students but also sparked a historical ideological debate with W. E. B. Du Bois (Ihle, 1986a).

The differing perspectives of Washington and Du Bois permeated the landscape of Black education. On the one hand, Washington championed industrial education for Black people. He and his supporters thought this form of education afforded Blacks the opportunity to acquire practical knowledge and skills in segregated schooling situations (Ihle, 1986a). Washington acknowledged the fact that a select few might need a strong academic background to access the professional sphere, but still "thought that industrial training was suited for the majority of the race" (p. 2). On the other hand, Du Bois believed in liberal arts education for Black students (Ihle, 1986b). In "A New Approach to Negro Education," Norman (1961) wrote: "[Du Bois] felt there should be an education founded on training in things cultural. He hoped for a 'talented tenth', a real Negro intelligentsia or elite in the European sense of the word" (p. 39). Du Bois did not believe that labor should be regarded as the way of life for the American Negro; instead, he thought the American Negro ought to receive extensive academic training and become a strong, ambitious leader. Unfortunately, the implementation of industrial and liberal arts training programs prepared a small number of people of African descent for the workplace in the American South (Woodson, 1933/1996).

Missionary organizations founded a plethora of institutions, even after Congress discontinued the Freedman Bureau's efforts to aid Blacks students (Ihle, 1986b; Thomas & Jackson, 2007; Woodson, 1933/1996). The establishment of educational institutions for Black girls and women, in particular, began in the mid-to-late 19th century (Ihle, 1986b). Notable institutions for Black women include Barber-Scotia College, Bennett College, Tillotson College,

and Spelman College (Ihle, 1986b; Thomas & Jackson, 2007). While it is important to recognize Maria Becraft, Nannie Helen Burroughs, Mary McLeod Bethune, Charlotte Hawkins Brown, Susannah Bradshaw, Sarah Ann Dickey, and Mattie Booth for founding schools for Black girls and women, Anna Julia Cooper and Lucy Diggs Slowe should also be acknowledged for their commitment to the teaching and learning of Black female students (Collier-Thomas, 1982; Thomas & Jackson, 2007).

Educational Training for Black Females

An industrial training program would offer "home economics" (Ihle, 1986a) courses to its female student body. Female students engaged in training of this sort due to "their perceived future roles as wives and mothers" (p. 2). Ihle claimed students would receive basic domestic skills instruction to ensure they met the needs of their families. In general, young Black women's industrial education curriculum included "large amounts of training in housekeeping and morality" (p. 2). Leaders in industrial education incorporated such training into the curriculum to change people's perceptions about their purported "sexually promiscuous" (Ihle, 1986a) behavior and to prepare them for domestic work. Range (1951) agreed, saying that the majority of higher education institutions at the time focused on training college-level Black women to perform "household duties…through the usual necessities of school dining halls, kitchens, laundries, and buildings, and partly in classes" (p. 72). Those who developed college curriculum for Black female students believed that they were only capable of fulfilling the duties of a domestic worker; unbeknownst to them, these women were in pursuit of a much larger intellectual project.

History of Girls and Women in Mathematics Education

The historiography of the mathematics teaching and learning of girls and women in the mid-to-late 20th century bares multifaceted discourses focused on the interplay between gender, mathematics, and mathematics teaching and learning. Exploring the densely layered history of research in mathematics education brings "questions of sex and gender differences in mathematics ability, achievement, and career attainment" to the fore (Damarin & Erchick, 2010, p. 312). Major historic moments of inquiry in the mathematics teaching and learning literature have been inextricably linked to research studies of sex/gender and mathematics (see, e.g., Benbow & Stanley, 1980, 1983; Fennema, 1974, 1996; Fennema & Sherman, 1977, 1978; Fennema, Wolleat, Pedro, & Becker, 1981; Hyde, Fennema, & Lamon, 1990; Sherman & Fennema, 1977; Leder, 1980, 1990; Seegers & Boekaerts, 1996). This area of the mathematics education literature came to nearly a complete halt in the United States at some point in the late 1990s. There has been limited research in the 2000s, specifically employing different theoretical and methodological approaches to understanding gender-related issues in the field of mathematics within the United States (there are a few exceptions; see, e.g., Boaler, 2002; Boaler & Sengupta-Irving, 2006). While most U.S.-based researchers have refrained from pursuing gendered-related research, non-U.S.-based scholars conducting individual and/or collaborative research projects abroad have been publishing a multiplicity of studies (see, e.g., Mendick, 2005a, 2005b; Rodd & Bartholomew, 2006; Solomon, 2012; Solomon, Lawson, & Croft, 2011; Walshaw, 2001, 2005).

Gender in Mathematics Education Research

The terms sex and gender have largely been regarded as "synonymous" in education research (Glasser & Smith, 2008). It has been argued that the history of education research

shows researchers have not been providing a sufficient enough definition for the term gender as it has been taken to mean the designation as either male or female. The lack of clarity has caused the terms sex and gender to become blurred constructs in research involving gender and mathematics. Damarin and Erchick (2010) published an article explicating the significance of gender in mathematics education research. They recognized "that mathematics is involved in many understandings of what is meant by gender and that it is, therefore, important that mathematics education researchers take up these issues and address the use of gender specifically in mathematics education literature" (p. 310).

In past decades, a number of mathematics education researchers have used the term "sex differences" while others have employed the term "gender differences" in the reporting of their analyses (Caplan & Caplan, 2005; Damarin & Erchick, 2010). The mathematics teaching and learning literature on sex/gender differences grew during the postwar era as researchers "endeavored to locate the origin of the differences" (Reeves, 1992, p. 18) between men and women. With regard to research on sex/gender differences in mathematics education research, Damarin and Erchick (2010) wrote:

> Reducing discussion of gender to "sex differences" has the tendency to essentialize girls and women as singular in all characteristics and to eliminate attention to the ways in which gender and race come together in the lives of girls and women, particularly those who are not White and middle class. (p. 312)

In other words, using the term sex differences inhibits mathematics education researchers from examining the multidimensional nature of girls and women's learning experiences. The "reduction" of gender in the literature is especially problematic for girls and women of color in pursuit of mathematics. Damarin and Erchick noted, "If mathematics education research is to

promote equity for girls and women within multiple racial and ethnic groups, similar attention to the intersection of clearly defined constructs, including gender, is required" (p. 312). Ensuring gender equity in mathematics education for girls and women begins with a clear definition of gender itself and a thorough description of its use in research.

Because my review of the literature includes an analysis of numerous difference inquiries in mathematics education, I make a clear distinction between the terms sex and gender throughout this project. According to *The Dictionary of Feminist Theory* (1995), *sex* refers to "the biology of a person—whether he or she is anatomically male or female" (p. 256), whereas *gender* is "a culturally shaped group of attributes and behaviours given to the female or to the male" (p. 106). I define these terms, with the hope that, I bring more "clarity" (Damarin & Erchick, 2010) and meaning to this project.

"Difference" Inquiries in Mathematics Education

In the mid-to-late 20th century, mathematics education literature was inundated with difference inquiries. Scholarship on sex differences "covers a broad spectrum, beginning with differences between the sexes in attitudes and abilities, and research finding the origins of these in terms of sex-role socialisation" (Humm, 1995, p. 256). The bulk of research conducted on sex-related differences in the field of mathematics education examined biological differences between males and females in varied mathematical settings.

Researchers have been publishing large-scale difference inquiries that produce so called "generalizable" results for public dissemination. Leder (1980) claimed, "a careful reading of … [mathematics education] literature reveals an inconsistency of findings, with boys performing better in some studies and girls in others" (p. 411). The inconsistencies in the literature related to differences have contributed to the construction of a master narrative about the mathematics

teaching and learning of girls and women. Reeves (1992) made clear her concerns about difference inquiries in the literature:

> An interesting question which is rarely asked, at least explicitly in the mathematics education literature, is whether or not differences in the mathematical ability of males and females exist. Rather, researchers are busy trying to decide to what extent there is a difference, what causes it, and when it happens, assuming the difference to be real. (p. 15)

In agreement with Reeves, I believe difference inquiries have been conducted by researchers in the United States under the assumption that disparities exist between males and females. Peeling back the layers of mathematics teaching and learning highlights not only the extent to which difference inquiries examined male and female biological characteristics, but also promoted sweeping generalizations about female students' mathematical ability and performance.

Research in mathematics education questioned female learners' ability to perform mathematical tasks, and as a result, was studied relentlessly (see, e.g., Armstrong, 1981; Benbow & Stanley, 1980, 1983; Fennema & Sherman, 1977, 1978). The perceived intellectual inferiority of girls and women in mathematics served as a backdrop for much of the literature written in the second half of the 20th century (see, e.g., Boaler, 1997; Fennema, 1979; Kolata, 1980; Skypek, 1980), especially research studies focused on sex differences in mathematics (see, e.g. Benbow & Stanley, 1980, 1982, 1983; Fennema, 1974; Hilton & Berglund, 1974). Fennema (1990) candidly wrote about her perceptions of difference inquiries in mathematics education: "It appears that these studies have been based on the idea that females' [mathematics] achievement and beliefs about themselves should be compared to males'" (p. 1). After reviewing a large number of research studies, I also believe the majority of researchers examined the mathematical

learning capacity and attitudes of male and female learners in effort to pinpoint glaring differences between them. According to sex differences research (see, e.g., Glennon & Callahan, 1968; Maccoby & Jacklin, 1974), female learners had not achieved the so-called "male standard"—a standard by which girls and women's mathematical capabilities have long been scrutinized and evaluated (Eccles, 1986; Fennema, 1990).

As researchers continued to conduct sex differences research, Damarin and Erchick (2010) claimed, "the absence of universal agreement among scientists and others as to whether certain characteristics, including mathematical ability, are biologically determined" (p. 313) became apparent. Consequentially, a few researchers began examining the role of gender in shaping students' mathematical experiences. Studying gender-related issues sheds light on sociocultural factors affecting girls and women engaged in the teaching and learning of mathematics (Damarin & Erchick, 2010).

The majority of researchers have been conducting sex/gender differences research in mathematics education, employing a quantitative methodology within a positivist framework (see, e.g., Benbow & Stanley, 1980; Fennema & Sherman, 1977; Hyde, Fennema, Ryan, Frost, & Hopp, 1990). Much of this research in the mathematics education literature came to somewhat of an end in the late 1990s. Theoretical and methodological perspectives associated with difference inquiries have largely remained stagnant thereafter. Conducting difference inquiries using quantitative research methods "assume[s] that truth can and should be measured with statistical precision… [which] reduces[s] complex information to numbers and ignore[s] that which is difficult to quantify" (Rubin & Rubin, 2005, p. 23). While I believe using quantitative research methods in sex/gender differences research is a particularly important part of the mathematics education literature, I argue that it prevents scholars from digging into the crux of an actual

investigation. These research methods provide researchers with superficial data with which to work, precluding them from carefully exploring the multitude of factors that influence participants' personal experiences (Rubin & Rubin, 2005). Introducing different perspectives in mathematics education research might prompt researchers "to take a new turn by acknowledging that the relationships of gender to mathematics education are much more complex than once thought and bringing theories of gender to bear on research" (Damarin & Erchick, 2010, p. 321).

Because researchers used the terms *sex* and *gender* synonymously in mathematics education research, it is of the utmost importance to acknowledge the framing of difference inquiries, especially research studies relevant to the mathematics teaching and learning of girls and women (see, e.g., Benbow & Stanley, 1980, 1983; Ethington, 1992; Kimball, 1989; Fennema & Sherman, 1977, 1978; Hyde, Fennema, & Lamon, 1990; Sherman & Fennema, 1977; Seegers & Boekaerts, 1996).

The Takeoff of Sex/Gender Differences Research

The American public education system caused great alarm in the mid-20th century. The nation's growing concerns regarding public education came from the insinuating notion that "anti-intellectualism has invaded the curriculum of [America's] schools, disparaged traditional learning, made a cult of mediocrity, turned our teachers into discussion leaders and amiable nonentities, and sought to remake society in the image of its own utopian social philosophy" (Bonner, 1958, p. 177). The public outcry over the woes of the education system created a sense of urgency for a concrete solution. In the face of the nation's intense challenges came Sputnik, a satellite launched by the Soviet Union on October 4, 1957 (Bonner, 1958; Cheek & Castle, 1981; Herrera & Owens, 2001; Schoenfeld, 2004; Stanic & Kilpatrick, 2004). Sputnik caused quite a stir because it "created the perception that the United States was behind in the world scene of

technology and military power" (Herrera & Owens, 2001, p. 85). To restore the nation's reputation, reform initiatives in mathematics and science education were promptly set in motion (Stanic & Kilpatrick, 2004). In the years immediately following Sputnik's launch, researchers conducted a multitude of studies examining sex/gender differences in mathematics, which in my view were major moments of inquiry in the history of mathematics education.

Researchers engaged in different paths of investigation in order to explicate how sex/gender played a role in mathematics (Walshaw, 1999). One of the largest research studies of the era, most commonly known as Project Talent, assessed the academic strengths and ambitions of over 400,000 student learners in the ninth through twelfth grades (Orr, 1961). The main purpose of this large-scale research study was to "help local and national groups to determine what the youth of 1960 [had] to offer" (Flanagan, 1960, p. 37). High school students participating in research were given a series of tests within a couple of days that "measured" their "aptitude" and "ability," among a host of other factors (Flanagan, 1960; Orr, 1961). Some initial findings indicated that there were no sex differences as it related to mathematical performance; however, high school senior male youth did have an edge over their female counterparts (Flanagan, Davis, Dailey, Shaycroft, Orr, Goldberg, & Neyman, 1964). Once the project was underway, Wise, Steel, and MacDonald (1979) determined that there were mathematics-related differences between male and female high school students. Male students showed improved mathematical ability and increased interest in the field compared to female students (Wise et al., 1979). This research study was just one of many difference inquiries to favor male students over female students.

After the women's liberation movement of the 1960s, a flurry of research studies emerged focused on sex/gender and mathematics education. Fennema (1990) articulated

researchers' motivation for conducting these initial studies: "In many countries, the incentive for such study has been the recognition that lack of mathematical learning and negative beliefs about themselves and mathematics hampers females from achieving equity with males" (p. 1). One of the most significant difference inquiries was the Fennema–Sherman study in 1977. This research examined the mathematical achievement and spatial abilities of more than twelve hundred high school male and female students (Fennema & Sherman, 1977). Fennema and Sherman studied sex differences in mathematical achievement and spatial ability to investigate the widespread notion that "males are superior in mathematics" (p. 52). Unlike other sex difference research studies, Fennema and Sherman considered the influence of high school students' background in mathematics on research and held this variable constant. Their findings did not corroborate the aforementioned notion of male superiority in mathematics; instead, Fennema and Sherman cited "sociocultural factors" as reasons for slight sex differences in research. Fennema and Sherman made clear the degree of confidence they had in the mathematical abilities of girls and women and urged researchers to carefully conduct research on sex differences in mathematics.

Three years later, Benbow and Stanley (1980) investigated the mathematical aptitude of junior high school students based on talent search data from the Study of Mathematically Precocious Youth (SMPY). This pair of researchers controlled for junior high school students' previous mathematical training. Benbow and Stanley made the decision to use mathematics training as a controlled variable to test the validity of Fennema and Sherman's (1977) research findings. They wrote: "If their hypothesis is correct little difference in mathematical aptitude should be seen between able boys and girls in our talent searches" (p. 1262). Male and female participants completed the mathematics and verbal sections of the Scholastic Aptitude Test (SAT) and test data were analyzed. The Fennema–Sherman study hypothesized that there would

be no difference in student performance if their mathematics backgrounds were the same, but in fact Benbow and Stanley's research results showed a significant difference in mathematical achievement for male and female students who shared similar backgrounds. Junior high school female students were characterized as having deficits in mathematics in comparison to male students. The publication of these research results brought Benbow and Stanley's proposed explanation for sex differences in mathematics to the fore of the public mind. These researchers believed "sex differences in achievement in and attitude toward mathematics result from superior male mathematical ability, which may in turn be related to greater male ability in spatial tasks" (p. 1264). More than 30 years after the release of this research report, Benbow and Stanley's statements continue to reverberate throughout the American education system.

There were also other highly influential research studies during this period that examined mathematics learners at different levels of education. Wigfield and colleagues (1997) explored the competence beliefs and values of elementary school students engaged in mathematics learning. This research revealed that the competence beliefs of male and female learners differed significantly. Wigfield and colleagues discovered that, in the early years of schooling, male students believed in their mathematical capabilities more than female students. In Hyde, Fennema, Ryan, Frost, and Hopp's (1990) research, affect and attitudes of male and female students in mathematics were measured. Focusing on mathematics attitudes, Hyde and colleagues found that high school male youth had more positive attitudes with regard to mathematics in comparison to female youth. Hyde and colleagues also reported that male students thought of mathematics as a male domain. Singer and Stake's (1986) research examined college men and women's self-esteem as it related to mathematics. This research study reported

that female students were not inclined to choose careers in the mathematics field. Moreover, college-aged men were said to be more confident as learners of mathematics.

In sum, research on sex/gender differences in the mid-to-late 20th century portrayed girls and women as mathematically deficient. From elementary-aged female learners of mathematics to young women enrolled in college-level mathematics courses, the pervasive sentiment was that these students lacked the mathematical knowledge and self-confidence to achieve academically. The prevailing master narrative of female mathematics learners, which I believe was an outgrowth of sex/gender-based research, sorely perpetuated a discourse of intellectual inferiority that permeated the educational arena. This research practically declared mathematics a male-dominated field without even exploring and understanding girls and women's overwhelmingly complex schooling experiences. In the next sections, I present a rationale and make a case for my dissertation research, and explain how it contributes to the mathematics education literature.

Mathematics Education of Undergraduate Black Women

The perceptions and experiences of Black women have been, for the most part, absent from the undergraduate mathematics teaching and learning literature. Research studies published in the mid-to-late 20th century used quantitative research methods to explore the mathematics education of women, most of which were not specific to Black female mathematics learners. Borum and Walker's 2012 publication of "What Makes the Difference? Black Women's Undergraduate and Graduate Experiences in Mathematics" is one of the few research studies in the undergraduate mathematics education literature that has captured the voices of Black women in pursuit of a bachelor's degree in mathematics; more broadly, though, there is a dearth of research addressing the undergraduate schooling experiences of women in the mathematics field (see, e.g., Rodd & Bartholomew, 2006; Solomon, 2012; Solomon, Lawson, & Croft, 2011).

There is, however, a literature base that makes inquiries about Black women in undergraduate mathematics settings. Research literature pertaining to science, technology, engineering, and mathematics (STEM) education provides a glimpse into the mathematical experiences of Black women undergraduates, but even so, the majority of it documents students' engagement in each of the four disciplines. Mathematics alone is not the principal focus of STEM researchers. Although scholars have published research on undergraduate women of color in STEM (see, e.g., Espinosa, 2011; Johnson, 2011; Ong, Wright, Espinosa, & Orfield, 2011), few researchers have published works based on Black female STEM students' participation (see, e.g., Charleston, George, Jackson, Berhanu, & Amechi, 2014; Hanson, 2004, 2009; Perna, Gasman, Gary, Lundy-Wagner, & Drezner, 2010; Perna, Lundy-Wagner, Drezner, Gasman, Yoon, Bose, & Gary, 2009). My review of the existing STEM education literature helped me to recognize its limitations with regard to the telling of undergraduate Black women's mathematics stories. Accordingly, I conducted research that explores the undergraduate education of Black women mathematics majors. First, though, I present the socio-historical context that lends understanding to the mathematics education of undergraduate Black women.

Socio-historical Background and Experience

The nation's Black students were, for the most part, dissuaded from pursuing scientific disciplines in decades past, particularly the field of mathematics ("Young Blacks," 2009). Black learners were thought to have lacked the intellectual capacity to process and understand such privileged disciplines ("No Need," 2001; "Young Blacks," 2009). According to "No Need" (2001), "When a black person came along who demonstrated talent in mathematics, whites were quick to respond with an explanation that would uphold their racial stereotypes" (p. 70). The

perpetuation of such negative stereotypes made it extremely difficult for Blacks to negotiate their schooling.

Black female students, in particular, were forced to endure the harshest of realities in their pursuit for mathematical understanding. Few Black women gained access to the mathematical arena due to oppressive forces inflicted upon them—they "faced the 'double whammy' of racism and sexism" ("No Need," 2001, p. 70). The relentless discrimination that these women dealt with through the years impeded them from participating in higher-level mathematics ("No Need," 2001; "Young Blacks," 2009). In other words, "For all women, and especially for black women, the field of mathematics was essentially shut tight" (" No Need," 2001, p. 70).

During the mid-to-late 20th century, Black women began to assert themselves in the mathematics field. Kenschaft (1981) estimated that over twenty Black women pursued terminal degrees in mathematics including Evelyn Boyd Granville, Marjorie Lee Browne, and Etta Zuber Falconer, just to name a few. This signified that Black women were graduating with their bachelor's degree in mathematics (and science)—although not nearly enough. Despite the pervasiveness of institutional discrimination, Black women not only completed undergraduate and graduate degree programs in mathematics, but also squarely confronted the oppressive forces working against them. In her article, "On Strong Shoulders Words of Wisdom from a Trailblazer," Smith (2007) stated that Granville held steadfast to her mathematical goals notwithstanding unfair criticism of her academic performance. According to Smith, in Granville's early years, "instructors instilled in her an unshakeable confidence that would help overcome any discrimination based on her race and sex" (p. 26). Kenschaft's (1981) chronicling

of Black women's mathematical stories, like Granville's, informed her notions about their character and schooling experience. She wrote:

> Certainly they all have emotional stamina. In each case there seems to be someone in the family who believed that she was very special and that it was worth sacrificing for her education. All the women apparently remember at least one supportive teacher along the way—someone who knew mathematics and told the young woman that she could be a mathematician. (p. 603)

Because family members and teachers encouraged those female Black students to deepen their knowledge of and hone their skills in mathematics, they have improved their visibility in the field.

Although more women of African descent have majored in undergraduate mathematics during the 2000s, there are still White academics who harbor prejudicial attitudes toward them. The "No Need" (2001) article stated, "Even today, many white scholars in the natural sciences hold deep-seated beliefs in the incapacity of black intelligence to deal with the complexities of advanced mathematics" (p. 70). Their longstanding negative beliefs only serve to reify harmful stereotypes and undermine strides made by Black mathematics learners. Will Black students ever meet the expectations of White academic professionals? Or, will they always be perceived as intellectually inferior to White learners? Black women's present-day mathematical experiences are eerily similar to those who pursued mathematics in the 1950s and 1960s; although, the time period has changed, the denigration of their abilities and character by Whites in academia has not.

Influence of Stereotype Threat

The effects of stereotyping the mathematical performance of Blacks (see, e.g., Johnson-Ahorlu, 2013; McGee & Martin, 2011; Steele, 1997, 1999; Steele & Aronson, 1995) and women

(see, e.g., Ganley, Mingle, A. Ryan, K. Ryan, Vasilyeva, & Perry, 2013; Good, Aronson, & Harder, 2008; Schmader, 2002; Spencer, Steele, & Quinn, 1999) have been well documented in the literature. Johnson-Ahorlu (2013) used the term "stereotypes" to refer to "gross generalizations applied to a group of people with some level of shared characteristics" (p. 383). This term generally has a negative connotation, and likewise in the field of education, stereotyping is viewed through a negative lens. Steele and Aronson (1995) claimed that pervasive negative stereotypes about the members of any group have the potential to cause "disruptive effects" (p. 797); they termed this phenomenon "stereotype threat." According to Johnson-Ahorlu (2013), "In educational environments, the anxiety of inadvertently confirming a stereotype has been shown to interfere with and depress academic achievement in many ways. The most widely researched consequence of stereotype threat is its power to impair academic performance" (p. 383). A number of studies have shown that stereotyping can have a deleterious impact on the performance of Blacks and women in school, particularly in mathematics. In what follows, I review existing studies to demonstrate the extent to which stereotype threat has affected their academic lives.

Steele and Aronson's (1995) seminal work on stereotype threat is one of the most widely known research studies in the field. They conducted several experiments to evaluate the effects of stereotype threat on undergraduate Black students who completed a standardized test measuring their verbal reasoning skills. In the instances when Blacks students felt threatened by the racial stereotype, their White counterparts outperformed them. Black students, however, improved their test performance compared to White students in the absence of the racially based stereotype. A research study conducted by Mayer and Hanges (2003) looked at Black college students' performance on the Raven Advanced Progressive Matrices (APM) test after the racial

stereotype was activated in their minds. Similar to Steele and Aronson's (1995) research, Mayer and Hanges found that making race salient to Black students negatively impacted their cognitive performance compared to White students. McKay, Doverspike, Bowen-Hilton, and Martin (2002) also found that when the Raven APM test was administered to college-aged Black students to measure their IQ performance under the same conditions, their test scores were significantly different from that of White participants. Taken together, these research studies provide evidence that Black students' intellectual performance has been particularly affected by stereotype threat.

Women, too, experience negative stereotyping, particularly in the field of mathematics. Spencer and colleagues (1999) argued: In mathematical learning environments "women bear the extra burden of having a stereotype that alleges a sex-based inability. This is a predicament that others, not stereotyped in this way, do not bear" (p. 6). In their quantitative research study, examining women's performance on standardized mathematics tests, Spencer and colleagues compared the results of 28 men and 28 women who attended a public research university. Their research determined that female students perform poorly compared to male students in the presence of stereotype threat. The results, however, also revealed that female participants' test scores were equivalent to their male counterparts when the gender stereotype was not salient amongst them. Likewise, Good and colleagues (2008) conducted a field experiment that examined the impact of stereotype threat on highly trained women mathematicians enrolled at a large public university. Over 150 male and female students participating in the study completed a calculus test that included test items from the Graduate Record Examination (GRE) Mathematics Subject test. In their study, they found that "even women at the upper end of the ability distribution…in the most difficult math courses can be vulnerable to the effects of negative

stereotypes" (p. 25). A thorough analysis of their findings showed that women's performance suffered if they tested in "stereotype-threatening situations" (p. 22).

Boswell (1985) studied the effects of stereotypes on female mathematics learners' achievement and participation. She claimed that "the sex-typing of mathematics as masculine, combined with the negative stereotyping of women in the field, function as significant deterrents to increasing female participation in this area" (p. 178). Her research recognized not only the harmful effects of stereotyping, but also the direct impact of stereotyping on women's mathematics engagement and academic performance.

Each of these research studies has shown that stereotyping affects students' capacity to perform academically. In her research study, Johnson-Ahorlu (2013) claimed, "African American students…made it clear that stereotypes and the threat of fulfilling them is a major obstacle in their academic lives" (p. 387). For this reason, I believe stereotyped groups ought to be equipped with coping mechanisms and practical ways to reduce the threat of negative stereotypes. I also believe it is of the utmost importance to help them deepen their understanding of how stereotyping operates in school. While I know that "patterns of prejudice, stereotyping, and social distance are difficult to change" (deMarrais & LeCompte, 1999, p. 265), I am a firm believer that stereotyped learners' experience in the mathematics classroom can be improved.

Although there is a dearth of literature on Black undergraduate women with regard to stereotype threat, research studies on the effects of stereotyping in the academic lives of Black and female students have assisted me in understanding how the race- and gender-based stereotypes might impact their mathematical performance. It is my belief that if either or both of these stereotypes are made salient, particularly in a high-stakes testing situation, Black women's intellectual performance might suffer. It is my hope that researchers began to conduct stereotype

threat research related to Black undergraduate women in mathematics. I believe that stereotype threat research and other projects documenting the personal "herstories" (Harding, 1989) of Black female mathematics learners can change the scope of mathematics education literature moving forward.

Establishment and Development of Spelman College

Spelman College, formerly known as Atlanta Baptist Female Seminary, is a historically Black, all-female, liberal arts institution located in Atlanta, Georgia. Around the time Washington showed his vehement support of industrial schools, the Seminary emerged onto the South's educational scene (Range, 1951). As was mentioned earlier, in the latter part of the 19th century after emancipation, Baptist missionaries endeavored to educate ex-slaves, so they could become part of the "American mainstream" (Brazzell, 1996, p. 17). It was then that two White missionaries, Sophia B. Packard and Harriet E. Giles, established a teaching-learning space for Black women in the basement of Friendship Baptist Church on April 11, 1881 (Lefever, 2005). Banks (2009) stated that during this time in the school's young history, the foremost priority and "educational focus for black women was on learning, accepting, and teaching white culture and morals (i.e., race); remaining in their place in the home while being subservient to men…(i.e., gender); and earning limited wages…to supplement the family income (i.e., class)" (p. 29). Soon after the Seminary opened its doors, its co-founders began introducing several new departments and developing basic training courses for new entrants (Lefever, 2005), teacher training courses in particular (Scriven, 2006). Establishing the Industrial Department marked a highly significant moment in the school's past because it offered Black female students domestic courses—teaching them not only about how to manage household responsibilities, but also common

gender role norms (Range, 1951, p. 72). The department offered courses in "cooking, washing, ironing, chamber work, sewing, garment making, needle-work, printing, and telegraphy" (p. 72).

With the financial support of John D. Rockefeller and his family, and other donor contributions, the institution grew substantially in size over the course of several decades (Lefever, 2005; Range, 1951). In the first decade after its founding, Scriven (2006) reported "the school had grown from a group of 11 students…to 800 pupils, 30 teachers and property valued at $90,000" (p. 131). Monetary contributions helped the institution build new facilities and even restore older ones (Range, 1951). At the turn of the 20th century, Spelman's undergraduate campus was thriving, and today, a few of its buildings bear the names of the Rockefeller family.

Looking back, retrospectively on Spelman's history and traditions, I better understand the impact Eurocentrism had on Black women's personal and academic lives. When the Seminary was first established, its co-founders faced an ethical quandary of sorts. Although Packard and Giles were "missionaries and educators who strongly believed in women's education…[and] 'saving the lost souls' of the former slave women of the South" (Scriven, 2006, p. 129), they proceeded to train them according to Eurocentric norms and standards. So on the one hand, it seemed as if they were committed to providing Black female students with enriching teaching and learning experiences, so they could improve their lives and participation in society; but on the other hand, it appeared they privileged Eurocentric education. The pervasiveness of patriarchal (and racist) social structures particularly affected Black women's schooling. Lefever (2005) discussed the co-founders' views regarding the role of female students:

> Although Packard and Giles were inspired by the values of their liberal-progressive New England background in the founding of Spelman College, they also employed some of the then-current assumptions about gender roles—that men should dominate the material

> world and that women should take primary responsibility for the physical care and moral development of family and community. (p. 62)

The school's course offerings mirrored the assumptions made by the co-founders. And although an increased number of academic departments and courses were made available to students in the years since its founding (Lefever, 2005; Range, 1951), Black women continued to combat socially dominant forces on campus, and in society at large.

Spelman alumnae, however, have seen their alma mater transform in past decades. From electing its first Black female president, Dr. Johnetta B. Cole, to the successful construction of numerous campus facilities, Spelman has grown exponentially and become one of the premier colleges for Black women. The institution's focus on the teaching and learning of undergraduate Black women has propelled a majority of its students to higher heights. The following mission statement delineates the purpose of Spelman in Black women's academic lives:

> Spelman College, a historically Black college and a global leader in the education of women of African descent, is dedicated to academic excellence in the liberal arts and sciences and the intellectual, creative, ethical, and leadership development of its students. Spelman empowers the whole person to engage the many cultures of the world and inspires a commitment to positive social change. (Spelman College)

This mission statement explicates the school's steadfastness to advancing the educational achievements of Black women. The College pledges to provide students with exceptional learning opportunities and facilitate their personal and professional growth. With the unwavering support of such a dynamic institution, Black female students have strived beyond their perceived limits and accomplished their short- and long-term goals. Marian Wright Edelman (2000) emphatically stated:

> I am so glad I went to Spelman. As an all-black women's college it gave me the latitude and safe space—"one not defined by male or white folks' expectations, habits of competition, or by the need to preen and prove myself to anyone beyond myself and God"—to dream my dreams and to find and forge my own path. (pp. 118–119)

Spelman's Undergraduate Mathematics Program

Much attention has been paid to Spelman's success in producing highly skilled mathematicians over the course of the last few decades—and too little attention to those instrumental in transforming the institution's core curriculum in general, and undergraduate mathematics program in particular. Interestingly, it was not until the second half of the 20th century that the College's administration and faculty began to reform curricula in its traditional academic departments (including the mathematics major) and create new programs for its growing student population (Scriven, 2006). Under the leadership of Albert Edward Manley, the first Black male elected as Spelman's president in 1953, it was decided that the undergraduate course entitled, "Elements of Math" be added to the general education curriculum (Scriven, 2006, p. 154). Students were involved in modifying Spelman's undergraduate curriculum, which was of paramount importance because the institution's past presidents had primed Black undergraduate women to perform domestic and childcare tasks before ever introducing them to the sciences (Peeples, 2010; Scrivens, 2006). According to Scrivens (2006), "Whether one attributes this push for curricular and institutional transformation to the natural progression of time or to that brief period in Spelman's history when students, influenced by wider social upheavals, were the major catalyst, changes did occur" (p. 173) during Manley's 23-year presidency.

The College's 1960s efforts to boost the general education curriculum were deserving of recognition, but failed to promote the teaching and learning of mathematics (and other science-related disciplines) among Black undergraduate women (Scriven, 2006). Because there were so few students pursuing degrees in mathematics, Spelman's curriculum decision-makers doubted the viability of their undergraduate mathematics department (Scriven, 2006). Developing the mathematics major with such low enrollment could have put the College in both precarious academic and financial positions (Scriven, 2006). Before long faculty members committed to creating mathematically rigorous experiences for undergraduate Black women began to express their dissatisfaction with the institution's treatment of the sciences. Scriven (2006) stated, "Two faculty in particular, Shirley McBay and Etta Falconer, both in mathematics, were convinced that the institution was not doing enough to encourage its students to pursue majors in the sciences" (p. 188). While decision-makers focused on institution-wide curriculum reform, they neglected to fully support the development of science programs and stimulate students' interest in undergraduate majors like mathematics. The College responded to faculty concerns by backing the mathematicians' plan to restore and expand the science curriculum (Scriven, 2006).

McBay and Falconer were academic visionaries who championed the pursuit of Black female students in the sciences. According to Scriven (2006), "They wanted to…enable this younger generation and future students to have what they didn't—access to other women in science who looked like them and the benefit of an educational environment that nurtured their growth" (p. 188). To bolster the quality of the undergraduate science programs including the mathematics major, McBay and Falconer aligned themselves with the institution's administration, including former president Manley, and faculty (Scriven, 2006). In her capacity as chair of the mathematics department, McBay advocated for a Division of Natural Sciences

(Scriven, 2006). This division coupled with summer programs intended to "increase student enrollment" in Spelman's science programs (Scriven, 2006, p. 204). In Falconer's (1978) article entitled "Women in Science at Spelman College," she described the importance of establishing the Pre-Freshman Summer Science Program in the early 1970s. She claimed the program improved Black women's academic performance and prepared them to pursue graduate degrees in science. The Pre-Freshman Summer Science Program provided students with "eight weeks of instruction…in reading, biology, and pre-calculus mathematics and enrichment courses in chemical instrumentation and computer science" (Falconer, 1978, p. 176). In addition to daily course instruction, students also heard the lectures of numerous Black women in science; these scholars discussed their careers paths and served as trusted mentors to Spelman's budding scientists (Scriven, 2006). Due to the "success of the overall science-improvement plan" (Falconer, 1978, p. 176), significantly more students engaged in the institution's science curricula and earned bachelor's degrees in science-related disciplines (Scriven, 2006). Falconer remained firm in her efforts to strengthen the institution's science program when Manley left office and Donald Mitchell Stewart became president in 1976 (Scriven, 2006).

Once Dr. Johnetta Betsch Cole arrived on Spelman's liberal arts campus, undergraduate science students' learning environment underwent an extensive transformation. Under her leadership, the Albro-Manley-Falconer Science center was built to provide support for the institution's science programs (Scriven, 2006; Stephens, 2004). Securing funds for the science center showed president Cole's commitment to the teaching and learning of Black women in science. Scriven (2006) had this to say about the difficulty of her endeavor:

> Raising $22.5 million for a science building (the cost of which would eventually rise to $30 million), for an-all female, predominately Black college in the South would prove to

> be no small challenge, but was met with ultimate success. Cole solicited the assistance of influential individuals in Atlanta and corporate executives to make the case to invest in a program to educate African American women scientists. The numbers were there, as was the quality of Spelman alumnae. (p. 275)

Similar to Cole, the institution's science-focused faculty worked diligently to recruit large corporations to develop research programs for undergraduate Black women with a vested interest in mathematics and science (Scriven, 2006). According to Stephens (2004), "This early exposure to research builds confidence, enhances communication and presentation skills, and ultimately helps students to make more informed career choices" (p. 24). Coupling an improved curriculum with strong research programs offered students a solid mathematical foundation.

Once Spelman began to receive accolades from educational entities across the nation for growing their undergraduate programs in mathematics and science (Scriven, 2006), more students gravitated toward those fields of study. In "Math Majors Tell (Almost) All," a group of undergraduate students discussed their reasons for pursuing a degree in mathematics. One of the students interviewed, Tanya Henneman, briefly explained how she came to major in mathematics at Spelman:

> I came in as a psychology major. In high school I did pretty well in math, but I never thought of it as a career. I took calculus my freshman year, and I just really enjoyed it. My math teacher asked me why I was a psychology major, and I said that I should be a math or engineering major. I took a couple of more math courses, and enjoyed them as well, so I decided to change my major to math. (Solow et al., 1994, p. 16)

Another Spelman student, Tracy Lawrence, provided an explanation for her major choice: "I came in as a biology major, and then after my freshman year, after I had taken calculus and I

really liked it, and I didn't like biology so much, I switched to math/pre-med" (Solow et al., 1994, p. 17). Both Henneman and Lawrence started their undergraduate careers majoring in non-mathematics fields, but eventually found themselves in the department of mathematics. Because their entry-level mathematics courses brought them a sense of satisfaction, they opted not only to pursue the mathematics major, but also build careers with a degree in the field.

The current undergraduate mathematics curriculum is a product of the institution's reform efforts decades ago. Spelman's mathematics majors enroll in numerous elective and required courses to accomplish one of two main goals—earn a Bachelor of Arts or a Bachelor of Science degree. The department of mathematics also makes the dual-degree engineering program available to interested undergraduate students; this program allows students to study mathematics intensely at Spelman and then engage engineering at Georgia Institute of Technology (Stephens, 2004).

After completing a bachelor's degree in mathematics (and engineering, in some cases), Stephens (2004) posited, "Spelman College graduates have pursued careers in traditional areas such as pure mathematics, applied mathematics, statistics, operations research, engineering, and education, and in nontraditional areas such as medicine, law, media technology, business, and the financial world" (p. 24). The graduates featured in her article provide evidence that the institution's undergraduate mathematics program prepares and supports mathematics students in navigating a productive career path. According to Stephens (2004), Jennika Gold, a 2001 graduate of Spelman's undergraduate mathematics program, had secured a position at Goldman Sachs as a trader/financial engineer, while Karen King, a 1991 graduate in mathematics, worked for the University of Michigan's Mathematics Department and the National Science Foundation's Division of Elementary, Secondary and Informal Education. The institution's

mathematics department significantly impacts undergraduate Black women's decision to pursue a career in mathematics —an admission unmistakably clear in Henneman's statement:

> In high school another reason I never considered math as a career was that I always had white male teachers for my math courses. I can only remember one female teacher. I never thought of it as a career for me, because I never saw anyone who was like me teaching math or doing things in math. I think that's one of the great things about Spelman. Everyone around me looks like me, and so I have no reason to believe that this isn't a career that I can do. (Solow et al., 1994, p. 17)

Henneman's mathematical experience at Spelman was unlike any of her childhood experiences. She admittedly held preconceived notions about a future career in mathematics because of her observations of mathematics teaching and learning prior to Spelman. The institution's undergraduate mathematics program was key in helping her realize that those who identify as Black women can achieve success in mathematics.

Many Black women have shown their capacity for learning in Spelman's undergraduate mathematics degree program. However, even with an increasing number of students participating in the program, their mathematical experiences remain underexplored. The undergraduate experiences of Black women, like Henneman, Gold, and King, ought to be examined deeply and carefully in effort to understand their mathematical stories. It is my belief that students' recollections of their participation in Spelman's mathematics program provide insight into its glaring uniqueness, including its departmental structure, qualities, and support.

Spelman Women's Pursuit of Mathematics

Publishing research in the field of mathematics education about the supposed mathematical shortcomings of American girls and women in general, and Black girls and women

in particular, has been the norm for decades. Research inquiries scrutinizing female students' mathematical ability, performance, and achievement have dominated the literature base, which in my opinion, is exceedingly problematic. Because of this focus, there is a paucity of literature about women's mathematical *experiences*. This project, however, examines the experiences of Black women who pursued an undergraduate degree in mathematics at Spelman from the 1980s to 2000s.

Sharing the stories of my participants' experiences in pursuit of mathematics in my dissertation research disrupts the "single story" (Adichie, 2009) master narrative about Black female learners and sheds light on the insistent stigmatization they experience in the field of mathematics. I emphatically believe that if more researchers like myself listen to "herstories" (Harding, 1989), then "we reject the single story … [and] realize that there is never a single story" (Adichie, 2009) with regard to mathematically talented Black women.

My dissertation research is, without doubt, a contribution to the literature base focused specifically on Black women in mathematics. Conducting this research incorporates Black women's voice into the mathematics education literature and offers a glimpse into their complex schooling lives as mathematics learners. The project interrogates the very intersections of gender, mathematics, and mathematics teaching and learning using an approach that might inspire new conceptualizations of Black women in mathematics. I believe that in order to realize the impact of these intersections on Black women in addition to "the historical oppression that they have faced and the social realities that they continue to face in contemporary times" (Martin & McGee, 2009, p. 210), it is of the utmost importance that we, as mathematics education researchers, explore their varied experiences in the field and ensure their voices are heard.

CHAPTER 3
NARRATIVE WAYS OF KNOWING AND UNDERSTANDING EXPERIENCE

The core of this doctoral research project is my *narrative inquiry* into the experiences of six mathematically talented Black women who attended Spelman College from the 1980s to 2000s. I conducted an inquiry into their experiences before, during, and after Spelman. For my doctoral research, I chose to *re*-tell three of my participants' stories of experience. Each of their narrative accounts provides insight into the complex nature of participating in mathematics, a field largely dominated by White men. In this chapter, I explicate how I use narrative inquiry as both a theoretical framework and a research methodology. I start by outlining a theory of experience, drawing heavily on both Dewey and Clandinin. I then move into detailing *my* narrative inquiry processes, discussing: (a) my own personal struggles with methodologies, (b) my recruitment processes, and (c) confidentiality and ethics. These discussions are followed by details related to data collection and analysis, including (d) from field to field texts, (e) from field texts to interim research texts, (f) from interim research texts to final research texts, and (g) research limitations.

Dewey's Theory of Experience

Conducting a narrative inquiry into the life and academic experiences of mathematically talented Black women who attended Spelman from the 1980s to 2000s meant situating my dissertation research in, and assuming, Clandinin and Connelly's narrative view of experience. Their conception of narrative inquiry was "inspired by a view of human experience in which humans, individually and socially, lead storied lives" (Clandinin & Rosiek, 2007, p. 37). Clandinin and Connelly's pivotal scholarship on narrative inquiry has drawn particularly on John Dewey's (1938) theory of experience. According to Clandinin and Rosiek (2007), Dewey's

conceptualization of experience "does not refer to some precognitive, precultural ground on which our conceptions of the world rest. Instead, it is a changing stream that is characterized by continuous interaction of human thought with our personal social, and material environment" (p. 39). Because narrative inquiry's ontological and epistemological assumptions are tied to Dewey's characterization of experience, his philosophical view, quite fittingly, framed my doctoral research.

Clandinin and Connelly (2000) emphasized the significance of the term experience with regard to inquiry-based education research. Dewey's ideas about experience "gives us [educators] a term that permits better understandings of educational life" (p. 2). Because I am both an educator and a researcher whose doctoral study involved closely examining the mathematical experiences of Spelman alumnae, I felt confident about being able to attend to their lived academic experiences. Dewey inextricably linked the personal aspect of human experience to the social (Clandinin & Connelly, 2000), highlighting the overwhelmingly complex nature of human reality. His philosophy of experience emboldened me to grapple with life's complexity. That is to say, in my doctoral research, my study participants were not "understood only as individuals. They [were] always in relation, always in context" (Clandinin & Connelly, 2000, p. 2).

Dewey was ontologically committed to a transactional view of experience (Clandinin & Rosiek, 2007). This ontological characteristic was made very clear "so that scholars could understand our project as narrative inquirers as distinct from the work of those grounded in other views of experience" (Clandinin, 2013, p. 14). Epistemologically speaking, Dewey's transactional view of experience

> implies that the regulative ideal for inquiry is not to generate an exclusively faithful representation of a reality independent of the knower. The regulative ideal for inquiry is to generate a new relation between a human being and her environment—her life, community, world. (Clandinin & Rosiek, 2007, p. 39)

This ontological commitment not only distinguishes narrative inquiry from other scholars' work, it highlights the importance of Dewey's theory of experience as a theoretical framework. Narrative inquirers have chosen this theoretical framework to understand new relations created between an individual and the world around her. Attending to new relations in this way hopefully encourages the participant, and the reader, to think about the aspects of experience that resonate with them.

This relational aspect of experience birthed the three common places of narrative inquiry—temporality, sociality, and place. Narrative inquirers envisioned Dewey's view of experience to be "a collaboration between researcher and participants, over time, in a place or series of places, and in social interaction with milieus" (Clandinin & Connelly, 2000, p. 20). Focusing on these three commonplaces throughout an inquiry "highlights the shifting, changing, personal, and social nature of the phenomenon under study" (Clandinin, 2013, p. 38). The ongoing collaborative interaction between my participants and me necessitated a three-dimensional space attending to each of the aforementioned dimensions of experience.

In becoming more deeply acquainted with narrative inquiry methodology, I recognized the importance of its three-dimensional space. Clandinin (2013) discussed the three dimensions of narrative inquiry, namely, time, place, and the personal/social. In Table 1, I provide my own examples of what the three-dimensional space of narrative inquiry looked like in the data collection phase of my study. The time dimension constitutes an integral part of this

methodological approach. It aided me in developing a better understanding of the context in which my participants' stories were told. In order to make sense of the context of their stories of experience, I paid close attention to "the past, present, and future of people, places, things, and events under study" (Clandinin, 2013, p. 39). The stories told by my participants also required me to "think simultaneously backward and forward, inward and outward, with attentiveness to place(s)" (Clandinin, 2013, p. 41). Because time and place are ever changing and fluid in nature, I focused on the personal/social dimension of narrative inquiry. According to Clandinin and Rosiek (2007), "Narrative inquiries explore the stories people live and tell. These stories are the result of confluence of social influences on a person's inner life, social influences on their environment, and their unique personal history" (p. 41). These social conditions contribute to and shape an individual's experience and situation. It is, therefore, of paramount importance for researchers to be attentive, and present in every way possible. As narrative inquirers, we should always "remind ourselves that we are within the metaphorical three-dimensional space with participants. These spaces, shaped as they are, are in the making and always open to revision and change" (Clandinin, 2013, p.41).

Dewey's ontology impressed the importance of continuity and interaction, two key criteria at the very foundation of his theory. Clandinin and Connelly (2000) claimed, from Dewey's philosophical position, continuity is based on the premise that—

> experiences grow out of other experiences, and experiences lead to further experiences. Wherever one positions oneself in that continuum—the imagined now, some imagined past, or some imagined future—each point has a past experiential base and leads to an experiential future. (p. 2)

Table 1
Dimensions of Narrative Inquiry (Clandinin, 2013)

Dimension	Definition	Examples…
Temporality	Attending to temporal ways points inquirers toward the past, present, and future of people, places, things, and events under study. The importance of temporality in narrative inquiry comes from philosophical views of experience where the "formal quality of experience through time is [seen as] inherently narrative" (Crites, 1971, p. 291). Other philosophers, such as Carr, highlight how "we are composing and constantly revising our autobiographies as we go along" (p. 76). (Clandinin, 2013)	*In the following conversation excerpt, I directed the conversation to get a sense of the temporal:* **Morgin:** How was that [referring to being a student in her father's school]? **Jasmine:** That was fun, but it also means you can't act up at school because your dad is right there. Not that I would have acted up at school…. My daddy would pop in. He was even my sixth grade math teacher. I had him. You should have seen all the kids talking about it. **Morgin:** So you actually had him for sixth grade math? **Jasmine:** I did, I had him…and he was a good teacher. At first it was kind of weird. I never call him by name. So it felt weird to call him anything. I would just raise my hand to ask a question because…saying Daddy in class felt silly…Other than that, he was a great teacher and I loved math. So it was like yeah, that is my dad. (Transcript, October 14, 2015)
Sociality	Narrative inquirers attend both to personal conditions, and, simultaneously, to social conditions. By personal conditions, "we mean the feelings, hopes, desires, aesthetic reactions and moral dispositions" (Connelly & Clandinin, 2006, p. 480) of the inquirer and participants. Social conditions refer to the milieu, the conditions under which people's experiences and events are unfolding. These social conditions are understood, in part, in terms of cultural, social, institutional, familial, and linguistic narratives. (Clandinin, 2013)	*In the following conversation excerpt, I directed the conversation to get a sense of the social:* **Danielle:** I would say my support network was more like friends and teachers. I wouldn't say my parents were really a part of my support network. They didn't really ask me about grades or what's going on with school…. They just kind of let me do what I was doing…. **Morgin:** How did they support you? **Danielle:** My teachers, I remember one of the teachers I was speaking of, I remember not getting a perfect score on one of my exams and then coming along on the next exam and getting a perfect score and her being like, yeah, I knew you could do it. That's what I'm talking about kind of thing, knowing that I would do better than I had done; so just kind of saying those kinds of things to me, yeah. (Transcript, January 9, 2015)
Place	Connelly and Clandinin (2006) define place as "the specific concrete, physical, and topological boundaries of place or sequences of places where the inquiry and events take place" (p. 480). The key to this commonplace is recognizing that "all events take place some place" (p. 481). (Clandinin, 2013)	*In the following conversation excerpt, I directed the conversation to get a sense of the place:* **Morgin:** That's great [referring to all the fun-filled family interaction]. Where did you grow up? **Jasmine:** In Mississippi, Red Banks, Mississippi. **Morgin:** What city or town? **Jasmine:** The town is called Red, as in the color, and Banks, like a place where you get money and the closest largest city is Memphis, Tennessee. It's 30 minutes south of Memphis, Tennessee. (Transcript, October 14, 2015)

This criterion is the main reason I began inquiring into my participants' personal-academic stories of experience, and even my own stories of school. I explored stories of their past school experiences (and my own) to see what experiences had inevitably grown from the earlier ones, especially as it relates to their tenure as a mathematics major at Spelman. From the beginning of my doctoral research, I seriously considered the following ontological assumption: "Experiences do not simply appear to be connected through time; they are continuous" (Clandinin & Rosiek, 2007, p. 40). That being the case, I thought if we shared school-life memories and stories from our adolescent years, I could better understand how those stories of the past influenced their college experience at Spelman, and other life defining moments. I am a firm believer that "what you see (and hear, feel, think, love, taste, despise, fear, etc.) is what you get. That is all we [narrative inquirers] ultimately have in which to ground our understanding. And that is all we need" (Clandinin & Rosiek, 2007, p. 41). In addition to continuity, I was also aware of the second criterion interaction. Like Clandinin and Connelly (2000), during my research conversations with participants, I found it helpful to "move back and forth between the personal and the social, simultaneously thinking about the past, present, and future, and to do so in ever-expanding social milieus" (pp. 2–3).

Narrative Inquiry Methodology

I took a detour before coming to narrative inquiry. Initially, I gravitated toward mainstream qualitative research methodologies—the types of methodological frameworks frequently employed by qualitative researchers (e.g., case study, grounded theory, ethnography). Nevertheless, after vetting several different approaches to qualitative research, my methodological expectations were often not met. I was not finding an approach that truly valued human experience and recognized people as producers of accumulated wisdom. I even

considered oral history methodology when my dissertation research project was first conceptualized, but soon realized I could not uphold its methodological commitments; because employing oral history meant there would be a lack of anonymity, I knew potential participants in the prime of their professional careers might not want to disclose their identities. And even if they did, I questioned if they would be open enough to reveal personal memories and stories. I then abandoned the idea of employing oral history altogether, hoping the methodological framework I was looking for complemented my dissertation research.

If it were not for my narrative inquiry group, I would not have found a methodological approach focused on storying human experience. When our group first came together as a research team to conduct a narrative inquiry into the experiences of pre-service teachers participating in a 3-year induction program, the majority of us were not too familiar with the methodology or the research literature. We relied heavily on the more experienced early-career professor in our group, and Clandinin (2013), to guide our understanding. After more than a year of studying, grappling with, and conducting a narrative inquiry, as part of a research team and independent researcher, I decided to employ narrative inquiry to understand the experiences of mathematically talented Black women who attended Spelman from the 1980s to 2000s.

Connelly and Clandinin used the term *narrative inquiry* in education research for the first time in 1990, in their article, entitled, *Stories of Experience and Narrative Inquiry*. These scholars first described narrative inquiry as a phenomenon and method, but shortly thereafter, began interpreting it as a research methodology (Clandinin, 2013). Although social scientists were first introduced to narrative inquiry methodology around the time Connelly and Clandinin's (1990) article published, it had been prevalent in other fields for years (Clandinin & Rosiek, 2007).

It became obvious to me early on that "while narrative inquiry shares certain commitments with other forms of qualitative inquiry…it is a unique research methodology" (Clandinin, Downey, & Schaefer, 2014, p. 44). Narrative inquiry, unlike other qualitative approaches, is informed by Dewey's theory of experience, and "narrative inquirers understand experience as a narratively composed phenomenon" (Clandinin, 2013, p. 16). This means that narrative inquiry is not only the study of experiential phenomena, but also a methodological approach that has a very distinct way of attending to people's lived experiences. Interestingly enough, Connelly and Clandinin (2006) defined narrative inquiry as both a phenomenon and methodological approach to research. They wrote:

> People shape their daily lives by stories, of who they are and others are and as they interpret their past in terms of these stories. Story, in the current idiom, is a portal through which a person enters the world and by which their experience of the world is interpreted and made personally meaningful. Looked at this way narrative is the phenomenon studied in inquiry. Narrative inquiry, the study of experience as story, then, is first and foremost a way of thinking about experience. Narrative inquiry as a methodology entails a view of the phenomenon. To use narrative inquiry methodology is to adopt a particular narrative view of experience as phenomenon under study. (p. 375)

Because my doctoral research was based solely on mathematically talented Black women's experiences at Spelman, I employed the narrative inquiry approach and focused on different aspects of their lives. I was drawn to this methodology because it "begins and ends with a respect for ordinary lived experience" (Clandinin, 2013, p. 18). By conducting this research, I was afforded the opportunity to "honor their experiences as sources of important knowledge and

understanding. It was their stories as they told them in relationship with [me] as [researcher], to which [I] attended" (Clandinin, Downey, & Schaefer, 2014, p. 44).

My Own Personal Struggles With Methodologies

Changing my methodological approach challenged the very design of my doctoral research. When I first proposed my research project, I had already begun developing a set of research questions to gain a better understanding of the stories of Black women who pursued their bachelor's degree in mathematics at Spelman from the 1980s to 2010s (the participants' years of graduation changed the timeframe to the 1980s to 2000s). I endeavored to use a qualitative research methodology within an "eclectic" theoretical framework (Stinson, 2009) consisting of Black feminist and womanist theories. After careful thought and consideration, however, I adopted narrative inquiry to ontologically, epistemologically, and methodologically frame my doctoral research. Making this methodological change was much harder than originally thought. Narrative inquiry suggested that I move away from my research questions and develop a research puzzle to guide my work. But, I thought, "Why do I need a puzzle? What purpose will it serve? I have 'good' research questions designed to guide my doctoral research." It seemed as if the more I questioned its purpose, the more I immersed myself in the research literature.

I consulted several narrative inquirers (e.g., Clandinin, 2013; Clandinin & Connelly, 2000; Johnson & Christensen, 2008) about this notion of a research puzzle. Johnson and Christensen noted:

> Framing or composing a research puzzle is part of the design process in a narrative inquiry. Each narrative inquiry is composed around a particular wonder and, rather than

> framing a research question with a precise definition or expectation of an answer, narrative inquirers frame a research puzzle. (p. 429)

Clandinin and Connelly (2000) argued that the term research question fails to represent "what [they] believe is at work with narrative inquirers. Problems carry with them qualities of clear definability and the expectation of solutions, but narrative inquiry carries more of a sense of a search, a 're-search,' a searching again" (p. 124). After a close review of the research literature, I, too, acknowledged that I wanted my doctoral research to be a "continual reformulation of an inquiry" (Clandinin & Connelly, 2000, p. 124). However, I could not have anticipated how difficult just thinking about the shift would actually be. Johnson and Christenson (2008) maintained, "this shift from research question to research puzzle opens up the possibilities of change over time in the inquiry as researchers and participants live out the inquiry" (Johnson & Christensen, 2008, p. 429), but I was still not convinced I ought to abandon my initial research questions, and soon realized, I did not have to.

The purpose of my doctoral project was to understand Black women's pursuit of mathematics at Spelman over the last 5 decades using narrative inquiry grounded in Dewey's theory of experience. The following research questions were developed at the beginning of my doctoral research process:

1. What are the experiences of Black women who pursued their undergraduate degree in mathematics at Spelman College from the 1960s to 2010s?
2. How did larger socio-historical and -political contexts and life experiences on and off campus help or hinder the construction of their identities as mathematicians?
3. How did the relationships with other Spelman students, faculty, and staff impact their short- and long-term goals in the field of mathematics?

I purposefully posed each of these research questions for consideration. I thought the first research question inquiring about my participants' mathematical experiences allowed me to directly address what I determined to be the "research problem." Because there are too few research studies in the literature focused on Black women in mathematics to date, I hoped my participants' stories describing how they navigated the mathematics major enlightened and brought awareness to the educational community in general, and the mathematics education community in particular. With regard to the second question, mathematical identity refers to a set of qualities or experiences my participant uses to identify herself as a member of the mathematics community. I posed this particular question, because, I wondered if a larger context and participants' stories of experience influenced the shaping of their mathematical identity. The final question considered the potential importance of participants' relationships in their undergraduate pursuit.

My research questions began to change after my project got underway. The following is the newer version of my research questions:

1. What were the life and schooling experiences of Black women who pursued their undergraduate degree in mathematics at Spelman College from the 1980s to 2000s?
2. How did larger socio-historical and -cultural contexts and life experiences (on and off campus) affect their image of themselves as mathematicians?
3. How did relationships with other Spelman students, faculty, and staff influence their short- and long-term goals in the field of mathematics?

For the most part, the first question remained the same. There are only two differences between the older version and the new. In the newer version, I made explicit that I could not just look at Black women's undergraduate experiences in mathematics. To better understand their

mathematical experiences at Spelman, I also had to inquire into their life experiences. My reason for changing 1960s to 1980s was simply because I recruited women who graduated from the 1980s to 2000s, not the 1960s to 2010s. My second research question was also changed slightly because as I conducted my research, I realized that I was not asking my participants' questions related to the larger socio-historical and -political contexts affecting their experiences and pushing conversations around identity construction. I was most interested in the larger socio-historical and -cultural contexts and how those contexts shaped their image of themselves as mathematicians. My third question, however, did not change at all.

Upon revisiting my initial research questions and my rationale for each question, it occurred to me that, they were, in fact, related to the three-dimensional narrative inquiry space: temporality, sociality, and place. I came to realize that, because each of my research questions inquired into aspects of my participants' undergraduate mathematical experiences, I was, in fact, attending to the temporality of their lives. I had hoped there would be mention of "the temporality of places, things, and events" (Clandinin, 2013, p. 40) in their narrative stories. I was interested in the social conditions surrounding the lives of my participants, especially familial, cultural, and institutional narratives. The place dimension, quite obviously, was related to my research questions. I asked about participants' experiences at Spelman, assuming there were "interconnections between place and experience" (Clandinin, 2013, p. 41). I was curious about how my participants' personal stories of school and stories of Spelman molded them.

After working through my initial research questions, I soon came to the conclusion that I did not have to do away with them after all. I could both keep my questions and attend to the three-dimensional narrative inquiry space. The realization that my formal research questions aligned with narrative ways of knowing through temporality, sociality, and place brought me

some relief. These were, indeed, the research questions that brought me to narrative inquiry, my study participants, and my general wonderings in the first place. Because I am a mathematician turned social scientist, I mightily hope readers understand my appreciation for the concreteness and structure my research questions provided me throughout my inquiry. I am inclined to think that my autobiographical narrative inquiry into my life and academic experiences before, during, and after Spelman helped frame both my research puzzle and further develop my research questions. I examined puzzles related to Black women's pursuit of mathematics because of my own unique set of circumstances as a mathematics learner. Black women's stories of experience were practically nonexistent in the mathematics education literature, and existing literature related to girls and women in the mathematical arena rarely addressed issues of women of color. In fact, few research studies have been conducted to explore the mathematics education of Black female students.

My Recruitment Processes

Recruiting Spelman alumnae for my dissertation research project was a yearlong process. Participants were selected according to the following criteria: (a) identified as Black and woman, (c) graduated from Spelman between 1960s and 2010s, and (c) earned a bachelor's degree in mathematics. Prior to conducting my narrative inquiry, I compiled a potential list of participants using two main sources. My first source was a web page entitled, "Spelman Mathematics Department Alumnae." This web page provided over 50 potential participants for my dissertation research. The second source was Spelman's Mathematics Department web page. The department published a list of Spelman alumnae who earned master's- and doctoral-level degrees. There were a total of about 80 Black women mathematicians on the list. With the help of these two sources, I identified a sample of approximately 130 potential participants. Given that most of the

profile information for these individuals was outdated, I spent countless hours updating their biographical and contact information using the World Wide Web. For the majority of potential study participants, I found complete contact information including telephone numbers, email addresses, and mailing addresses.

At the beginning of the fall 2015 semester, I invited Spelman mathematics alumnae to participate in my dissertation research. I sent potential participants an invitation letter via email stating the purpose of my research and briefly explaining their roles and responsibilities if they agreed to participate (see Appendix A). In the case that potential participants simply refused to respond or declined the invitation altogether, I made provisions to employ snowball sampling as a possible method of recruitment. For instance, if consenting participants knew other Spelman women who satisfied my study's selection criteria, I asked them to give their referrals my contact information so that they could reach me directly regarding participation. Between my formal invitation letter and the snowball sampling technique, I recruited a total of six participants.

Table 2
Description of Research Study Participants

Name	**Graduation Year**	**Undergraduate Major**	**Occupation**
*Annette	1982	Mathematics and Engineering	Associate Professor
Danielle	2002	Mathematics	Biostatistician
Jasmine	2001	Mathematics and Engineering	Director of Engineering
*Lauren	2002	Mathematics	Assistant Professor
*Mikayla	1998	Mathematics and Engineering	Professor and Department Chair
Veronica	2002	Mathematics	Business Analyst

Note. Participants with an asterisk before their names were included in this research project.

After each of my participants responded to my invitation letter, saying they were interested in participating, I emailed them an informed consent form (see Appendix B). In the body of the email message, I explained that the consent form would describe my dissertation research including the risks and benefits of the study and provide more information about what their involvement might entail. After participants read the consent form in its entirety, I

requested them to return a signed copy of it if they were still willing to participate, and to send me their availability so that we could schedule our first meeting.

Once I received a signed informed consent form from participants, I began scheduling my first research conversations. Given that the majority of my study participants moved out of the state of Georgia after completing their bachelor's degree in mathematics, my conversations with them were held over the telephone and on Skype. Because I had not used the telephone or Skype to conduct a narrative inquiry in the past, I knew it was important for me to establish some level of comfort and confidence with such a different process of coming alongside. With my study participants living in different parts of the country, I realized the importance of being intentional about building rapport and strong, long-lasting relationships with them. Because I understood, "relationships among narrative inquirers and participants are at the heart of narrative inquiry" (Clandinin, Downey, & Schaefer, 2014, p. 48), I immediately became acquainted with my research participants through our frequent email correspondence. Email was a quick, convenient means of communication that allowed us to keep in close contact. After sending the invitation letter, email correspondence was a lot less formal, and much more personal in nature. For example, I remember scheduling research conversations with my participants around the winter holiday in the midst of their ongoing lives, and it was extremely difficult to find a time to meet. So we found ourselves exchanging numerous emails and sharing personal details about major life events. I wondered why we felt compelled to share such intimate details about our lives. I suspect we shared them as justification for rescheduling research conversations. Once we met over the telephone and on Skype, we bonded over our special connection with Spelman. It was then that my relationship with participants strengthened. Reminiscing about our tenure at

Spelman, mathematics faculty and alumnae in particular, brought us together, in relation to one another.

Confidentiality and Ethics

In Hostetler's (2005) "What Is 'Good' Education Research," he emphasized that conducting a research study is more than just satisfying methodological standards. He believed "important ethical questions about how researchers should understand and work with the human beings they study" (p. 16) ought to be part of the discourse as well. The demands of "good" research require researchers to work together in effort to achieve the highest moral standard and concern for study participants. Hostetler insisted, "even if we can get past the question of what is good, we must ask whether the good thing is good for these people, at this time, in this [research] situation" (p. 20). When I set out to conduct my narrative inquiry alongside Spelman mathematics alumnae, I began asking myself these very same questions, more so, because I recognized the importance of addressing ethical matters, especially relational ethics in my doctoral research.

Before I reached out to graduates of Spelman's mathematics department, I sought approval from my University's institutional review board (IRB). The IRB application submitted for my dissertation research project described what participants' involvement and engagement might look like throughout my narrative inquiry, and outlined all my research and confidentiality procedures. After my application was reviewed and approved in the fall of 2015, I obtained informed consent from those who showed interest in participating in my narrative study, making them aware of my project's procedures (see Appendix B). There was a section in my informed consent form that not only highlighted the voluntary nature of participation in my dissertation research, but also the fact that participants could withdraw from my narrative study at any point

in time. I made sure my participants knew that this dissertation research project would not expose them to any more risks than they would normally encounter in their daily lives. I did, however, alert participants to a potential risk with regard to confidentiality if any study records were sent to them via email. I offered to send study records through the mail along with a postage-paid return envelope or via fax, but all my participants chose to receive study records via email.

I informed participants, at the outset, that their participation in my research study might not benefit them personally. However, I am almost positive that each of my participants relished the opportunity to reflect on their pursuit of a bachelor's degree in mathematics at Spelman and other life experiences. Because of their willingness to share stories of their experiences in Spelman's undergraduate mathematics program, other mathematically talented Black women might actually see their own experiences in and/or relate to my participants' narratives, and pursue a future in the mathematics field.

From the very beginning, my participants were knowledgeable about the confidentiality of study records through informed consent. My participants' information was stored in a password- and firewall-protected computer. Our audio-recorded research conversations were stored electronically in a password-protected folder; I was the only person with access to the recordings, keeping my participants' words confidential. To keep my participants' identifying information separate, I removed all identifiers and used pseudonyms to protect their identities. The code sheet linking participants' names to pseudonyms was also stored in a password-protected folder. I assured participants that they would not, under any circumstances, be identified personally.

Aside from ensuring my participants' confidentiality, I focused sorely on relational ethics. Clandinin, Downey, and Schaefer (2014) reminded me that it was enormously important to "continue to think about relational ethics as [I] sought out, met with, listened to, wrote about, and eventually negotiated narrative accounts with each participant in [my] study" (p. 48). According to Clandinin and Connelly (2000), "In much the same way that we consult our consciences about the responsibilities we have in a friendship, we need to consult our consciences about our responsibilities as narrative inquirers in a participatory relationship" (p. 172). In my doctoral research, I made a conscience effort to assiduously attend to my participants' dispositions, and honor any commitments we made to each other. For example, I remember a time when one of my participants told me she could only engage in conversation for a short time because of a work-related event. So a few minutes before she was scheduled to attend the event, I began to wrap up our research conversation and talk briefly about scheduling our next meeting. Because we were living alongside one another in a participatory relationship, and I knew the importance of being punctual, I felt it was my responsibility to assure she made it to the event on time. Nurturing my relationships with participants and honoring commitments made to them were my foremost priority throughout my research project.

From Field to Field Texts

I collected a variety of field texts for my doctoral research, while simultaneously attending to the three-dimensional narrative inquiry space. According to Clandinin (2013), "Field texts are the records, including, for example, field notes, transcripts of conversations, and artifacts, such as photographs and writings by participants and researchers" (p. 46). Because narrative inquiry is such a relational methodology, when narrative inquirers enter the field, they co-compose different kinds of field texts alongside research participants (Clandinin, 2013).

Instead of referring to the collected records as data (which is usually the case when using other research methodologies), narrative inquirers have long been identifying them as field texts (Clandinin, 2013; Clandinin & Connelly, 2000; Clandinin, Downey, & Schaefer, 2014), because it was said that they—

> are experiential, intersubjective texts rather than objective texts. Field texts are co-compositions that are reflective of the experiences of researchers and participants, and they need to be understood as such—that is, as telling and showing those aspects of experience that the relationship allows. (Clandinin, 2013, p. 46)

I borrow the term "field text" from Clandinin and Connelly (2000), and use it throughout this project. Because the researcher–participant relationship is constantly being negotiated throughout an inquiry, Clandinin (2013) urged researchers to co-compose field texts with participants to ensure we are consistently telling stories of and engaging in our experiences in new and different ways. She said, "It is important as researchers to stay awake to the multiple ways to tell and live experiences" (p. 46). Recognizing that there can be variation in the way my participants' narratives and my own schooling narratives are told, I ventured out into the field, inquired into each of my six participants' personal stories of experience, and co-composed multiple types of field texts with them.

I initially began this research phase by writing stories of my own personal and academic experiences. I wrote an autobiographical narrative inquiry in effort "to begin to understand how the participants [I] have imagined can shape the inquiry" (Clandinin, 2013, p. 43). My wonderings about how Black female mathematicians negotiate the predominantly White male space prompted me to interrogate and think about my own experience as a young Black woman in the mathematical arena. In Chapter 1, I constructed a narrative that described my

undergraduate mathematics career and experience teaching mathematics at Spelman. I also wrote about my doctoral student experience in the Applied Mathematics program at UMBC. Because I endeavored to come alongside mathematically talented Black women, I thought writing down my storied past might aid me in understanding their complex, life-shaping narratives (Clandinin, 2013).

To compose a narrative reflective of my past experiences, I revisited artifacts to awaken memories and excite emotions within me. Because I have, in my possession, photographs from my undergraduate days, I could recall reaching certain milestones in my undergraduate career, and reminisce about the camaraderie among mathematics majors, faculty, and staff. Looking at old photographs from as far back as my freshman year made me not only think about stories of and conversations with the people featured in them, but also think of those who were not pictured at all. By putting each of the photographs in chronological order, starting with images taken during my freshman year and ending with my senior portraits, I was able to retell stories of my experience as a college student. I began the stories by writing down the smallest remembered detail in hopes that I could piece together the full story behind it. Although these old photographs brought back numerous memories of my undergraduate life, it is worth mentioning that, because these artifacts were merely "triggers for telling stories," they "are not themselves part of [my] field texts" (Clandinin, 2013, p. 46).

I did, however, thoughtfully consider some field texts while composing my own autobiographical narrative inquiry including memory box photographs and other items, and a journal written during my undergraduate tenure. In addition to all my old photographs, I had kept a memory box full of undergraduate memorabilia; much to my surprise, it was in fairly good condition. My memory box was filled with everything from old notes from required mathematics

courses to information regarding my commencement ceremony. As I studied each of the items in my memory box, I thought about what my participants might have experienced as a mathematics major at Spelman, and wondered how their stories compared to mine. I also consulted the pages of my tattered journal. Although I did not write in it often enough during my undergraduate years, I still drew from the intense, emotional experiences described in the text. Conducting an inquiry into each of the field texts, according to Clandinin (2013), "allow us [researchers] to understand who we are, and are becoming, in relation with potential participants and particular phenomena" (p.43). I firmly believe that, writing my own personal narrative helped me adequately "justify" the need for my dissertation research (Clandinin, 2013). It is of significant importance to my project's overall design.

I inquired into the stories of Black women's experiences by having spirited research conversations with each of them, as mentioned above. Clandinin (2013) stated, "The most frequently used starting point is telling stories [in narrative inquiry], and the methods most commonly used are conversations, or interviews as conversations" (p. 45). Because storytelling is so incredibly powerful, I chose to engage in research conversations, rather than interviews of any kind. Research conversations naturally "create a space for the stories of both participants and researchers to be composed and heard" (p. 45). Engaging in uninhibited interaction with my participants allowed us to share intimate stories from our past and present. Our research conversations encouraged us to bare detailed memories of our mathematical journey and offer intuitive perceptions of our unique circumstances as mathematically talented Black women.

Prior to my research conversations with study participants, I created a basic list of broad, open-ended topics and questions related to my study's research questions (see Appendix C). I then created what many qualitative researchers refer to as an interview guide to ensure the IRB

was made aware of the general topics and questions that might have been covered, in our research conversations. In the majority of my unstructured conversations, though, my wonderings guided the direction of my narrative inquiry. By no means am I saying that I did not have questions in mind; I am merely saying that I did not have a list of topics or questions in hand each time we met.

Each of my three audio-recorded research conversations with participants lasted approximately 60–90 minutes. Although each of my research conversations with participants varied in content, I designed them so that we engaged in dialogue around our life's experiences before, during, and after Spelman. Clandinin (2013) stated, "The stories we live by, and the stories we live in, over time are indelibly marked for all of us by stories of school" (p. 22). For this reason, in our first conversation, it was absolutely necessary that we discuss our early school experiences and the circumstances that led to our first introduction to mathematics. We also engaged each other in conversation about how our family's core beliefs and values shaped our identity, and how we made that all-important decision to attend Spelman. Our second conversation focused on our undergraduate student experiences at the College, particularly those in relation to being a mathematics major. We spoke about the challenge of negotiating the mathematics major, our relationships with faculty and students in our department, and the unconditional support and encouragement we received throughout our academic journey. In our final research conversation, we talked extensively about our lives after earning a bachelor's degree in mathematics from Spelman. We shared stories regarding the ways we carved out our professional paths, and reflected on memories of our missteps and victories.

My research conversations with participants were transcribed shortly after we met. As each conversation was being transcribed, I carefully reviewed it for accuracy–paying very close

attention to every single word on each page. Transcripts of conversations between my research participants and me were, indeed, one of the most important field texts created during my entire research process. The transcripts were packed with descriptive stories about our school life; stories that captured our growth through the years and typified our mathematics experience. Because these transcripts disclosed a great deal about the nature of my relationship with participants and the intricacies our life experiences, I made it my mission to ensure their exactness.

Before the decision was made to employ narrative inquiry, I considered using the photo-elicitation method. Harper (2002) stated, "Photo elicitation is based on the simple idea of inserting a photograph into a research interview" (p. 13). I held on to the belief and expectation then that introducing photographs and other forms of data into my research interviews might provide insight into the academic lives of my study participants by bringing memories of their past experiences to the forefront of each of their minds, much like my old photographs did when I was constructing my autobiographical narrative inquiry. That being the case, as part of the coming alongside process, I emailed my research participants prior to my second conversation with them, saying, that I would like very much if they could share photographs and artifacts with me from their academic tenure at Spelman, but none of my participants provided anything of the sort except one. A couple of them did respond to my request, though. In Lauren's email response about the items, she wrote: "I don't have too many pictures that speak to my experience of being a math major. Maybe one or two." But, I never saw them. Mikayla noted, "I am wondering about the artifacts, because I don't know if I saved anything (!)." Coincidentally, most of my other participants responded in the same manner. I could tell that my participants really did not know

if they still had any photographs and/or artifacts in their possession; and even if they did, it seemed the items were just too hard to locate.

In the midst of conducting my narrative inquiry, I made contact with the archivist at Spelman to gain access to historical documents housed on campus that shed light on the undergraduate mathematics program's evolution and its first students. During multiple visits to the Spelman archives, I looked through the College's yearbooks from as far back as 1960. Sifting through the faculty section of the yearbooks prompted me to seek out all the former mathematics professors, perusing the clubs and organizations section made me realize students' involvement in the mathematics club. Early on, it seemed mathematics majors themselves were interested in minoring in secondary education, and in later years, became intent on pursuing more science-related disciplines. In addition to looking at yearbooks, I delved into the Spelman Messenger, which is an alumnae magazine published by the College. Reading some of the older issues clued me in on the department's first graduates and how those in the Spelman community perceived the mathematics major. In an effort to keep a record of the documents held in the archives, I took photographs and wrote down an assortment of very detailed notes.

Throughout my entire inquiry, I kept a research journal and wrote field notes. Reflective journaling provided me a space to write down the ebbs and flows of my dissertation research. By committing myself to a regimen of journaling, I recognized the ways in which my affinity for Spelman affected my decision-making in research, and pushed me to exceed my own expectations. There were a multiplicity of records to preserve given a research project of this magnitude; therefore, it behooved me to use journal writing specifically for organization and management purposes, too. As part of my writing regimen, I also created field notes after each conversation alongside a participant. My field notes explicitly described observations of my

study participants and insights that came from our conversations. Taken altogether, the field notes collected and created for my project were highly enlightening and incredibly powerful.

From Field Texts to Interim Research Texts

I was swamped with composed field texts by the time I exited the field in February 2016. I had binders, electronic file folders, digital photography, and other study records consuming me. So devising a manageable plan for organizing all my field texts was fairly lengthy process. Initially convinced my analysis and interpretation would be conducted by hand, I began thinking about my first graduate research assistantship appointment, and the usefulness of hands-on analytic techniques. Having had experience analyzing qualitative data using pencils and pens, and sticky notes and highlighters of different colors, I leaned toward using binders as a management tool for all my field texts. However, I soon began considering computer software to store my field texts and assist with the analytical aspects of my dissertation research. On the one hand, I was uncertain about moving in this direction given that "some researchers working on small individual projects still prefer to do analysis without using one of the specially designed computer programs" (Bogdan & Biklen, 2007, p. 184). But on the other hand, I was interested to know more about how these computer programs could potentially improve my analysis procedures.

To manage all the field notes collected and created for my research project, I contemplated making use of computer assisted qualitative data analysis software (CAQDAS). In general, CAQDAS provides researchers with the tools necessary to organize, analyze, and decipher different forms of project data. Although I had been introduced to a couple of sought-after proprietary software packages, I familiarized myself with Dedoose, a web-based software. Because many of my colleagues were using Dedoose to assist them with ongoing projects, I

gathered information about its functionality to determine if it was appropriate for my doctoral research.

Initially, I thought, Dedoose was the best, most convenient option for managing my field texts, but in the end, I decided to organize collected material using boldly colored, three-ring binders. My graduate experience conducting qualitative analysis by hand influenced my decision. Although Dedoose would have allowed me to sort collected field texts and conduct analysis from any location with Internet access, and securely store records in a password-protected folder, I recognized, in this research situation that arranging my field texts in binders and doing work without CAQDAS boosted the level of my engagement during the analysis phase.

For this project, I obtained assorted colored binders to hold all my field texts. After composing field texts alongside my research participants, I prepared one solid-colored, three-ring binder for each of my six participants. Each participant's one-inch binder included transcripts of our three research conversations and field notes from our time spent together. Once a rough draft of the stories of my participants' experiences was written, it was also included in their binders in addition to any feedback I received from them regarding the loosely constructed narratives. I acquired a couple of other binders to organize the following records: my personal narrative; a range of field texts including copies of my own photographs, paper memorabilia, and journal pages; a printed copy of potential conversation topics and questions; historical documents from the Spelman archives including copies of photographs from past yearbooks and issues of the Spelman Messenger; my hand-written notes regarding the historical documents; and my research journal. Utilizing different-colored binders assisted me in sorting my field texts and think narratively about my research participants' experiences.

I fully engaged in intriguing research conversations with my study participants from mid-October 2015 to late February 2016. Coming alongside my research participants over the course of several months led to the telling of some revealing stories about their experiences as talented mathematics majors. But, after spending those months in the field, I knew the time had come for me to start "negotiating [an] exit" (Clandinin, 2013, p. 44). Because narrative inquiry is such a relational methodology and strong connections had been built between my participants, and me, exiting the field proved to be one of the most challenging undertakings of my dissertation research process. Nevertheless, Clandinin reminded me that a researcher's "exit is never a final exit. We [researchers] continue to carry long-term relational responsibilities for participants, for ourselves, and for the work we have done together" (p. 44). So although it felt like I was abandoning my inquiry and those who I had grown so close to during my time in the field, I had to begin the analysis phase of my dissertation research, and that meant drawing on Connelly and Clandinin's (1990) analytic tools including broadening, burrowing, and storying and restorying.

Transitioning from co-authoring field texts with my research participants to writing, what Clandinin and Connelly (2000) termed interim and final research texts, did not come without apprehension. I was overwhelmed by "the quantity of field texts, including the transcripts, artifacts, documents, photographs, and field notes" (Clandinin, 2013, p. 47) that we created together. Once my field texts were manageable, however, I proceeded to write interim research texts with the help of ongoing feedback from my research participants. Clandinin and Connelly's use of the term "interim research text" refers to the first version of a written narrative about a participant's lived experiences. An interim research text is informed by field texts composed by researchers and participants. Clandinin stated, "Interim research texts are often partial texts that are open to allow participants and researchers opportunities to further co-compose storied

interpretations and to negotiate the multiplicity of possible meanings" (p. 47). Final research texts, on the other hand, are co-constructed narratives of participant's experiences that have been rethought, reworked, and rewritten. This version of a participant's narrative is made "visible to public audiences, unknown audiences who may be far removed from the lived and told experiences of participants" (p. 50), which can be exceptionally worrisome for researchers. I designed this project with the intention of constructing "research texts that allow audiences to engage in resonant remembering as they lay their experiences alongside the inquiry experiences, to wonder alongside participants and researchers who were part of the inquiry" (p. 51).

Out of the six participants who agreed to participate in my study, I co-composed research texts with three participants, namely, Lauren, Annette, and Mikayla; they graduated from Spelman in 1982, 1998, and 2002, respectively. I selected these three research participants based on the year they graduated from Spelman. There was a range of different decades (80s, 90s, and 2000s) represented by choosing them. I created research texts with only three study participants because I believe co-composing six narratives of Spelman mathematics alumnae would have been too much for my readership to take in at once. Therefore, I wrote three narratives of my participants' experiences as completely as possible. It was of the utmost importance to me that I refrained from telling bits and pieces of my participants' life and schooling experiences. Sharing sketchy, incomplete texts would have undervalued all my participants' contributions to this project. By co-composing no more than three narratives, the stories of my participants' pursuit of mathematics became much more thorough and understandable.

By the time I exited the field and limited my contact with Lauren, Annette, and Mikayla, I had already begun to read our transcribed conversations from beginning to end. After reading those conversations between my participants and me multiple times, I began identifying specific

events in each of their lives. Then I began moving from field text to interim research text by using Connelly and Clandinin's (1990) three analytic tools to examine different aspects of the events. I used broadening, burrowing, and storying and restorying. Broadening, the first analytic tool used in my doctoral research, was described by Connelly and Clandinin. They stated this—

> occurs when we [narrative inquirers] generalize. An event recalled will be used in a chronicle or incipient narrative to make a general comment about a person's character, values, way of life or, perhaps about the social and intellectual climate of the times. These generalization appear as character and social descriptions. (p. 11)

In this project, broadening accounted for the larger socio-historical and -political contexts related to events at Spelman, and society at large. I relied on historical documents from the Spelman archives including photographs and text from past year books, and issues of the Spelman Messenger to make general comments about the socio-historical and -political changes on Spelman's campus prior to my participants' coming to the institution. I also used the literature around the mathematics teaching and learning of Black women from Chapter 2 to discuss the changing educational landscape at the time related to those same contexts.

> Burrowing was the second analytic tool I used. A narrative inquirer uses this tool to—focus on the event's emotional, moral, and aesthetic qualities; we then ask why the event is associated with these feelings and what their origins might be…. This way of approaching the event is aimed at reconstructing a story of the event from the point of view of the person at the time the event occurred. (Connelly & Clandinin, 1990, p. 11)

Therefore, with this analytic tool, I delved into my participants' thoughts, feelings, and emotions related to the event itself. I used each of the transcripts from our research conversations, field

notes, and my research journal to think narratively about the interconnectedness between my participants and the event.

Storying and restorying is the third tool I used. Connelly and Clandinin (1990) interpreted this tool by thinking about the individual mentioned in the explanations for the other analytic tools. They wrote, "The person returns to present and future considerations and asks what the meaning of the even is and how he or she might create a new story of self which changes the meaning of the event, its description, and its significance for the larger life story the person may be trying to live" (p. 11). However, they also mentioned "these questions often emerge at the point of writing, after all the data are collected" (p. 11).

As I arranged participants' stories into categories and immersed myself in the sense-making process, I considered the "three-dimensional narrative inquiry space" (Clandinin, 2013, p. 49). Making temporality, sociality, and place my principal focus allowed me to think deeply about and question the nature of events in participants' stories of their experiences (Clandinin, 2013). According to Clandinin, "The three dimensions in the inquiry space are interconnected and interwoven. Temporality is threaded into place and into events and emotions. The dimensions are not separated from one another" (p. 50). I tried to look at each of the dimensions independently at first, but soon realized that was an impossibility. I then began examining the connectedness between temporality, sociality, and place as it related to my participants' events. I am in agreement with Clandinin's position regarding the narrative inquiry space. She said, "When we [researchers] make all three dimensions of the inquiry space visible to public audiences and continue to think narratively, we make complexity of storied lives visible" (p. 50).

Once all the events were explored and noted in the margins, those chunks of text were extracted from my transcribed conversations with participants and examined by looking through

narrative inquiry's three-dimensional lens. After delving into participants' events, I created a list of recurring threads, and then narrowed it down considerably. The following are just a few examples of preliminary threads included in the list: familial support and involvement, role and identity as an undergraduate mathematics major, and pursuit of advanced degrees and professional experience. Identifying repeated threads in the text enabled me to determine the most prominent ones listed.

Before I began writing each of my three interim research texts, I reexamined participants' events. Creating a list of preliminary threads aided me in deciding which events to feature in Lauren, Annette, and Mikayla's written narratives. After pinpointing each of the events to be included in participants' narratives, I ordered them chronologically and proceeded to compose a draft of their interim research texts. Each of the research texts started with their family experiences during childhood and ended with their professional experiences.

On finishing the drafts of my participants' narrative accounts, I emailed them so they could provide me some feedback. In the body of my email message, I explained to my participants that what I had written was "just a rough draft" and could be redrafted, if necessary. I not only wrote questions for them throughout the draft in different sections to clarify story details, but also invited them to write in the draft so that we could shape the interim research text together. Clandinin (2013) stated,

> Bringing back interim research texts to further engage in negotiation with participants around unfolding threads of experience is central to composing research texts. The dialogue with participants around interim research texts can lead the inquirer back for more intensive work with the participant if more field texts are needed to be able to

> compose research texts that researcher and participants see as authentic and compelling (p. 47).

However, our email conversations did not lead us back to "more intensive work" at all. For example, Lauren responded by saying, she was "fine with [my] interpretation of the conversation." Annette noted: "I enjoyed reading the transcript. You did a good job with it." Mikayla wrote: "This is BEAUTIFULLY WRITTEN! I am so pleased with how it turned out. I hope that I can keep this and refer to it for a autobiography that I would like to write one day." When I read my participants' responses with regard to the interim research texts, I felt fortunate that they were so positive, but questioned if I had fulfilled my role and responsibilities as a narrative inquirer. I wondered if I had explained the inquiry process well enough to participants in the beginning. I also wondered if the distance between my participants and me had any bearing on their level of engagement in my doctoral research. Although my participants seemed "satisfied" with the way the interim research texts were written up, two out of three provided further clarity by answering all the questions I posed regarding their stories of their experience.

From Interim Research Texts to Final Research Texts

Around the time I received feedback from my participants, and members of my narrative inquiry group and dissertation committee, I revisited the preliminary threads identified earlier in my analysis. Looking across each of my three interim research texts, and refining and synthesizing preliminary threads resulted in the following list: (a) familial support, connectedness, and influences on education, (b) innate mathematical ability, (c) familial and teacher role models, (d) pre-college summer programs and "WISE" Scholarships, (e) mathematics majors' role and academic experience, (f) the Department's "not-so-hidden" agenda, (g) faculty and staff caring, support and mentorship ("professional mothering") and

student relationships, (h) post-college mentality shift and reflections, and (i) after-college challenges, opportunities, and professional experience. Each of these major threads emanated from my research conversations with participants and framed my interim research texts.

I modified my research texts after obtaining constructive feedback from those around me. As I incorporated the feedback, I began to appreciate how intricate and multifaceted my research participants' narrative stories really were. Fixating my attention on temporality, sociality and place pushed my thinking and focused my writing. Sorting out the storied details related to these three commonplaces helps narrative inquirers, like me, "come to understand in deeper and more complex ways the experiences relevant to our research puzzles. Only through attending to all dimensions can we see the disruptions, interruptions, silences, gaps, and incoherences in participants' and our shared experiences" (Clandinin, 2013, p. 50). My narrative stories of participants' experiences are not meant to represent all Black women who have pursued an undergraduate degree in mathematics, nor am I claiming that they are flawless. I admit there were times throughout my narrative inquiry process when it seemed there were more questions than answers. Nonetheless, it is my hope that my final research texts encourage my readership to reassess their thinking about the mathematics teaching and learning of Black women, and support those who aim to make this White, male-dominated field more inclusive.

Research Limitations

I noted several research limitations with regard to my dissertation research. Coming alongside mathematically talented Black women who graduated from Spelman more than a decade ago, and reside in different parts of the country, presented some unique challenges throughout my narrative inquiry. The following are (some of) the project's limitations: (a) participants' memory of past experiences, (b) method of communication, (c) time and schedule

constraints, (d) number of co-constructed field texts (Webster & Mertova, 2007) and final research texts. Recognizing these limitations in my project encouraged me to think about how they might be addressed and improved in future research studies.

Before I began conducting my narrative inquiry, I knew my participants' memory might be a limitation of my doctoral research. Since Annette, Mikayla, and Lauren graduated from Spelman in '82, '98, and '02, respectively, I thought they would experience difficulty recalling their school stories. I could not have been more right about the effect of time on my participants' memory, especially with regard to my eldest participant, Annette. I felt my research conversations with her were complicated by the fact that she could not remember details surrounding her past mathematical experiences. The more I probed into her past, the more effort she put forth to remember specific details of events related to her experience as a mathematics major. Annette always helped me put stories from her experiences in chronological order, but when it came to specific story details, if she did not know, she would simply say, "I don't remember." In those instances, I usually asked closely related questions or moved on to another subject altogether. My other participants recalled stories rooted in their memories, detailing scene and plot. But there were times they too experienced memory lapses. Because of my connection to Spelman, I jogged my participants' memory when they could not remember faculty members' names and other details involving our alma mater. I intend to address this limitation in future projects by using the photo-elicitation method. I realize participants might choose not to share their photographs and/or artifacts with me, but if they do, I truly believe they will be the stimulus that prompts them to recall stories from their past.

Having had the experience of conducting research conversations with my participants over the telephone and via Skype, I must acknowledge, was yet another limitation of my study.

Engaging relationally with my participants by telephone and Skype made coming alongside awkward at times. Not being able to observe my participants' non-verbal cues (Rubin & Rubin, 2005) in a telephone conversation and build a relationship with them through face-to-face interaction caused me to question if I was doing enough to sustain the bonds between us. Although my relationships with study participants grew over the course of several months, I often wondered what our relationship would have been like if we engaged using a different method of communication. I am firm in my belief that researchers do not communicate the same way with participants on the telephone as they do in a face-to-face conversation. When researchers and participants meet over the telephone or Skype, it is "more difficult to engage in casual small talk…and [participants] may want to get to the point quickly. The result may be less time to build trust before asking questions" (Rubin & Rubin, 2005, p. 125). In my narrative inquiry, though, I made sure to establish rapport and trust with my participants, and to raise their comfortability level whenever possible. Despite not talking to my participants face-to-face due to distance, we made every effort to learn from and teach each other. To overcome the issue of distance, I would like to submit a grant proposal to support my research on mathematically talented Black women and use some of the funds to travel the nation and meet my research participants personally.

Time and schedule constraints created lulls in my engagement with research study participants. Because my participants are professional women who have built successful careers in corporate America and academia, they were heavily involved in their own work lives when I came alongside them. Therefore, I was not surprised when the unforeseen arose on the days we were supposed to meet over the telephone and Skype. Each time this happened, my participants apologetically cancelled and requested to reschedule our meeting. In some instances, our meeting

would not be rescheduled for weeks, creating large gaps between conversations. If the gaps of time are too large, it is difficult for narrative inquirers to forge relationships with their participants. I did not, however, let these gaps dictate the nature of my relationship with study participants. Our tie to Spelman always seemed to bring us together and fuel our conversations. To ensure continued engagement throughout the narrative inquiry process, I might discuss the importance of timing and scheduling with participants prior to coming alongside them. If these matters are considered ahead of time, it will be easier to talk through them later.

While the large number of field texts co-composed with participants in my narrative inquiry overwhelmed me, the small number of final research texts about participants' academic lives motivated me. Prior to composing my autobiographical narrative inquiry, I did not realize my time spent in the field would generate such a wide variety of field texts. It was only when I exited the field that I began to put the number of field texts we created into perspective. Because there was a multiplicity of field texts collected and co-constructed, organization was a crucial aspect of my research process. Being organized allowed me to execute an analysis of participants' experiences and compose their narrative stories. I believe the stories of my participants' experiences will inspire other mathematically talented women of color, although I only wrote three final research texts here. Not only were my participants' words filled with wisdom, they were full of grit and determination. These final research texts reminded me of the importance of continued research on Black women and mathematics. In future research, I intend to gather and co-compose field texts that provide depth to participants' stories, highlighting all the complexities and idiosyncrasies—after all, it is about the quality, not the quantity of field texts collected. I hope that co-composing such illuminating field texts with my participants persists in encouraging me to write final research texts. It is my belief that, sharing stories of

their mathematical experiences will serve as an impetus for more storytelling and meaningful research conversations in future projects.

CHAPTER 4
LAUREN: "MATHEMATICAL BRILLIANCE RUNS IN THE FAMILY"

My first conversation with Lauren was scheduled for the end of October. We planned to talk mid-morning via Skype for about an hour. Before we spoke that day, I distinctly remember, my palms were sweaty and my stomach churned as I told myself repeatedly, "Calm down, you'll get through this." When I finally Skyped Lauren, she answered and we exchanged pleasantries. During the first few minutes of our conversation, I suffered a power outage due to bad weather. It was totally unexpected. My Internet connection failed, and Skype stopped working. I was then forced to make a split second decision. It was either wait for Skype to reboot and start working again or call Lauren on the phone. I decided to turn our Skype conversation into a phone conversation. I sorely apologized to Lauren and explained the circumstances.

Our second and third conversations were held over the phone and Skype, respectively. Although our means of communication varied, I felt our connection growing with each conversation. Lauren and I met over the course of three months, starting in October 2015 and ending in January 2016. Like our first conversation, we talked close to an hour in our last two meetings. She shared benefits of participating in a pre-college summer program, complexities of her undergraduate mathematics experience, and circumstances surrounding her pursuit of a Ph.D. degree. During the time we met for our conversations, Lauren, who was in her sixth year of assistant professorship, found herself in the thick of her university's tenure process.

Strong Familial Ties to Education

Lauren comes from a perspicacious family who knew the value of a quality education. Both her mother and father have been in the education profession for as far back as she can remember. In our first research conversation, Lauren recalled her mother's first teaching

appointment in South Carolina after graduating with a bachelor's degree in mathematics from a private, historically Black women's institution in North Carolina. Her father attended a public, historically Black, coeducational institution in the same state where he majored in history. After her mother and father became New Yorkers and were married, she remained in the classroom as a schoolteacher, and he worked as a substitute teacher.

Lauren and her sister, who's four years older, were raised in a neighborhood in Brooklyn, New York called Bedford-Stuyvesant, or "Bed-Stuy" as Lauren called it during our first meeting together. When she described her middle-class upbringing in the majority Black neighborhood, she spoke, for the most part, about the interconnectedness between her educator-parents and school life. From the time Lauren shared that her mother and father were both educators, I became very curious about their influence on her personal life and schooling experiences. At the beginning of our first conversation, she acknowledged because her parents were teaching professionals, her conduct and perspective as it relates to school had been impacted. As Lauren explained more of her family's work history, I learned in the early years of her schooling from elementary to high school, her mother was a principal and her father a special education teacher. Her father actually taught at the same junior high school Lauren attended in Brooklyn. When she was an elementary school-aged child, he served as a teacher in her school district. Because her family worked in the area, Lauren said,

> The administrators knew my family and then my aunt was also in administration in my school district, the same school district I went to elementary school, so I don't know how personally I was aware of it [the influence], but I knew administrators knew who my parents were and teachers knew that my parents were educators. So, I think having teachers who acknowledge your parents are educators I think you get treated slightly

> differently. So in some regards it's an expectation thing but in other regards I feel like if you have a teacher that's not a hundred percent committed, they step up their game a little bit when they know your parents are educators.

Once Lauren reached junior high school, she began to realize her father's profession. She stated, "I probably had a conscious awareness of the fact that my father was a teacher, more so because he worked in my school." Their paths did not cross much at all in junior high school, however, because she was enrolled in the gifted education program located in the basement of the school while he taught special education students on the fourth floor. On the few occasions when Lauren and her father did come in contact with each other, she received no special treatment; he typically treated her like his students. She did remember one time, though, when she refused to submit an assignment. Lauren was made to leave gym class to address the missing piece of work. She was convinced that, that situation "probably would not have occurred if he wasn't a teacher, wasn't in the school." It was clear to Lauren then, that, when your parent is a teacher in the school you attend, unexpected things are bound to happen.

While Lauren's father made certain she thrived academically during school hours, her mother always encouraged her family to participate in activities held outside of the regular school day. For example, she recalled a conversation she had with her father about an upcoming parent-teacher night. Lauren distinctly remembered that her father really did not want to attend the event and urged her mother to go by herself. But her mother impressed upon the importance of participating in the parent-teacher night. She recalled her mother's words to her father, she said, "no you're going…because you know what they think about black parents, you know this single parent household type of thing so like no you need to…show them that this is not the situation." This story about whether to attend parent-teacher night seemed etched in Lauren's

mind; it showed her the complex nature and issues of educating Black students in communities like that of Bed-Stuy. She spoke of her mother needing to "prove a counternarrative to the perceptions of blackness." She knew, as a parent-educator, it was incredibly important to show her interest and concern for Lauren's education, at school activities like parent-teacher night.

For a time during Lauren's childhood, she frequently travelled to her mother's southern hometown. These trips usually occurred over the three-month summer break. When she returned home after each visit, she usually came back with more knowledge and understanding about southern culture and traditions. I sensed Lauren had a deep affection for the South, not to mention an appreciation for all of the lessons she learned from past summers spent with her family. She said, "even though I grew up in New York I definitely had, I would say southern values, southern black values." Knowing her tie to those southern Black values, I wondered, throughout the course of our conversation, if they had any bearing on her post-secondary educational trajectory.

Lauren spoke often of the stories of her grandmother and mother's experiences teaching in the South. Her family's connectedness to education runs deep, in that, her maternal grandparents were members of the teaching profession. When she was a fifth grader, her grandmother shared a story about her experience teaching in a "one-room schoolhouse." Her mother described what it was like to be a teacher in one of the South's integrated schools, and talked about the time she finally left her teaching position at the school. Lauren said, "she [her mother] used to teach honors classes and during integration she was no longer allowed at the school…to teach honors classes because then it was reserved for white teachers." But before Lauren's mother left, she experienced a hostile White parent who thought his wife's son should

have earned a higher grade in her class. Lauren explained, “hearing stories like that…shaped who I am educationally.”

The example set in her formative years by both her immediate and distant family also shaped her educational path. In addition to her parents attending and graduating from HBCUs, her older sister earned a bachelor’s degree in biology from a private, historically Black institution in Louisiana. Because I, too, had applied to that very institution for my undergraduate studies, I was familiar enough with the school to know that the admission staff accepts only highly talented college bound students into their rigorous academic programs. As Lauren and I continued our conversation about her family’s pursuit of higher education, she said, “Actually both my mother’s mother and father went to college as well and her grandmother went to college, and everybody went to HBCUs so that’s kind of the thing that we did.” After Lauren told me about all of her family members that have attended HBCUs, I began to understand the importance of being a part of and maintaining such a legacy. Growing up in the Bed-Stuy neighborhood listening to stories of their undergraduate experiences made Lauren much more aware of the significance of HBCUs in the lives of young Black men and women. The messages she received in her youth about HBCUs resonated powerfully with her to such an extent that, she knew, she’d attend one too someday.

Early Years of Schooling in “Bed-Stuy”

As Lauren described her childhood memories growing up in Bed-Stuy, she recalled her habitual after-school routine. When I asked pointedly about her early experiences, she said, “I would come home from school, have a snack, do my homework type of deal.” As I understood it, her parents’ expectation with respect to her schoolwork was that it would be completed

satisfactorily shortly after she came home. That is the kind of "two-parent household" she lived in for a time some years ago.

She characterized herself as an easygoing, soft-spoken student who always managed to finish assigned tasks and follow classroom rules. As Lauren continued to recount her early school days, she mentioned that she rarely cared to engage in class discussions, nor did she think it was necessary to make all A's. Lauren explained,

> I definitely wasn't an A student, I was more like a B student, I was one of those students who, if I didn't have to do work and I could get a B then I was not going to go the extra mile to try and get an A, because it was fine to get a B.

I wondered, though, about what Lauren's educator-parents would have thought if they had known she was disinclined "to go the extra mile." Would they have been disappointed that she did not put forth more effort to make A-level grades all the time—grades that purportedly show a child has reached her or his highest potential? Or, would they have been satisfied knowing she was earning A's and B's, despite her lack of effort?

Lauren, a self-described A/B student, did share a time when she received a lower grade on her report card. She said she did not get punished for her "bad" grades; her parents simply told her "to try harder" when that situation occurred. Her report card experience helped me better understand her parents' perspective regarding schoolwork. It became very apparent to me that it was necessary for Lauren's parents to know she was working diligently on and submitting each of her school assignments. Her story resonated with me because my parents required the same thing of me. My parents, especially my mother, a veteran schoolteacher, instilled in me the need to work hard in school. Like Lauren's parents, they expected me to aim high and put forth my best effort. She said, "I really didn't have any chores as a kid, I really didn't have to work as a

kid, so it was like the expectation is you go to school…and do your best." If Lauren experienced difficulty in any subject area, her mother and father would be sure to "seek out resources to support [her] educationally." She told me that she did not think they had "unrealistic expectations" of her at all.

Discovering Mathematics Potential

The more she shared detailed stories of her childhood experiences, the more I learned about Lauren's mathematical prowess as a youngster, and how her interest in mathematics was emboldened by her engagement in extracurricular programs. She said confidently, "I always was good in math…that was always probably my strongest subject area." Realizing reading, writing, and spelling were not her strengths; she gravitated toward mathematics, a subject for which she received higher marks. Although Lauren excelled in mathematics, she admittedly acknowledged, she "wasn't a fast math student." She told me that many of her peers had mastered their times tables and performed such mental calculations with great speed. Describing her own capacity for mathematics in grade school, Lauren said,

> I could get the answer but I was one of those people that took a little bit longer to do it so I would never be on like the math competition team because I was never fast at it, but I could always get the right answers so I always did well on my tests, I just wasn't one of those speedy types of people.

But, regardless of whether she was fast at mathematics or not, her talent could not be denied. She asserted that mathematics was indeed her "strong point" and her educator-parents fully supported her incredible strength.

In conversation, she mentioned her parents were instrumental in honing her mathematical talent. Lauren said her parents would always enroll her in mathematics-related activities after-school in addition to programs in the summertime. She said,

> So my parents would set up a context of, you're going to do a program. The program that you choose to do is up to you…but you're going to do the program and here are options. The options that I would pursue would be math-related because I was more the math person.

For example, one summer Lauren participated in a program in Brooklyn as an elementary school student. The program offered participants a wide range of activities and she made the decision to choose the architecture activity because it involved mathematics. Lauren also participated in a summer program run by a multinational technology company. Because mathematical subject matter "came natural" to Lauren, those opportunities particularly appealed to her.

In junior high school, she joined an afterschool program so that she could take mathematics courses for high school credit. She said if you passed an examination at the end, then you could earn course credit. She said, "So, in seventh grade I took ninth grade math…In eighth grade, I took tenth grade math so when I went to ninth grade I took eleventh grade math…and in tenth grade I took AP calculus," successfully passing each of the courses. She refrained from taking additional mathematics classes after that. By the time Lauren reached high school, her innate capacity for mathematics led her to the honors program.

Mother Knows Best

Lauren's honor student status her first year of high school drastically changed her course trajectory. During her first few days of school, her guidance counselor placed her in a mathematics course for ninth graders. Given that she had already passed the examination and

earned high school credit for the course, she needed to be transferred to another mathematics course immediately. Lauren told me that "it took [her] mom calling up a whole bunch of times like no, my daughter…doesn't want to be here she took her [examination] and passed it." After her mother called, approximately two weeks later, Lauren was placed into an algebra and trigonometry course. She sincerely believed that if her mother had not advocated for her in that situation, she would not have had the same positive outcome.

Lauren also recalled her mother having to deal with a grade discrepancy situation on her behalf at her high school. When Lauren's humanities teacher gave her a lower grade than she deserved in the course, her mother spoke directly to the teacher. During their conversation, her teacher questioned if Lauren had turned in her assignments. Her mother could not believe what she was hearing and finally "said you know I'm an educator.... This is unacceptable. My daughter doesn't get these types of grades in this type of class." Sure enough, shortly thereafter, her teacher changed her course grade. After listening to Lauren's stories about her experiences, I wondered how her academic path might have unfolded if her mother was not her biggest advocate. How would she have negotiated the unforeseen circumstances described here?

A Mathematically Talented Female Role Model

Lauren felt a connectedness to mathematics since she was a small child. When I asked about the source of her inspiration to pursue mathematics, she began to consider her mother's role on her academic path. Lauren expressed her closeness to her mother when she said, "I was always a mother's girl…my mom taught math. She had a degree in math so…you know, I'm a mother's girl, I can relate." Identifying with her mathematically talented mother aided her in realizing her own "math identity." Lauren seemed to thrive in all her afterschool activities and

excel on all her standardized tests related to mathematics. I am convinced that her mother's presence in her life made seeing Black women in mathematics, far from an anomaly. She said:

> I don't feel like as a kid I'm a woman I shouldn't be doing math. But maybe because my role model was in my household, she did math, she was math, so I don't think that concept of like, oh this is crazy that you're into math.

Lauren said the only time she experienced sexism was in that summer program when she participated in the architecture activity. At the start of the summer, there were a total of two girls, including Lauren, but after a while, the other girl left, leaving her with all the male participants.

Having had the experience of being the only girl in her architecture class, Lauren recognized the importance of having **"**people in your life who look like you, who are doing it." Lauren believes witnessing a mathematically talented woman, like her mother, at home and in the field, was significant because it became "a dominant experience" for her. Because seeing a Black female mathematician was an everyday occurrence, hardly anything could deter her from pursuing mathematics on the collegiate level.

WISE Scholars Unite

Prior to Lauren's freshman year at Spelman, she began to form long-lasting bonds with a great number of college-bound women interested in the fields of science and engineering in a pre-freshman summer program. The Women in Science and Engineering (WISE) Scholars Program sponsored the pre-freshman program. Although Lauren was not a WISE scholar that particular summer or when she enrolled the following fall semester, she was afforded the opportunity to participate in the program. She told me that because "a lot of the math majors were WISE scholars," the pre-freshman summer program gave them a chance to get to know one another and mull over their shared interests. Lauren described the summer program as

"extremely beneficial" simply because "the social network aspect of it was really helpful." It also helped form their "common identity" as mathematics majors and WISE scholars. She officially received her WISE scholarship a few weeks into the start of freshman year.

Lauren benefited substantially from her summer experience in the pre-freshman summer program. Her participation in the program made her transition from high school to college a surprisingly smooth process. The bonds she formed with her classmates, the close proximity to the dormitory she stayed in, and the courses she took for college credit over the summer all helped her to become acclimated to life on Spelman's campus the following year. She further explained:

> So it [pre-freshman summer program] formed a community before you even entered there which was really helpful. Particularly coming from New York to Georgia, so that shock of being in a new town I think was buffered because we had that summer program. It was very intimate too, so I think that was helpful.

Another benefit of participating in the pre-freshman summer program was that she met several members of the Spelman faculty. A faculty member from the mathematics department, Dr. Mark Hudson, taught her calculus course. She also had the opportunity to meet a computer science and chemistry professor. Dr. Rosie Faison, a long-time member of the chemistry department, was actually the director of the WISE Scholars Program at the time. After she told me she had been introduced to each of these faculty members, individuals with whom she would come into contact throughout her undergraduate years, I realized why Lauren expressed such an affinity for the program.

Majoring in Mathematics

Receiving the WISE scholarship at the beginning of freshman year changed the course of Lauren's undergraduate studies. She became so immersed in WISE activities and familiar with the other scholars in the program that, during her first year on campus, she began to identify more as a WISE scholar than a mathematics major. Lauren would spend each summer participating in an internship arranged by the WISE Scholars Program. She interned at America's renowned space agency in Florida for multiple summers. When Lauren reflects back on those summers in particular, she thinks about the "good time" she and the other WISE scholars had in their condominiums on the beach. She enthusiastically told me "it was just like amazing to see space shuttles launch" with her peers, but what made it even better was that they were experiencing it all together. Lauren said, "That was a community and that's what I—my Spelman experience is. That's a community."

When Lauren talked about the notion of a mathematics community within the department, she expressed her distaste for a couple of situations that happened during her pursuit of an undergraduate mathematics degree. Like when she was a youngster, she described herself as a mathematics major whose grades were, for the most part, in the B range. Because her grades were not typically A's all the time, Lauren felt like Dr. Hudson, the mathematics faculty member she had had in the pre-freshman summer program, did not favor her. When Dr. Hudson was asked about her mathematics performance, he told WISE leadership, "she was alright." Needless to say, that situation in and of itself "left a nasty taste in [her] mouth" because she did not necessarily feel supported by him. Lauren recalled another time when her course group for Real Variables had to split into two separate classes. As it turns out, the students who were considered Dr. Hudson's "favorites" made up one section while those who were not formed the other class.

Because Lauren was not considered his favorite, she transitioned to another class entirely. Once this happened, she questioned how "inclusive" their mathematics community really was. She said, throughout her undergraduate years, it was actually her friends who played a major role in making her feel like she was a part of the departmental mathematics community.

As she described her mathematics identity in a majority-Black mathematics department, I thought back to our first conversation and recalled some pertinent details of her childhood. Because most of her teachers were Black growing up, Lauren expressed that she was not moved by the fact that she came into contact with so many Black professors in Spelman's mathematics department. It was not "strange" to her at all. She realized, however, that Black women undergraduates in pursuit of a bachelor's degree in mathematics is uncommon, and it is equally uncommon for them to engage in science and engineering; the sole reason she was awarded the WISE scholarship. She said:

> I don't know if it's subconsciously or consciously makes you think I can do this, like I'm seeing someone who looks like me in front of me teaching this class. And maybe that's why I felt more inspired by or felt more connected to those [black] faculty members. Not to say that the other [white] faculty members didn't have that cultural competency or that understanding. I just felt a sense of more encouragement from those other [black] faculty members.

Coming to Spelman with such a rich mathematical past and those undeniable familial ties to the teaching and learning of mathematics made Lauren feel confident about her prowess. But, once she had begun taking mathematics courses in the department, she experienced some overwhelming challenges. She thought that because she had encountered such difficulties, those

moments had tarnished her mathematics identity somehow. She explained her feelings about her mathematics identity by saying:

> It's like yeah I don't know if I'm really this math person. I mean I'm getting this degree, I get this scholarship and because I am a math major it does the type of identity that people can respect, a black woman who is getting a degree in mathematics so maybe from the outside world, particularly the outside world who aren't math people it's like oh, yeah you're math, you're good at math. You're majoring in math. But then I don't know how it—I partially internalize myself as having that identity but then partially it's like yea I doubt I'm going to get a degree in mathematics after I leave here. So I don't know how much of me seeing myself as a person who is really mathematically inclined versus a person who is a mathematician. I don't think I ever saw myself as a mathematician.

As our conversation progressed, my curiosity seemed to grow about the kind of support she received as a mathematics major. Lauren clearly explained to me that she refrained from attending faculty members' office hours because she did not see herself as that "type of student." Instead, she would either seek support from her classmates or study harder if she had difficulty with schoolwork. With regard to always soliciting her peers for help in times of need, she said, "I think that affects relationships…with faculty members, particularly in the sciences." Lauren recalled a specific instance when she failed an examination in one of her mathematics courses and felt very disappointed about the whole situation. She immediately stopped attending class and eventually withdrew altogether. Looking back, she felt her withdrawal could have been prevented with an email from or short conversation with her professor about her course progress:

> I would say that he equally wasn't like necessarily invested in me as a student because I would think that if you are really vested you would notice that the student struggles….
>
> But some faculty members are like that and I think in the sciences it's just like okay.

I was under the impression then that she believed this dynamic played out quite a bit in science-related undergraduate programs. I wondered about the disconnect between undergraduate science students and their professors. Could that partnership be improved somehow? I thought extensively about what might facilitate a more supportive connection between the two groups.

It seemed that even if Lauren's pursuit of an undergraduate degree in mathematics became increasingly difficult, very seldom did she rely on her parents for support. The majority of the time she maintained a grade point average (GPA) of 3.0 or better, so she sought little to no academic support from them. The "one time" she did reach out to her parents for support was when she struggled to pass a mathematics course. Lauren's mom told her in conversation, "You got it, you can do it, it'll all work out." Lauren felt her mother could relate because of her mathematics background. Her mother's words of encouragement and advice helped her push through that terribly difficult time.

Lauren's older sister provided her a great deal of support the whole time she pursued her degree at Spelman. Because her sister moved to the city of Atlanta prior to Lauren's freshman year, she found herself at her sister's house on a regular basis. She told me that she could depend on her sister for "emotional support" throughout her undergraduate career.

In our second conversation, Lauren highlighted positive qualities of Spelman's mathematics department and areas needing improvement. Because it was not a great number of students majoring in mathematics at the time, she appreciated the size of her "community of learners." In addition, she enthusiastically stated, "Well particularly as an African American

person in the sciences, I really liked the fact that we had a decent amount of black faculty members." Lauren remarked, because there were "a good amount of people with Ph.D.'s who…were black, I think you had enough people who were supportive of you and I think even generally wanted people to do well." If she was the type of student who sought help during a professor's office hours, she felt she would have benefited greatly from it. She did think, however, that faculty should have refrained from allowing their biases to influence their interactions with students. Lauren said that faculty could have also provided each of the mathematics majors with comprehensive career guidance. It was not enough for faculty to introduce students to Ph.D. programs in mathematics and statistics, according to Lauren. But, then again, Lauren always thought the faculty lacked investment in "middle of the road math" students, which she viewed as a serious weakness of the department. She felt that there should have been more attention paid to "students that just aren't the top students."

We had a sobering conversation about her last few days on Spelman's campus. As Lauren thought about her four years as an undergraduate mathematics major, I could tell she felt a "sense of relief" that she had taken all the mathematics courses required for the program. She said, "That last one [mathematics course] I probably was like I'm done. I'm done with my major. If I want to get up out of here, I can get out of here right now type of thing." Being a mathematics major was far from easy, so I completely understood her feelings. From the time she stepped onto Spelman's campus, she never overthought her choice in major, though. Thinking back to her first days in the program, she said, "I don't think I had expectations of I'm about to be this super math person. I think it was like I'm going to college. I'm good at math; so major in math." Reflecting even more deeply about her undergraduate work in its entirety, she said,

> I definitely don't think Spelman gave me this passion for math. I don't think as a math major. So I don't know. I kind of think you don't know what real math is until you become a math major. Dealing with numbers I still love. Where did those numbers go?

Despite not being passionate about mathematics at the end of her undergraduate tenure, she knew pursuing her bachelor's degree in mathematics was a challenging feat, and that she should be proud of such a commendable accomplishment. By senior year's end, she was more than ready to graduate and confront life outside of Spelman.

As we continued to discuss her undergraduate mathematics experience, she recalled a stunningly powerful moment during her graduation in 2002. Surprisingly, at the commencement ceremony, the audience was asked to acknowledge all the graduating mathematics majors. She pleasantly recalled the audience giving them a standing ovation. It was then that she realized that "we [mathematics majors] did something that was pretty cool and respected by our peers." It was her belief that "it was just respected because you were a black woman doing this thing that—even on a bachelor's level most black women don't do." She was obviously highly affected by the audience's applause and praise.

Building Long-lasting Relationships with Faculty and Peers

Lauren developed supportive and positive peer relationships. The majority of her peers majored in mathematics and/or participated in the WISE Scholars Program. When she described her peer relationships, she said, "I think my classmates were very collegial so we really had a good relationship." In addition to participating in the WISE Scholars Program, she was a member of the Honors Program. Because she had involvement in this program at the start of freshman year, she lived in a residence hall on the same floor with honors students, and in close proximity to WISE scholars. Thanks to her living situation, she was afforded the opportunity to

befriend both honor students and mathematics majors in the WISE Scholars Program, which created a strong network of support. For example, she recalled attending a conference one year with her classmates and on their way back to Atlanta; they were stuck at the airport for a while because of a delayed flight. Because they had to endure an airport delay, they supported each other in studying for upcoming examinations.

While Lauren attended Spelman, she formed the closest bonds with her classmates. She expressed how much she enjoyed their interactions in the classroom and simply being in their presence; she treasured the sisterhood. A couple of her really "good friends" majored in mathematics and then pursued their masters in statistics. Now that they are more than a decade removed from their undergraduate years, she said, "It's funny I don't see them as like these are my math major friends, I just see them as these are my friends so I don't really categorize them in that sense." Lauren speaks to her Spelman sisters at length over the phone regularly for at least two hours at a time, and periodically via text (or some other form of communication). Lauren said, "Even though you have drama but any sisters in your life have drama, it's still a value and an appreciation of each other at the end of the day."

When I asked Lauren about her relationship experience with faculty members in the department, she began to talk about some of the first professors that came to her mind. There was one professor, she mentioned, that she simply "couldn't learn from" because of their teaching style; she eventually withdrew from his course. There were other faculty members, however, that she described as "amazing," especially Dr. Evelyn Gold, one of the first African American women to earn a Ph.D. in mathematics in the United States. Because Dr. Gold had retired by the time I started my undergraduate studies at Spelman, I looked forward to hearing Lauren's portrayal of her. She described her abstract algebra professor, Dr. Gold, as having an "old type of

personality," and because of her outstanding accolades, she said, "you had to respect who she was" within the academy. Lauren also remembered a mathematics professor named, Dr. Daniel Roberts. Like Lauren, I, too, recalled him being "quite entertaining with his big country accent;" she only took one elective course with him. Lauren thought she was most in sync with Dr. Yolanda Powell. She actually enrolled in quite a few of her courses because she used effective teaching methods. I sensed, from our conversation, that Dr. Powell had challenged her and helped her develop as a skillful mathematics learner.

After Lauren briefly spoke about each of the professors, we talked extensively about a comment Dr. Soraya Ali, a retired member of the mathematics faculty at Spelman, said to her one day. Lauren told me bluntly in our second conversation that Dr. Ali called her a "lazy" student. As soon as I asked her why she thought Dr. Ali would say something like that, I suddenly remembered her telling me about her reluctance to put forth extra effort into her schoolwork as a youngster. She responded by saying,

> Because I probably was lazy. I mean...if I could chill and get a B or really work hard and get an A I probably was going to chill and get that B. That was the type of student that I was. So I think she saw that in me.

Knowing Dr. Ali myself, I am inclined to think that her remarkably candid comment endeavored to show care and concern for Lauren. It is my belief that Dr. Ali aimed to push Lauren to maximize her mathematical talent in her Biostatics course. Despite their encounter her senior year, Lauren said she "still had a good relationship with her." She also made it a point to say, "I had a real positive experience with most of the faculty members there [at Spelman]."

Lauren did began to notice, however, that the mathematics faculty seemed "really connected to people who really excelled in math." According to Lauren, professors would

always seek out high-achieving students in the department and work with them. Because the faculty did not see her as one of the top mathematics students, she was not afforded the same opportunities as the high achievers. Lauren was convinced, "If you wasn't that A math student…a professor's investment in you was slightly different." Although mathematics faculty was drawn to the top students, relationships with them were memorable for her.

Spelman's Guidance in Career Planning

During the spring semester of Lauren's senior year, she focused heavily on preparing for life after graduation. There was a "big push" for senior mathematics majors to pursue graduate school by faculty in the department, but Lauren never imagined earning a master's or a Ph.D. degree in mathematics. She did, however, have a few friends that pursued their master's degree in statistics. Because Dr. Ali had close working relationships with colleagues at a large, public research university in the southeastern United States, a group of approximately five students including Lauren traveled to the school on a weekend to learn more about their graduate program. She said,

> I think I went because my friends were going. It wasn't like…let me go to this [graduate school] to see what they're really talking about to see if I really want to do this…I didn't think I was going to get that master's, but then I didn't think about that until just now that, that was another way they were pushing us into graduate school through opportunities like that which I can't really fault them, but yeah. I wasn't really going because I was going to apply to [graduate school]; I was going because my friends were going…

Dr. Ali also introduced Lauren and her peers to actuarial science. As she thought back to her final year at Spelman, she suddenly realized that Dr. Ali was the only professor in the department

to suggest a probable future path for students other than graduate school. But due to the fact that actuarial science is still "an extension of math…it's still promoting that agenda of higher ed[ucation] in a mathematics discipline." Lauren briefly considered a career in actuarial science, but ultimately decided there were entirely too many examinations involved.

Lauren knew the reason her mathematics professors advocated for graduate school was because that is what they knew best. Because the majority of faculty pursued a Ph.D. in mathematics and experienced graduate school firsthand, they could share stories of their experiences, offer guidance and instruction, and help facilitate the graduate admissions process. Lauren asserted,

> If they [mathematics faculty] see a special interest in you, then they definitely want to push you towards Ph.D., I would think. Because that's what they do. And if you're struggling they probably just want to help you get out. So I don't know how much I necessarily expected that career guidance, but I know it wasn't there.

She mentioned, though, that she received most of her information about pursuing a Ph.D. from faculty leading the WISE Scholars Program. It seemed very evident to me, that she relied on her close association with them to guide her.

Lauren became increasingly more interested in securing a job after her undergraduate studies, instead. For this reason, she spent an enormous amount of time perfecting her resume and readying herself for job interviews. Lauren frequented the career services office on campus in effort to seek out employment opportunities with the most sought-after companies. It behooved her to "stay connected with career services for that type of guidance." In our final conversation, she explained the process of interviewing with large, well-established companies. She stated that a number of companies conducted their first round interviews with college seniors

in the city of Atlanta. These companies held several rounds of interviews to acquire strong candidates. Lauren had a successful first round interview with a multinational banking firm, so they flew her to New York for a second round. She attributed her success to a two-day workshop on women and investment banking she attended while in college. She also interviewed for several job opportunities with another company based out of New York. Flying to her hometown for job interviews was "pretty sweet." Lauren told me she "would always try and do something closer to the weekend so [she could] spend a couple of days at home" and visit her family.

Lauren soon found out that interviewing for positions within large corporations post-9/11 required a great bit of patience. After the events of September 11, the reality was that companies were not hiring like they had done before. The economic impact of the terrorist attacks crippled American companies. Lauren had heard from others "that to maintain positive relationships with schools they [companies] still had to come out and play the game and interview and things like that"; therefore, she did not know what to believe. Lauren recognized that they could have conducted several rounds of interviews and hired a large number of students seeking jobs. However, sounding unconvinced, she stated, "you never know how big business really works."

Continuing the Legacy of Teaching and Service

Instead of pursuing a career in investment banking, Lauren applied to a master's program in teaching based in New York. She described it as being "similar to Teach for America," an organization, she mentioned, that denied her application. This particular program, however, paid the majority of Lauren's tuition for her master's while she single-handedly taught in a K–12 classroom on a provisional teaching license. As she reminisced about returning to her hometown and obtaining her master's degree, she arrived at an incredibly important realization. Lauren stated, "That's kind of how I got involved in education and thinking about, I think people get

into careers sometimes based on what they know, and education is something I knew my whole family were educators." At that particular moment, it is my belief that Lauren knew she not only had embraced her calling, but also not taken her family's legacy in education for granted.

Her master's degree program lasted approximately two years, although she remained as a classroom teacher for about three years. Balancing teaching and graduate coursework was not an onerous task for Lauren. While she pursued her master's degree, she developed a genuine camaraderie with each of the teachers in the program, and in her predominantly Black school district. Along the way, she even helped a couple of her Spelman sisters obtain teaching positions at her school.

She appreciated that the majority of her university-based coursework was tailored to fully support her and the other graduate students in the program. The only course that was not arranged especially for those seeking a master's in teaching was her mathematics methods course. Because Lauren sought a degree in secondary education with a concentration in mathematics education and already had a bachelor's degree in mathematics, she received her certification from the program to teach mathematics.

After earning a master's degree in teaching, Lauren thought seriously about pursuing a Ph.D. Because her parents were not completely on board and pushed teaching another year, she made the decision to stay in the classroom for a third year and save her money. In the meantime, she applied to a doctoral program at one of Georgia's research universities. Because the University's graduate admissions office took so long to respond to her application, she never really considered their program. Lauren did, however, thoroughly examine Ph.D. programs at a public research institution in North Carolina and the flagship University in the state. Both schools offered her full-time assistantships. Because the institution in Georgia's university

system provided her with more financial support, she opted to forgo the North Carolina institution's offer in the end. After all the negotiations were done, Lauren left New York and her family behind, and embarked upon her doctoral journey in Georgia.

When Lauren first arrived on the flagship University's campus, she confronted a seemingly important decision. She was unsure if she would pursue a Ph.D. degree in middle school education or mathematics education. Around the same time Lauren's mother coincidentally heard a bit about one of the University's professors at a conference named Dr. Gloria Singleton; she is a highly respected associate professor of mathematics education. Because Lauren was conflicted as to which discipline she would choose, she made it a point to drop by Dr. Singleton's office in an effort to have a face-to-face conversation with her. However, when Lauren visited the department, she was not there that particular night. Surprisingly enough, during that same visit to the department, the chair willingly reached out to Dr. Singleton with a telephone call, and as a result, Lauren walked out with her home telephone number in hand. Lauren told me she would have never gone so far as to call her, though. She said:

> They gave me her number because she said give me a call, but I'm not that…outgoing so the fact that I actually went there and while I was there I specifically asked for her, that was enough out of my comfort zone.

Although she ended up in the doctoral program in middle school education, she truly believes she would have pursued a Ph.D. in mathematics education if she had talked to Dr. Singleton at the very beginning of her program. During Lauren's second year, she finally met her in person. She immediately began to develop a relationship with her. Lauren admired her scholarship and service, and her capacity to be poised and undeniably pragmatic. She told me that Dr. Singleton became her trusted mentor and committee member; she was one of five Black professors that

shaped her doctoral student experience. Lauren gravitated toward her "because she had a sense of black identity." Her personal history and involvement with HBCUs completely convinced Lauren that "she knew the deal, what it was like to be a black woman" in predominantly White higher education institutions.

Negotiating the Ph.D. Process

In general, Lauren felt very supported in her pursuit of a Ph.D. degree. She was a full-time graduate assistant, which afforded her access to faculty and a multiplicity of teaching and learning opportunities within the department that she would not have had otherwise. Lauren unequivocally believes her graduate assistantship gave her "a higher status within the program," as opposed, say, to part-time graduate students. She emphasized this point in our conversation by saying, "You [full-time graduate students] definitely got a different experience as a graduate assistant versus a person who went part time and was like in a classroom teaching. It was a whole 'nother doc program to be honest." Her full-time assistantship experience was exceedingly gratifying; it consistently continued to put her in the right place at the right time. For example, Lauren recalled a time when she wrote a paper for a course and the professor asked if it could be included in a book publication along with his work. She, of course, thought it would be an incredibly invaluable opportunity to be published in such a book and highly beneficial as a job market candidate. The distinction Lauren highlighted between the full- and part-time experiences of graduate students demonstrated a disparity in the level of support her department provided those who were not there as often. I wondered how Lauren would have fared if she were a part-time doctoral student in the middle school education program at the flagship University. I wondered about the aspects of her program that might have varied.

During the tenure of her Ph.D. program, she purposely registered for a number of engaging education courses with quite a few Black faculty members. Enrolling in their courses, she noted, also made her feel very supported. Lauren seemed to have built and surrounded herself with a strong support network that kept adverse situations at bay. Lauren said, "I don't feel like I experienced any strong negative things, particularly relating to race as a black graduate student there." Black faculty members' presence throughout Lauren's doctoral journey made her everyday reality a much less daunting experience, especially her mentoring relationship with Dr. Singleton. In our final conversation, Lauren shared that she not only signed up for one of her courses, but also developed closeness in her relationship with Dr. Singleton that flourished over the course of time. Lauren was exceedingly pleased when she agreed to be a part of her dissertation committee because she offered her both straightforward talk and tremendous understanding. She addressed their mentoring relationship by saying,

> It wasn't like she [Dr. Singleton] had any super power over me so it [their relationship] was just really cool, that dynamic of like mentorship when I was doing my job interviews I didn't get a particular job and she was like, you know you didn't want that crappy job anyway. So she was just like, you don't want to be there, like…she was just good at people so I really had a good relationship with her.

Like Lauren's family, Dr. Singleton set an example for her in their interactions together, and in her interactions with colleagues. She modeled precisely what it meant to be an obliging, perceptive university faculty member. Lauren witnessed Dr. Singleton maintain "good working relationships" with faculty across the university, including her major advisor. She would have conversations with her about everything from particular courses to graduate professors. Dr. Singleton would always share informative bits of wisdom with Lauren in their meetings, in

addition to giving her prudent advice at times. Lauren talked extensively about some advice she received from her during her graduate schooling experience:

> One of the best lines that she's ever given me that probably is the best advice that I've gotten in graduate school was, it took me five years to finish. My father passed away while I was in graduate school and I think that kind of, I was out for basically—I wasn't out, I was there doing my assistantship, probably taking classes or maybe not taking classes…But she was like, no we don't tenure graduate students, so that was just her way of saying you need to get the hell up out of here. It was like I'm tired of seeing you, you know I don't need to see you a whole 'nother year now you need to do your thing. I just, that tickled me so, we don't tenure graduate students! It always sticks with me too.

I told her that I could relate because I, too, had a similar situation happen to me. Not only am I writing my dissertation in my fifth year, but I have also experienced the death of my own mother, and my dad's completely unexpected stroke during the summer semester of my third year in graduate school. I fully understood Dr. Singleton's advice and knew exactly what Lauren must have endured.

Her mentorship and support became increasingly important in Lauren's final year in the program. As she neared the end of her dissertation work, she found herself unable to complete all the writing by the specified deadline. Because Lauren was vying for faculty positions at colleges and universities that year, she spent a great deal of her time preparing for on-campus interviews. Luckily, she was granted an extension to finish her doctoral dissertation. She remembered Dr. Singleton saying, "I'll give you extra time, but you know, you need to do it." Although each of her committee members had a short period of time to read her dissertation, she particularly recollected Dr. Singleton's support and words of encouragement after reviewing it. She

genuinely wanted her to graduate with her Ph.D. degree. Lauren recalled Dr. Singleton's reason for urging her to complete the doctoral program in middle school education:

> I want you out of here because I want a colleague. I want somebody out there who's doing the same type of work who I can work with who understands the struggle… it's not about just getting out, it's like, we need to be in the struggle together type of deal so. Which is humbling, that someone can see you in that light in that future light, in that future role as well.

A Retrospective Reflection

Lauren's schooling experience at Spelman changed her thought process, built her self-confidence, and aided in developing her critical consciousness. When she first considered pursuing a Ph.D. degree, she immediately thought about the financial aspects of graduate school. However, after she graduated from Spelman, it was her mentality that she should not have to personally finance her graduate studies. Spelman had taught her that if she planned to pursue a graduate degree, then she should seek out ways to fund her degree, and she did just that. Lauren held a graduate assistantship that waived her tuition while she obtained her Ph.D. degree. Although she took out a small loan in her fifth year, she prided herself on her ability to stay virtually debt-free.

In addition to changing her mentality about financing graduate school, Spelman helped her realize she possessed great self-confidence. Knowing we share the same alma mater, she said, "I think you know, Spelman will give you some self-confidence…I might have been struggling to finish up this math degree…but you [Spelman students] knew you were capable" of overcoming hardship and graduating with a bachelor's degree at the end of senior year. Lauren soon believed that her intelligence was one of her greatest academic strengths, and that her

discipline could propel her forward, especially in her pursuit of a doctoral degree. But, although Lauren knew she was capable of achieving academic success in graduate school, she remained grounded. She said: "I think it [the Spelman experience] gives you a sense of humility of understanding of—being humble…of respecting the fact that you're an African American getting this Ph.D. … .It is an accomplishment, and it is something worthy to be proud of."

Lauren also walked away from Spelman with a critical consciousness. In our last conversation, she discussed the impact of having such a consciousness on her graduate student experience and her perspective on the world. She said:

> Spelman does give you a critical consciousness. Or at least my experience it gave me a critical consciousness that I think I brought to the classes that I took at [the flagship University in the state] and my interest in my dissertation and the lens in which I viewed the world. I think Spelman helped to create…helped to shape it.

She told me that, though her "Afrocentric family" initially shaped that lens, Spelman played a significant role in allowing her to develop a more critical perspective, an approach she later employed in her graduate work. Coupled with developing such a perspective, it was Lauren's belief that attending an HBCU, like Spelman, also served to "reinforce that critical consciousness, that sense of black community, sense of black understanding" in the classroom. She then proceeded to tell me "that lens is extremely important as you do your own scholarship." I enthusiastically agreed with her sentiments.

The Road to Tenure

After Lauren earned her Ph.D. in middle school education, she accepted a tenure-track position as Assistant Professor at a mid-sized research university in the Midwest. She teaches middle childhood education and teacher action research courses in the Department of Teacher

Education. Lauren has focused the majority of her scholarship on teacher education and teaching for social justice and equity. With regard to teaching for social justice, she mentioned in conversation that Dr. Singleton acquainted her with several mathematics education scholars that have helped her to think a great deal about curriculum and instruction. Ever since she was introduced to Paulo Freire's *Pedagogy of the Oppressed* at Spelman, she has had an interest in curriculum as it relates to teaching for social justice. In addition, she told me that she also endeavors to "push [back] against" this notion of developmentalism in middle level education. She said that she looked to "disrupt that a little bit…which ideally would open the doors for more critical views and more sociocultural views of young adolescents."

When I asked Lauren about how she decided whether to pursue a research-intensive institution versus a teaching institution, she began to detail her reasons for becoming a tenure-track faculty member. She disclosed that, although her research university is technically an R2 institution or a doctoral university with "higher research activity," she does not hold a position where she is constantly submitting her work for publication. Lauren said:

> I don't think I wanted that grind of publish, publish, publish, publish…publishing all the time? But, I also knew I didn't want to teach a 4-4, cause I knew I didn't want to teach all the time. So I thought, [my research university] really was a good balance between the two. I have a 3-2 load. Right now, I'm only teaching one class this semester because I have a course release to do some other stuff so it just really was that good balance.

Having taught numerous middle childhood courses at the flagship University in the state, Lauren expressed that she was adequately prepared for her teaching load at her new institution. As far as her research is concerned, she said, "I think as I become more confident in my writing, a shift might occur…I don't know if I want that energy of high publish, but I probably would do

that type of work in the institution I'm at now." Lauren shared that she had set what she thought were reasonable publishing goals for the year—goals that satisfied her both personally and professionally.

Because Lauren is currently in her sixth year at her research university, she is totally engrossed in the tenure process. I congratulated her because her department recently "voted unanimously" to grant her tenure. She told me that now she is patiently awaiting the dean's decision. After the dean makes her tenure decision, the packet will be thoroughly reviewed by the provost of the university. I smiled when she said, "I'm fairly confident in that process." It must have been the way she said it because I, too, believed there would be a great outcome after all was said and done.

CHAPTER 5
ANNETTE: "LEARNING THE LAY OF THE LAND"

I spoke to Annette for the first time on the 11th of December at 3:00 p.m. Central Time, a couple of weeks before the winter holiday. Because I reside in the state of Georgia and it is located in the Eastern Time Zone, after she emailed confirming our first research conversation to be held over the telephone, I became increasingly nervous about the time difference. I obviously recognized that there was only a one-hour time difference between Eastern Time and Central Time, but for some reason, I still envisioned calling her either too early or too late on that particular day. One day prior to our first research conversation, I finally pinpointed the very source of my anxiety. Considering all the participants who had consented to take part in my dissertation study, I realized that Annette was the only participant representing the 80's decade. All my other consenting participants graduated with their bachelor's degree in mathematics from Spelman in the 1990's and 2000's. It is my belief that I ultimately feared jeopardizing the opportunity to come alongside Annette and learn about her southern upbringing, undergraduate experience as a mathematics major, and career path after Spelman. In truth, I looked forward to hearing stories of her experiences and seeing how they compared to Spelman mathematics alumnae representing other decades.

To avoid the unforeseen from happening, I made sure to communicate with Annette as often as possible. Constantly communicating with her kept my insistent anxiety about her participation in my dissertation research at bay. I was visibly less uptight and more confident after we had spoken via email. Our frequent email correspondence aided me in building my own self-confidence, not to mention genuine rapport with her. Because of our ongoing communication, even when there was a month-long lull between our first and last two research

conversations, I sincerely felt her investment in our work together. During January 2016, the very month we neglected to schedule a research conversation, she graciously sent me a one-line email saying, "I haven't forgotten you." I interpreted Annette's message as her way of saying: Despite the fact that we have not been able to schedule another meeting, I fully support you and your dissertation work, and plan to meet with you some time very soon. Knowing that Annette is a highly successful woman with an incredibly busy academic career, I found myself continuously expressing my gratitude for her willingness to share stories and wisdom gained from her undergraduate mathematics experience.

Our final two research conversations were scheduled a couple of weeks apart in February 2016. In these hour-long telephone conversations, Annette discussed her perception of campus life and involvement in Spelman's Dual Degree Engineering Program. She also shared stories about her personal life and career after graduating from Spelman. I gained insight into her way of thinking and interpreting life's realities.

Growing Up in Small Town Alabama

Annette described the memories of her childhood and formative years in 1960s Alabama as overwhelmingly happy, but incredibly poor. Remembering her carefree childhood, she told me that she never knew she lived in extremely poor circumstances. Annette's maternal grandparents and aunt raised her in such a loving, supportive household that she considered it "a place of refuge and safety and belonging," which seemed like an especially significant part of her childhood story. She said, "I just never had any doubt that the people in my family loved me. You know what I mean? They just made me feel confident." She distinctly recalled the younger version of herself growing up in a racially segregated neighborhood, but feeling a great sense of peace and comfort in her family home. Because of rampant racial segregation, she did not attend

the school across from her house. She said, “I went to a school that was on the other side of town and we used to walk there every morning, there was a group of us.” As she and her neighborhood buddies discovered shortcuts on their morning walks to school, their familiarity with one another grew stronger.

Although Annette spent time with the kids in her neighborhood, she refrained from referring to them as her “friends” in conversation. I then wondered about the qualities she thought a friend ought to possess and if they just simply failed to meet her standards. I thought to myself, “Why did she constantly surround herself with people she did not consider her friends?” Annette told me, because her grandmother kept her from nurturing close relationships with the neighborhood kids, she had always viewed them as mere acquaintances. Annette described her grandmother as a very caring, but particularly strict woman who dictated when she interacted with the kids (or not). Surely Annette played with them, but there were certainly some days when her grandmother disallowed her from participating in outside activities. Her grandmother sincerely thought the values she had instilled in Annette were far superior to those of the neighborhood kids. Annette said, “I could walk to school with them, but sometimes I couldn’t play with them, if that makes any sense. Sometimes I could, but sometimes I couldn’t.” Her grandmother refused to grant Annette permission to play outside at times because she knew the kids might negatively influence her; she unapologetically wanted to protect her granddaughter. Annette came to understand her grandmother’s position, and the feelings of her entire family when it came to interacting with the kids in her neighborhood. She stated, “I just think they wanted the best for me. That’s all.”

Identity Development and School Achievement

In our first research conversation, Annette talked extensively about the formation of her school identity. She told me that, prior to starting grade school, she read all the books she could get her hands on inside her family's home. Annette became such a confident reader that she developed a keen interest in and fondness for learning. Once she began attending elementary school, she quickly realized that she was not athletically inclined at all, but, instead, more of a studious, reserved individual. Annette gravitated toward school and performed at a high level academically. She said, "I was a good student so school was fun for me. I always made good grades…I might not have been good at athletics, but I was always smart…I was [Annette] the smart one."

Annette briefly reminisced about her days as a fifth-grade student. She mentioned to me that she took great pleasure in writing back then and wondered where she would be if she had pursued it further. She said, "I used to write a lot as a kid, I used to make up stories. I used to write stories." It was apparent, writing was an outlet for her. Instead of endeavoring to develop herself as a writer, though, she became interested in mathematics. She said, with the utmost confidence, "I was just good at math, math was easy."

Although she excelled in grade school, she still recalled participating in sports and physical activities. Engaging such activities proved to be particularly difficult for her. She said, "I wasn't confident in all things…sports I just wasn't, and …that had to do with my size and my coordination." She thought back to her mother's words when it came time to tumbling in her physical education class. According to Annette,

> she [her mother] said something about you're going to hurt yourself, and I took that to mean that I'm going to hurt myself because I'm so big and I never tumbled again because I felt like tumbling was not for big people.

Once she abstained from participating in tumbling, and sports activities in general, she began to embrace being smart—it became a major part of her identity. When I asked how she felt about having a scholarly identity, she said, "I milked that for all it was worth."

By the time Annette reached high school age, some of the schools in her area had begun to desegregate. Because there were a number of White students whose parents did not want them attending desegregated public schools, a number of private academies were built to accommodate them. Because most of the White parents in her southern town were sending their children to these new private academies, the number of White students enrolled in and White teachers employed at her small, desegregated high school was particularly low. She did, however, remember one White teacher who taught mathematics named Mrs. Mitchell. Annette described her as a top-notch educator. Annette spoke about her experience in Mrs. Mitchell's mathematics classroom and a couple of her most distinctive attributes. She said,

> she [Mrs. Mitchell] would always go to the board and we would have to work problems on the board and she was just orderly…. I just like order and I think that's why…she just made a lot of sense to me, she was patient, she had a nice, soft voice.

Annette could not say enough about Mrs. Mitchell and the way in which she ran her classroom. She obviously left a lasting impression on her. Because Annette admired the environment Mrs. Mitchell created for mathematics teaching and learning, I wondered what she drew (if anything) from such a positive student experience. Then, in the next moment, she definitively said, "that's where I developed my love of math in high school."

Annette paid very little attention to fellow students who endeavored to become one of her high school's top academic performers. In other words, she could not have cared less about competing academically with those around her. More so, because she had already claimed the top spot—she knew she "was going to be the smartest one so it really didn't matter." There was only one high school student who remotely came close to matching her academic prowess; however, Annette was convinced she was no competition at all. When Annette found out she would be named valedictorian of her graduating class, she attributed her success not only to studying long hours, but also to the influence of positive role models in her life. She achieved a feat that most high school students do not. I should not have been surprised by all her outstanding achievements. With pride, she said, "That's who I was…Barry [her last name] the smart one."

Identifying Personal Coping Mechanisms

When Annette looked back on her life, she realized her affinity for food. To cope with challenging situations that arose during her childhood, Annette sat for hours and ate. She said, "Food was always…something that our family did very well, so we celebrated around food, we talked and laughed around the kitchen table…so food was very comforting for me, so…I would just eat." She ate with her family the majority of the time, but overindulged in food by herself a lot, too. Annette dealt with feelings of loneliness by spending money and time on food. Reluctant to say anymore about her food habits, she said, "I guess I can't really talk about it like that…it just stays in my life."

During stressful times, she would also read and write. As I mentioned above, Annette has liked to read books ever since she was a small child. She would write stories for pleasure growing up. If she was ever in a situation where she did not know the people around her, she

would read diligently to pass the time. Because Annette always had a passion for writing, I could not help but think about how different her career might be today if she studied writing in school instead of mathematics.

Because Annette made mention of prayer early in our first conversation, I asked a specific question about the role religion has played in her life and how it has lent itself to helping her through tough times. At first, it seemed she was taken aback. Annette almost could not believe she "didn't consider that [religion] a coping mechanism." But, once she opened up about her relationship with God, I came to understand just how important knowing His love was to her. Being part of such a devoted "church-going family" afforded her the opportunity to seek God. She told me she "prayed all the time in terms of talking to God," telling Him about her worries and life's problems. She said,

> I do believe that God has gone before me…and maybe that's why I don't stress out as much, maybe that's why it took me so long to realize that I was eating—eating away a lot of stuff because I never would have said that I was eating away a lot of stuff, I thought I dealt with life as they say on life's terms. As I look back today, I don't think that was true.

Strong Female Role Models

Although her grandparents and aunt reared Annette when she was a young girl, her mother still played a huge role in her upbringing. Annette described her mother as a single woman without a college degree. Because she did not have a degree from a higher education institution, she impressed the importance of education on Annette and her younger brother. She said,

> My mom really valued education so basically if you had anything to do related to school you had to do any homework. So basically…I never learned how to cook…I don't know any of that stuff because any time it was time for that to be done, I would say I have to study.

Her mother made it very clear that getting an education took precedence over cooking and any other household chores left undone. If there were outstanding household chores, her mother always refrained from asking Annette to take care of them. She said,

> As long as you had a book in front of you and seemed like you were doing something…you didn't have to do any kind of chores, so my brother was always doing chores, I never did chores. I was scared to tell him what the secret was because I thought he might tell my mom and she might catch on and I'd have to start doing chores.

The fact that Annette never did any housework and was only expected to put forth effort into her schoolwork, showed just how important her mother thought education was, and why she wanted her children to realize its value.

Her mother's sister was another woman who set an example for her. Because she grew up living with her aunt, she recognized not only her imperfections, but also her much stronger qualities. She said, "She just worked hard. She was a hard worker and…I could always depend on her." Annette did, however, recall one particular day when she "was in some kind of play…at school and she [her aunt] was supposed to bring [her] outfit and she was late." Although late pick-ups happened more than once, her aunt "could do no wrong in [her] eyes growing up"; her image never tarnished. Annette loved her despite her flaws. She told me "there was one point in [her] life where you just really couldn't say anything negative about her at all or [she] would just go off, that would not happen around [her]." Like her family protected her when she was a little

girl, Annette was highly protective over her aunt. According to Annette, she was hard working and dependable, which are both qualities worthy of admiration and respect.

Annette's high school English teacher, Mrs. Simpson, was instrumental in showing her the value of becoming a strong, career-minded woman and introducing her to Spelman. Her mother thought very highly of Mrs. Simpson because of all her educational accomplishments and lifestyle choices. Annette explained her mother's partiality for Mrs. Simpson:

> She was…young and single and educated and my mom didn't have a college degree so my mom was all about the college degree…you've got to have a college degree. So you know this woman, my mama liked her too, she was single, she seemed to have her life together, you know what I mean? So…what she said carried a lot of weight with me.

She demonstrated Mrs. Simpson's influence when she shared her vivid recollection of interactions with her. Even to this day, Annette remembers using "improper grammar" during one of Mrs. Simpson's English classes. Mrs. Simpson posed a question to Annette in her class one day and she responded by saying, "them over there." Just a few seconds after she responded to her words, she found herself face-to-face with Mrs. Simpson. She was not too happy about Annette's misuse of grammar. Annette told me that the entire situation "hurt [her] for a very long time because it was very important to [her] how [Mrs. Simpson] thought of [her]." It became obvious to me that Mrs. Simpson's perception of her meant more to Annette than anything else.

Building a strong relationship with a positive role model like Mrs. Simpson was incredibly beneficial for Annette as a college-bound high school student. When Annette readied herself for the conversation about attending college, Mrs. Simpson immediately stepped in and shared much useful information with her. But in actuality, she had only one school in mind for her. Annette said, "she's the one who told me to go to Spelman…she [Mrs. Simpson] told me

that would be a good place for me." She recommended Spelman because her niece had gone there. Because of Mrs. Simpson's encouragement and support, Annette believed she had the mental toughness to pursue an undergraduate degree at a four-year institution. She even imagined life after graduation with a bachelor's degree. She said, "I could see myself being a single professional woman like her [Mrs. Simpson]." The advice Annette received from Mrs. Simpson about college ultimately led her to pursue the application process in hope of being accepted to Spelman the following school year. Although Spelman did not offer her the best financial aid package, she said, "that's where I ended up going."

Early Exposure to Engineering

In preparation for her undergraduate career, Annette participated in a pre-college enrichment program held at a public research university in the state, the summer before her senior in high school. This pre-college summer program introduced minorities to different fields of engineering. Prior to attending the summer engineering program, she said,

> I never really heard of engineering before. I mean, it's hard to believe. But, I took some aptitude tests and it said that because I was good in math I could easily be an actuary or an engineer, and so I said well engineering sounds pretty good…so I ended up in a dual degree program, and that was another reason I went to Spelman because they had a dual degree program.

After Annette completed the summer program, she remembered being confronted with a big decision with regard to her undergraduate trajectory. She contemplated whether she should attend Spelman or another undergraduate institution. She told me, however, that it was a fairly easy decision for her to make. Annette decisively decided to pursue an undergraduate career at

Spelman because of the way in which they could hone her mathematics and engineering skills through the Dual Degree Engineering program.

Her experience in the summer engineering program was unlike anything else she had ever tried before. She spoke very highly of her experience saying, "Oh, it was great. It was wonderful." Because it was one of the University's many summer programs, there were a number of employers on campus interviewing students for summer jobs. When she began to interview with these large companies, she learned "that you have to talk a lot in order to impress people"; she could not just sit and be quiet. For example, there was a time when she interviewed for a summer position and the company did not hire her. But, by the end of the summer, a member of the company's hiring staff told her that she had really matured mainly because she talked more. She said,

> that's when it occurred to me when you…don't talk a lot of times people think you don't talk because you're stupid or because you don't know or people just like people who are engaging…so from then on every job I interviewed for, I got first.

She expressed her gratitude for her participation in the program and all the lessons learned along the way. It seemed one of the biggest lessons she learned was about the interviewing in general. Annette said, "I understand that a big part of the interview process is energy. So what you got to be able to do is give off a positive energy, and usually being quiet does not do that."

Experiencing Campus Life and Seizing Opportunities

When Annette first stepped on Spelman's campus in 1977, she became acutely aware of her family's poor financial status. During her childhood, she had not recognized her impoverished lifestyle. It was not until she entered Spelman that she realized her poverty-stricken circumstances in eastern Alabama. Early on in our second conversation, Annette shared

her candid impression of her fellow undergraduate classmates. She said, "I felt like everybody at Spelman was rich except me. I swear it's like every girl on campus had a BMW. I'm like how do these girls get these cars?" She mentioned that her family's car did not even compare to the cars students were driving around campus. While the majority of her classmates drove around in incredibly expensive vehicles freshman year, she was making frequent trips to the financial aid office to devise a plan to pay for her college education. She figured, however, that there had to be other women who shared her financial status because she was not in that office by herself.

With the help of the financial aid office, Annette secured an award package that included a work-study position to assist her in paying for a portion of her college expenses. She worked as a student employee in a computer lab at Spelman's brother institution. Her work-study position not only introduced Annette to the institution's faculty and staff, and undergraduate student community, but also helped her gain substantial experience in computer programming. She talked extensively about the responsibilities of her position. She said,

> The computers had these programs and we [she and the other student employees] had these big cards and we'd take these big cards over to the computer and then, that's how you would run your program. We did COBOL and FORTRAN…it was crazy. That was back in the olden days.

In addition to maintaining her position in the computer lab, she felt it was of great importance to establish herself as a well-rounded and highly intelligent individual around Spelman's campus. She would not and could not allow Spelman to dissuade her from being socially confident at the beginning of her undergraduate career. For that reason, during Annette's freshman year, she campaigned for the position of Spelman Student Government Association (SSGA) representative. Although she did not receive enough votes to be elected, she was proud of her

efforts, especially given that running for this position was "out of her comfort zone." Around the same time, Annette became a member of the InterVarsity Christian Fellowship, a religious organization recognized by the College. As she continued to reach beyond her comfort zone, she began to interact more with her peers and better understand the intricacies and idiosyncrasies of campus life.

When Annette spoke about the relationship with her freshman year roommate, she recalled the awkwardness and tension the first time they met. The very first meeting between she and her roommate whose undergraduate major was in biology took place at an on-campus social event. She said, "my roommate looked me up and down and turned her head and kept talking to the person she was talking to." Her roommate, of course, did not remember behaving this way, but Annette vividly recalled details of their first encounter. Though, they ended up being roommates for two consecutive years, it took time for she and her roommate to become familiar with one another. In conversation, Annette mentioned that she was "intimidated" by her roommate initially because she ranked number six out of six hundred-plus students in her senior class. Annette was overawed by her roommate's academic performance in high school. She was named valedictorian of her high school class, but there were only seventy-seven graduating seniors. She said, "That was just very intimidating to me that she had more people in her graduating class than I had in my high school." Furthermore, what also astounded Annette was the fact that her roommate had used their first-year calculus textbook at her high school. So, from the very beginning, Annette thought she would experience academic difficulties. Once she realized that her roommate could be potential "competition" for her, she began to seriously focus on her major field of study.

Earning Dual Undergraduate Degrees

Annette's mathematics major and staunch involvement in the dual-degree engineering program shaped her undergraduate student experience. Because she had a dual-degree scholarship, she participated in the Program majoring in mathematics for three years, and then entered the same public research university in the state she attended for the pre-college summer program as an industrial engineering major for two more years. More specifically, she began her undergraduate studies in the fall semester of 1977, and graduated from both institutions five years later in the spring semester of 1982. Like Annette, the majority of students in the dual-degree program majored in mathematics and pursued their engineering degree thereafter. Although she finished her undergraduate studies a year later, she still considered herself a proud member of the College's class of '81.

A typical day in Annette's life as an undergraduate student majoring in mathematics began with early morning classes. She preferred morning classes because of the proximity between her dormitory and the building where mathematics courses were held. Not to mention, she and her peers simply thought it was best to attend early classes so that they could dedicate their time and energy to engaging in a wide range of activities afterwards. For example, Annette fulfilled the responsibilities of her work-study position after completing her morning class schedule. When she finished working for the day, she would eat dinner in the cafeteria, and then study alone for hours in her dormitory room. Annette sought a good night's sleep after completing the bulk of her schoolwork.

Annette developed a strong habit of studying ever since she learned her roommate was an academically talented student at the beginning of freshman year. She committed herself to studying her course textbooks and other related material each night in order to stay current in her

discipline. Her preference was to study by herself. Annette refrained, however, from staying up late at night. It was her belief that she should be in bed before midnight unlike her roommate. Her roommate normally studied until 3 o'clock in the morning. Annette closely followed her bedtime routine almost always studying with a particular plan in mind. She briefly explained her intentions to me. She said, "So we would study at night and my goal was to study and to go to bed and leave her up studying and then do better than she did on the test." It seemed as though Annette used studying to combat deep-rooted feelings of intimidation. She recognized early on that if she regularly studied the material in each of her courses, she would thrive academically and be known for her intellectual capabilities. She admitted that receiving a higher examination grade than her roommate was indeed her "greatest joy." Then she added, "I think with her, I think she was probably the only person I really felt competitive with…. I took great pleasure in doing better than she did on anything."

When Annette thought back to her undergraduate mathematics experience, she distinctly remembered receiving a highly charged telephone call from one of her classmates prior to each course examination. Her classmate would always call, in hopes that Annette would channel their professors' affinity for mathematics, and more importantly, impart their mathematical expertise. When her classmate telephoned during the late-night hours before an examination, she would straightforwardly ask her to share "everything" pertaining to the mathematics course in which they were enrolled. Because Annette prepared early for examinations, she usually served as a "tutor" for her peers. She explained why studying daily and adequately preparing for examinations remained the cornerstone of her academic success. Annette said,

> If I didn't know it [mathematics concepts to be tested] before the night before the test, I was not going to know it because I would just be nervous, so I had to study…every day. I had to not get behind, and so I knew that and so I didn't for the most part.

Being studious helped Annette carve out a space for herself in the mathematics department. She enthusiastically told me that she thrived in her mathematics courses; even in the presence of students who cross registered into her most rigorous classes. Once the faculty and students realized her capacity for teaching and learning mathematics, she said, "that kind of made a place of for me, you know what I mean? Everybody knew that I was a good student and I was a nice person. That kind of made a place for me."

Although she had found her niche in the department, Annette still did not have any real expectations regarding the outcome of her experience as an undergraduate mathematics major at Spelman. Because she was the first in her family to attend college, she had not heard stories from family members about college life. As for her own college experience, she said,

> I didn't know what to expect. I just knew that I needed to do well and I was pretty intimidated because I came from such a small school in Alabama and I knew that we didn't have the resources that everybody else had, but I did well, but I studied.

Working hard alongside other mathematically talented Black women became the norm. It was not uncommon to witness she and her peers showing concern for one another. As I understood it, they actually concentrated their effort on lifting each other up. Annette described the nature of her peer group by saying, "We could all be good and it didn't have to be bad. Just because I excelled didn't mean that you, my excellence didn't take anything away from your excellence. We could both be excellent."

In conversation, Annette shared a story with me about when one of her dual-degree classmates boasted her superiority over other undergraduate women majoring in non-scientific disciplines. She recalled her classmate telling her clique of undergraduate students majoring in scientific disciplines that they ought not to befriend one particular student because everyone she associated herself with majored in English. Her classmate, the most outspoken leader of them all, encouraged them to think that undergraduate science majors had more rigorous and demanding degree programs, and a much higher intellectual capacity. Annette described her reaction to this distinction made by her classmate. She said:

> They were English majors and we were going to be science majors…. My girlfriend thought that we were better than those people because we were science majors…I don't know what that child's thinking was, but it was a thing that we were science majors and they weren't. So we were better than them and so that was why we didn't like this other girl. Well, that's why one of the science people liked this other girl.

Because Annette's clique was "brighter than those other people" in her classmate's mind, it was her belief that they should surround themselves with likeminded undergraduate women from the sciences. At that time, she said, "There was something about being a science major that said that she [her classmate] was just smarter than anybody else and some of us bought into that more than others of us." Annette, however, refused to subscribe to her classmate's thinking.

As Annette satisfied all her major requirements during the academic year and participated in internships over the course of the summer, she began to envision a future career as an engineer. The dual degree office was instrumental in securing interviews for summer internship opportunities. When she thought about each of the summer internships she interviewed for, she said, "I never did any work that was strictly math. Most of my internships had some relationship

to engineering." The experience she acquired in these summer internships sufficiently prepared her for an engineering-based career.

Caring Relationships with Faculty and Staff

When I asked Annette about her relationships with faculty in the mathematics department, she immediately began to share her recollections of Dr. Evelyn Gold. Annette seemed intensely fond of Dr. Gold, and considered her a "good person" worthy of much admiration and respect. She described her as being unbelievably kind and enthusiastically "supportive" of the mathematics majors in the department. Although Annette characterized her as being very "stern," I sensed she cared deeply for her students. Annette recalled a specific instance when she provided her with sound advice regarding a job opportunity. She distinctly remembered Dr. Gold telling her to avoid settling for entry-level positions at top companies. Instead, she thought Annette ought to seek senior-level positions at companies hiring college graduates. Annette told me that the majority of her conversations with Dr. Gold, much like the job-seeking conversation, were especially helpful in bringing about a clearer understanding when different situations would occur and important decisions had to be made. In our second conversation, Annette thought back to those moments in her office. She said, "I remember going to her…I remember that her door was open and she was easy to talk to. So if you had something to talk about, you could go talk to her." It seemed she was also helpful in bringing about resolution when incidents occurred in the department. Annette briefly described a time when she and others "had like a rebellion about something and we went to talk to [Dr. Gold] as a group." Fortunately, Dr. Gold was able to effectively defuse the situation and guide them in addressing the reasons for the rebellion.

Besides mentioning the kindness and support shown by Dr. Gold, Annette remembered enrolling in mathematics courses taught by a White male professor. She thought he was a "good" mathematics professor, but wondered why she and her peers were subjected to courses led by a White professor at a historically Black women's college. Given that there were very few White faculty members employed by Spelman at the time, he sorely "stuck out" in her mind. It became obvious in our conversation that Annette believed she should have had more "women role models" in her mathematics courses instead of a White male professor. Although she would have never initiated a sit-in or any other form of protest with regard to this matter, she thought it was important for she and her classmates to see female role models, especially those of color.

In her candid retelling of her undergraduate experience as a mathematics major, Annette emphasized the high level of care that faculty and staff always showed toward her. It became very challenging for her to pinpoint specific examples that demonstrated their generosity and concern in her academic life because, she said, "the whole experience was characterized as one of caring." According to Annette, her mathematics professors were invariably kindhearted and supportive, which inevitably boosted her academic performance. She spoke about her enrollment and matriculation in Spelman's undergraduate mathematics program:

> There was nothing about the Spelman experience that I found negative, nothing at all. I felt encouraged the whole time…I think it was just a great experience and I think being a math major, one of the reasons we liked doing the dual degree is because the early math classes at bigger institutions, we call them weed-out classes. So those classes were structured to get certain students out whereas I felt like at Spelman, they wanted everybody to do well. So that was never an issue with us.

Because there were not too many mathematics majors in her department, she did not have to attend mathematics classes with large numbers of students. Annette never feared she would get lost in the crowd and not receive the help she needed. Annette told me definitively "those were stories that we [she and her peers] did not have."

Annette even remembered the care shown by her dormitory director, Ms. Brady, during her first years in college. Ms. Brady made a profound impact on Annette's life. Her influence over Annette was so strong that when she was afforded the opportunity to publish a fictional book some years ago, she not only created a character after Ms. Brady, she dedicated the entire book to her. She said:

> I think Ms. [Brady] kept me at Spelman. She kept a lot of us there. She would pray for us. She was funny though. She would talk about us, telling us stuff not to do, and how this is going to have a bad end and if you had a problem, you could go to her room and talk to her.

Ms. Brady's openness drew Annette in. Being hundreds of miles away from her family made her appreciate Ms. Brady's willingness to discuss and help her resolve problematic situations. After Annette graduated from Spelman, she continued to nurture her close relationship with Ms. Brady. After all, it seemed they were both incredibly invested in it.

We talked extensively about this notion of care at Spelman, to discern whether it should have been considered coddling or not. I have had a number of conversations with people over the years who have said, "They [Spelman faculty and staff] care so much for their students, that when they get out into the real world or they go to graduate school…it's just a difficult adjustment because…they were coddled prior to coming to graduate school." Annette firmly believed, however, that she was "very well prepared" for life after Spelman due to their

attentiveness throughout her undergraduate career. Although she did not tell me directly, I sensed she thought that Black women pursuing a bachelor's degree in mathematics necessitated a high level of care. She attributed much of her academic success to the relationship she had with the dual degree office and the faculty and staff she engaged on a daily basis. She greatly benefited from their constant support and guidance. Annette said, "I actually had a good time at Spelman to be honest." Because of their interest in her undergraduate studies, she felt ready when the time came to transition to the University, where she studied engineering.

The dual degree office, she mentioned on several occasions, was a tremendous resource for her. Annette told me she rarely "worried about things" and if she did, it was usually a money-related problem. Like the time she almost had to consider not wearing deodorant because her work-study check had not come or the time she did not have enough scholarship money to cover the outstanding balance of $500.00 on her student account. Annette's unflustered demeanor and positive attitude did not allow her to become overly fretful; she knew it would eventually "work out" in the end. When she experienced financial hardship, she simply relied on the dual degree office, a constant source of support for her at the time. She said, "That was where I went for all my kind of support, academic support, financial support, yeah." Annette recounted the many days she visited the dual degree office and the program's "friendly" secretary. It was said that she worked extremely hard to assist students with everything from managing coursework to completing the program. Annette referred to her as the "heart of the program." After some time had passed, she came to know her and began treating her like a confidant. Annette said, "Even if you had personal issues, you could talk those over…. She was wonderful. She really, really was. I bet she was like a surrogate mom for a bunch of us." Her presence on campus became important for she and her peers. According to Annette, the dual degree office represented more

than just student support services; it represented an encouraging, positive environment, where real conversation and interaction could take place. When she thought back to all the faculty and staff that supported her throughout her undergraduate career, she said, "I think well, I think people—people are more important to me than things, always have been, always will be."

Considering Spelman Family

When I asked Annette if she considered the people at Spelman her family, it seemed she was not quite sure how to answer my question at first. She told me she adored members of the faculty and staff, especially Dr. Gold, a professor whom she kept in close contact after completing her bachelor's degree. It became obvious to me that she took great pleasure in spending time with most of the individuals she met during her matriculation, but really had to think deeply about if she regarded them as part of her family. She expressed her sentiments saying:

> I can say Spelman is family and I can say it and feel good about it, but it's not the same feeling that I have. Like we went for our 35th reunion I think and the girl who was president for our class when we graduated, she's still acting as president of our class. She's now on the Spelman Board of Directors. So I think she has a different feeling about Spelman than I do because she just loves, loves Spelman. I mean…I don't have it like that.

Although Annette had the utmost respect and admiration for her alma mater, she realized she did not possess an overwhelming feeling of love for and connectedness to Spelman, like many of her peers. She did, however, communicate with a few of her classmates after she graduated. Annette kept in close touch with her freshman year roommate until her passing in 2006. She asked me if I had ever heard of her roommate's name because I was a student when she served as a faculty

member in the biology department. Annette told me also, that she has been in contact with a group of approximately 6 to 8 women who graduated from Spelman, most of whom were, dual-degree mathematics and engineering majors. Annette meets with each of the women every other summer at a classmate's house in Tennessee. It seems as though this particular classmate was left with the great responsibility of keeping everyone connected; but in actuality they all continue to make a valiant effort to reunite and appreciate each other's company on a periodic basis. It sounded as if their coming together is of great importance to her. Before our second conversation came to a close, Annette spoke about her plans to attend her 35th class reunion. After her class president corresponded with her through email urging her to participate in the upcoming festivities, she began arranging her trip to Atlanta. She said, "I'm looking forward to seeing everybody and a lot of them keep in touch a whole lot better than I do."

Transitioning to Graduation School

After Annette earned undergraduate degrees in mathematics and industrial engineering, she pursued her master's degree in operations research. A large telecommunications company offered her a position as a systems engineer upon graduation, which afforded her the opportunity to further her education. Ironically, she remained at the University, where she studied engineering, as a graduate student for two more years before assuming her new position in the New Jersey area. She said, "I got a job offer that said that they would pay for me to get my graduate degree. They didn't want me to go to [the University]…because they didn't want you to go to schools that you had been to." But, because the company had already extended Annette an offer, they allowed her to complete her master's work there. Because the shift from undergraduate to graduate studies has the potential to be a particularly cumbersome process for many students, I wondered how Annette negotiated the transition. Although she had a sense of

familiarity with the University, she knew very little about it from the perspective of a graduate student. I was suddenly interested in the stories of her graduate student experience.

When I asked Annette directly about her experience as a first-year graduate student, she told me she felt very prepared. There was never a time when she "went to [the University] ever saying we didn't learn this at Spelman." She did, however, experience some difficulty in one of her first courses. Around the same time period, strangely enough, she befriended three male students of different nationalities who quickly became her study partners. She studied and took courses with them throughout her master's program. They are still in contact with one another. However, when each of the group members asked Annette to be part of special occasions in their lives, some years back, she refrained from attending. She said very forthrightly, "I'm not a very friendly person and I didn't go to any of them. So we probably would have been lifelong friends if I had been friendlier."

Annette spoke openly about her academic achievement in graduate school. By the end of her first semester, after acclimating herself to her master's degree program and meeting regularly with a group of the most reliable study partners, she was beginning to successfully negotiate graduate student life. Annette earned top grades in each of her first-semester courses and felt confident about her trajectory as a graduate student. She completed a few more graduate-level courses to fulfill the requirements for her master's degree the following semester; she received all B's in those courses. Much like her first semester, her third semester's final grades were all A's. However, Annette experienced academic difficulty during her final semester in the program. She told me she "probably flunked out," but managed somehow to graduate from the master's program in operations research. Annette described her disposition toward the end of her program by saying, " I was just tired by then… .It was pitiful, but I knew I was leaving Atlanta and I just

didn't want to do any work. I was tired." She admitted that she should have given more thought to taking a break after she earned her bachelor's degrees.

I began to better understand, in the midst of our conversation, the ways in which Annette's graduate experience helped her gain a new perspective on and appreciation for her tenure at Spelman. It is my belief that, after graduating from both schools, she never ceased to constantly compare the particulars of the two higher education institutions. She talked about the differences between her tenure at Spelman and [the University] students' experience:

> I remember when we would go to [the University] and students would tell us stories about how they would go to their first class, one of those big lecture classes, and the teacher would say look to your left, look to your right. One of you won't be here at the end of the semester. That's what the teacher would say. Six of you will not finish this class. They were looking around to see six black students in the class.

Annette intimated that the classroom culture on the University's campus was unlike that of Spelman's. Because her undergraduate institution had much smaller class sizes, she was not partial to taking courses with a large number of other students. Annette rarely took courses with more than 30 students at a time, especially in the mathematics department. I could tell she realized the importance of the relationship between class size and students' academic performance. She knew that in order to become a top academic performer at a large university, she had to put forth great effort to prove herself to those around her. According to Annette, the reality of the situation was that the University's faculty did not show concern for their student learners like the faculty at Spelman. Annette believed the College's faculty always encouraged she and her peers to succeed academically, and she seemed very appreciative of their support.

Starting Anew and Taking Calculated Risks

Annette described her position at the large telecommunications company as a very pleasant learning experience. She worked for this particular company for approximately eight years. In her position as systems engineer, she said, "I did specifications for telephone systems… So we were designing telephones, switching systems, and features for telephone switching systems. So I did the specifications document, working with the developers." Because most of her colleagues had earned graduate degrees, they were super-competitive people. But despite the highly competitive work environment, Annette openly admitted to me that her "job spoiled [her]…because basically, you came to work when you wanted to and you left when you wanted to." It was really flexible, according to Annette. Her next job, however, was not the "wisest career choice" and did not last as long.

Once Annette made the decision to leave the telecommunications company, she moved to Chicago for a short period of time, and then accepted a position in Atlanta. Because she had a strong desire to return to Atlanta, it seemed everything was working in her favor. Annette told me about the moment she knew the time had come to leave the Atlanta-based company:

> I was in a meeting and I was still doing systems engineering work, but at the time my title was research engineer and I was…arguing with this guy about a feature that was going to go on the telephone service. In the middle of the argument, it occurred to me that I didn't really care what the answer was. I just wanted to win the argument… .So that was the last argument I had because it didn't really matter. That's when I decided I needed to do something different.

Annette thought long and hard about what she should do next. Initially, she thought she ought to teach, but she would have had to enroll in a computer science course, and then complete an alternative teaching certification. She expressed her feelings on such a course of action:

> I just thought that was crazy given that I have been working in that computer industry for 13 years that I needed to take an introductory computer science course. So I decided then that I don't need to be a K–12 teacher.

Annette earned her second master's degree in a Human Resource Development [HRD] program as a part-time student to teach adults, while working a full-time job. Because she had a remarkably "positive experience" in the program, she began to give serious thought to pursuing her PhD in Instructional Technology. Because her graduate institution was not interested in accepting new applicants at the time, she applied to the flagship University in the state. Once she learned she had been accepted into their PhD program and considered a full-time doctoral student, she began to make some very drastic changes in her life.

Prior to starting her first semester in the program, she resigned from her job and moved in close proximity to the University in an apartment near the College of Education building. Annette received a multi-year fellowship to complete her doctoral studies. During her studies, she conducted research with a number of different professors including the "only two women faculty in the department," wrote conference proposals and papers, and published a book chapter and several journal articles. She said, "I worked with some good people who gave me the opportunity to do some work. So I just didn't do the grunt work. They let me do the good stuff, too." She graduated from the University with her PhD in Instructional Technology in 2001.

Balancing Academic and Personal Life

Her first appointment after graduation was an assistant professor position in the Human Resource Education department at a Big Ten research institution. While she worked at the institution, she directed doctoral dissertations and taught doctoral- and master's-level courses. Since Annette had already gained HRD experience in her second master's program, she was specifically hired "to do technology in HRD. So [she] was a good fit." However, as our conversation went on, it seemed she came to the realization, at some point during her tenure, that the position might not have been such a good fit at all. She said,

> In some ways it's [the Big Ten institution] like Spelman, but it's just an elite school. So people at [the University] actually think that they're better than people at any other school and they consider themselves a top tier school and they are very, very, very classy and I don't feel like I fit from that perspective.

Not to mention, she felt very isolated. She said, "I was lonely. I was lonesome up there." Although she met her husband around that same time, he lived miles away in Michigan. And if there is "one thing [she has] learned about faculty life is that you don't make moves when you want to make moves. You make moves when there are opportunities to make moves." She knew it was a delicate balance between the two.

During her fifth year at the Big Ten institution, though, she made incredibly bold moves. Annette interviewed for faculty positions at two different universities. She accepted a position as associate professor of instructional technology at a large public university in Alabama, one of the institutions she was interested in a decade ago. Unlike other posts where her employment was short-lived, Annette still works at the University today. She resides about two and a half hours away from the small town where she grew up. Over the years, Annette has taught (and currently

teaches) a multiplicity of graduate courses, and has been responsible for designing and redesigning an undergraduate course in her department. She said, “Some classes and some students I like better than others. I don’t like large classes. That’s one reason I don’t teach an undergraduate class.” I wondered if her preference to teach smaller classes has anything to do with her experience as a mathematics major at Spelman. I am inclined to believe that smaller class sizes have helped Annette to make genuine connections with her students.

When Annette started recalling stories of her experience, she immediately began to explain why her feelings toward the school have changed over the course of time. Initially, she said, “When I came [to the University], I told myself that I didn’t care how crazy that [racism] got, I wasn’t going to go anywhere and I’m reevaluating that statement now.” Back in 2010 when Annette found out she had breast cancer; she refrained from doing work that required too much effort and energy. Annette did, however, teach all of her courses from home, which kept her focus on teaching, rather than herself. When she returned to campus, several racist incidents occurred that left her feeling very dissatisfied. For starters, she thought, it was very unfair that when her dean retired, the University’s Black female associate dean was not granted a face-to-face interview for the vacant position. And although she and some other colleagues met with the provost and expressed their views on the matter, it made no difference at all. Absolutely nothing changed.

Annette also told me about the time her department was looking for a new chair; she could not believe her colleagues’ racist remarks with regard to the two candidates they interviewed for the position. She said, “I was very disturbed around the conversations that we had around those two people. Some of the comments my colleagues made, they just shocked me. I have never been so disappointed in my whole life.” The blatant racism she witnessed changed

her perspective of the department's inner workings. The same kind of thing happened when she sat on her department's tenure committee and both a Black and White woman were up for tenure together. She stated, "The discussion around the white woman was oh, she's such a great colleague and she's making a great contribution. The conversation around the Black woman was she needs to publish more." Her colleagues seemed to always have a dismissive attitude toward Black academics, and that deeply affected her. She said:

> That kind of stuff, it does do things. It sort of makes you look at your colleagues cross-eyed and it also lets you know that it's important for you to be in the room when decisions are made because they just don't see things the way we [black women] see them. They just don't.

I understood exactly what she was saying. Her every word resonated with me. I knew about being the only Black graduate student in the room and striving hard to make sure my voice was heard. I, too, believe that one's thoughts, feelings, and concerns are more likely to be taken into consideration if she or he is fully present and able to share her or his perspectives and beliefs. I wondered if Annette's experience as a mathematics major inspired her to use her voice in the aforementioned situations. From talking to her, I came to understand just how much Spelman had shaped the way she sees the world around her. It was obvious that her experiences at Spelman and outside its gates have provided her with tremendous insight. In our final conversation, she offered me some of the best advice. She said, "Sometimes when people start saying stupid stuff, you really got to speak up." I simply remember nodding in agreement; more so, because I really appreciated Annette for reminding me "racism is alive and well in this country even though we try to pretend like that it's not and even though sometimes we forget that it is."

Annette expressed her frustration about being an academic. She spoke about all the time she spends in departmental meetings and how "burdensome" they have become. Instead of the incessant meetings, Annette would like to focus solely on research and scholarship. She said, "It's a burden. It really is a burden, but I kind of feel like it's a burden that I have to bear because I'm a black faculty person." She told me sometimes it is so chaotic that occasionally she has "to take a mental health day and not show up." Being part of an organization on campus for Black faculty members has even caused her to feel overwhelmed at times. In the midst of these stressful situations, Annette deliberately tries to find balance, ultimately aiming to make family her first priority.

Looking to the Future

When I inquired about whether she would stay in Alabama or pursue a faculty position elsewhere, Annette admitted she had already been thinking about leaving and actively exploring other employment opportunities. By the way she talked, I could tell, change is imminent. Although she has taken great pleasure in advising doctoral students and been a highly productive academician, she is prepared to endure the job search and hiring process. She said,

> I mean I'm looking, I'm looking and I am interviewing, but I don't feel compelled to take anything. I feel compelled to take something that's right. I'm at my 10th year at [the University] and you're [retirement] vested at 10 years…. So it's a good time for me to look.

Annette has also been tempted to walk away from her faculty position because she would like to experience a brand-new way of life. She said,

> I think I need a new stimulus…I've been here for 10 years. That's a long time…. Well, a part of me says it's time to try something different, but I've got tenure. So, if I went

> anywhere, I would want to have tenure. Would I go somewhere that I wouldn't have tenure? What would that mean? I don't know.

After she muddled her way through her own questions about applying for academic jobs as a tenured professor, she began to describe her professional goals. Annette looks forward to conducting research projects that "look at creative ways for doing a doctorate because…[not] everybody who does a doctorate is interested in doing research and they're not interested in faculty positions." In other words, she would like to redesign a much quicker way in which students earn a doctorate degree. This work could be difficult because, according to Annette, those who hold a Ph.D. degree "don't want everybody else to have it easier than they did because they feel like that's devaluing their own degree, but…we [academics] got to be more creative in what the doctorate is." To pursue her research goals, though, she said, at some point, "I got to either say I'm going to do them here [at the University] or figure out where I'm going to do them so that I can do them."

CHAPTER 6
MIKAYLA: "A VISIONARY'S DREAM OF BECOMING"

My guilt almost sabotaged my opportunity to come alongside Mikayla. We first spoke on the 22nd of December, and that was the very day, I learned she was in transition. Mikayla was in the midst of leaving one of the most highly regarded research institutions in the Midwest where she made history a few short years ago. To my surprise, she had accepted a position at another prestigious research university several hours' drive away. Mikayla would soon become the first chair and professor of a newly established department at the institution. She had planned to vacate her office the day after we spoke. When we talked about her transition in our first research conversation, I thought to myself, participating in my dissertation research might eventually become burdensome for her. It occurred to me that she might not have the time or even the desire to fulfill her responsibilities as my research participant. But, in that moment, I quickly reminded myself that she did, indeed, respond to the invitation letter agreeing to participate. Mikayla was interested in participating in my dissertation research since its inception, and I sorely appreciated her enthusiasm and support.

Although we shared details of both our personal and professional lives in our first Skype conversation, especially with regard to our lives prior to attending Spelman, I knew we had more intriguing stories to tell and retell. I was suddenly very curious as to how we would affect each other by retelling stories of our life experiences. Because Mikayla was relocating for her new position, I really had no idea when I would email her to schedule our second research conversation. According to her new hire paperwork, she was expected to report to work shortly after the New Year. I did not want to email too soon and overwhelm her with my request for

another conversation. So I used patience and emailed her toward the latter part of January. It was my great pleasure to speak with Mikayla again on the 29th of the month.

I opened our second conversation asking about her transition. I was still concerned her participation in my dissertation research might unnecessarily overwork her, but, in actuality, the contrary was true. It seemed she was not only enthusiastic about participating, but also delighting in her position as department chair and full professor. It was apparent to me that, although she did not have the smoothest transition, she was confident everything would work out eventually because of her preparation efforts. Mikayla talked about the process of getting acclimated to her position:

> Yeah, it's going really well though. I am happy and calm even in the midst of the other stuff that's going on. There's some confusion about some things, but I'm not stressed…. In the past, I would have been very agitated. Like oh, my gosh, people didn't get this letter and I'm going to lose my status for this and what's going on with my projects because I'm hearing from the IRB. I'm hearing from sponsor programs.

Mikayla even heard her student's project might be suspended because it was said that she did not have faculty status at the institution she used to work for; this particular student had planned to defend her dissertation within days. She expressed her feelings about the lack of communication and understanding, saying, "I did my part. I made preparations…I don't have time to worry about that. I sent the emails. I sent the letter. I've done my part. That's it." Knowing that she had done all she could, she did not overthink it. I admired her candor regarding her transition, and appreciated her willingness to share her story.

My final research conversation with Mikayla took place a couple weeks later on the 15th of February. In that conversation, we talked more about her first days in her new position,

lessons learned from her life experiences, and how she has grown, both personally and professionally. The realness and frankness with which she spoke in our research conversation will not be soon forgotten. Her life experience enlightened me, and her insightful wisdom taught me. Our final conversation reminded me that we are always in transition, and that transforming is a part of life. I, for one, am proud to have been a part of one of her life's major transitions.

Entrenched in Stories of Family, Culture, and Community

Mikayla is a Georgia-born woman, raised in rural Alabama by her mother and father, two very experienced educators. Her mother taught first grade for over forty years, while her father worked as a mathematics teacher. In our very first conversation together, she told me her father also served as an administrator at an area vocational school. When she looked back on her early childhood, she fondly remembered, living in "a household of educators," and all the teaching and learning that occurred outside the classroom.

As Mikayla casted her mind back to the days when she was a young child, she began retelling one of her mother's most amusing stories about the time she read her first book. According to her mother, for some unforeseen reason, it seemed she became an avid reader overnight. She tried to explain how it all happened, saying:

> I just started reading one day and she [her mother] doesn't really know where it came from, but…I think maybe I was looking at [television] or maybe I'd absorbed something, but I just had a book and all of sudden I could read it and there was something to that…I picked up on, you know, just education and upon things that most people learn formally…just because of the materials, the toys, television or whatever was around me at the time so that was really important.

She talked about the fact that her parents always bought her "educational toys" to play with including board games like trivial pursuit and checkers. Being an only child prompted her to engage in board games and other activities on her own. If Mikayla ever wanted to check out library books, her parents would make certain she was afforded the opportunity to do so, despite the 30-mile drive to get there. She told me that, because her family made regular trips to the bookstore and reading a part of her norm, she was able "to let [her] imagination just kind of be free." Mikayla went on to say, "there's something about engaging a child, you know, mentally so that you allow that person to not just have access to resources, but to dream, and you push that child…to move forward and to do some things."

Mikayla described herself as an incredibly inquisitive child. She recalled a time when she was a kindergarten-age kid and witnessed a Ku Klux Klan rally while riding in the back seat of her family's car; her parents were in the front seat. As they rode over some railroad tracks, she remembered "looking out the window and seeing the people…in their sheets, and [she] asked [her] parents, what is that, why are they dressed up like that, what's going on?" Her parents explained, in an age-appropriate way, that the individuals wearing white sheets did not like Black people. Mikayla became very confused by her parents' explanation. She wondered: "How did they [Ku Klux Klan members] not like me when they don't know me? That doesn't make any sense to me." As I listened to Mikayla's story of her childhood experience, I could tell it was a defining moment that had shaped her character. She said, "I just remembered as a child wanting to be the type of person to dispel myths that somebody who didn't know me would have…about me." The individual I had come to know was doing just that.

Besides being super inquisitive, Mikayla was a very ambitious child who did not shy away from confrontational situations. When she was in the fifth grade, she was a self-described

goal setter. As a participant in her class spelling bee, she was asked to spell the word "ambitious," and unfortunately, failed to spell the word correctly. She recalled the shock in her fifth-grade teacher's voice. Mikayla told me her teacher said, "I'm surprised that you don't know the word because that's what you are. You're ambitious." After that, she proceeded to find its definition. When she found it, she said, "Interesting. I like that word. Yep, that's me. I'm ambitious." And ever since then, she has knowingly exhibited great ambition and drive. When she set a goal, she worked hard to achieve it.

During Mikayla's high school career, she engaged confrontation with little to no hesitation. She once sat in a classroom amongst her White peers and actually challenged her history teacher. She told me her teacher was saying uncalled-for remarks about a former student with an uncommon name, and at one point, even questioned why any parent would name their child that. She said, "I remember the teacher talking really cruelly about that and I'm the only black person in the class." She then reminded me that the majority of her family grew up in her small, rural county. Mikayla was so disturbed by her teacher's criticisms of the former student that she raised her hand and waited to be called on. When her teacher finally acknowledged her, Mikayla emphatically told her that she was related to the student; she is her second cousin. She followed that up by saying, "You don't need to talk about people like that in a classroom just because you think that's funny, like that's not cool." Her teacher looked at her with distaste and asked to meet with her outside the classroom, and then said she was mouthy and behaved in an antagonistic manner. But, Mikayla felt she was raised to be that way. She said, "I feel that I've always been that person, even as a child, to educate my teachers in the rural south…[because] they were set in their ways and there were certain ways of living, and I thought that I was always trying to tell them no, you can't do that."

Almost like the time she wore a democratic t-shirt to school. Because her parents raised her to be a staunch democrat, she did not care whose political feelings she hurt. Mikayla donned the shirt pushing back against her teachers' political ideas:

> That's always been my personality…I want to push the envelope; I want to start a conversation. I dare you to question me. I dare you to say something crazy to my face about this, because you know that I'm going to talk back to you.

As she spoke, I began to understand why her family found it necessary to instill in her an attitude of confrontation. Mikayla closed her t-shirt story by telling me unashamedly that that is who she is and she is not going to change.

Because both her parents were teachers in her small, country town, she began her elementary school education in close proximity to her mother. Mikayla attended grade school where her mother worked. She referred to this school in conversation as "a southern school" because it was located in the southern part of her county's school district. Mikayla spent her first year of middle school, however, at another K–12 school on the north end of town. After that year, though, her parents enrolled her in a southern middle school. During the time that she was in high school, her educator father signed her up for courses at a local community college. She told me her high school "did not have a lot of advanced classes…so [she] did not have calculus, advanced placement classes, international baccalaureate classes, none of those things." Mikayla never saw the people in her town in pursuit of a science, technology, engineering, and mathematics (STEM) education or career. She mentioned to me that "many people were just educators, very community-oriented, and they just wanted the best for the people in that community, so [she] was in a loving community, but very small." She said,

> I would go to school during the day and then I would take some community college classes…[in] areas of history or music appreciation, art appreciation…so I had about 40 credit hours by the time I graduated from high school.

Mikayla reaped a huge reward from all the hard work and effort she put forth in high school; at the end of her senior year, she was named valedictorian of her graduating class. When I asked Mikayla how she felt about receiving such an esteemed honor, she said, "It was expected. I always planned it. It was just something that I wanted. I was like; I'm going to be valedictorian. So when it happened, I was used to it because I'd already seen it, already knew it."

Her parents not only showed her the importance of education, but also the value of building strong family relationships. Given that Mikayla was an only child, it seemed her parents made sure she knew her extended family. She spent much time nurturing close relationships with elder family members, primarily because she had a very special connection to each of them, especially to those who lived nearby:

> I really was around older people a lot more like my aunts and my grandmother, and my parents, you know, they were all older, and so, they were kind of my playmates…. I didn't really miss being around people my age…[because] I always had people to talk to, and you know, people who loved me and supported me so, that was good.

In conversation, she explained to me that her paternal ancestors were enslaved Africans in her small Alabama hometown, a very short distance from her family home. That being so, her parents rooted her in their longstanding family history and ensured she heard stories about her family's past. Because Mikayla's parents took her to visit family members each and every weekend, she could recall some of their stories. She said, "I remember every Sunday evening we [she and her parents] would go visit my grandmother and my aunt." She would see her other

grandmother quite a bit, too. Her grandmother, on her mother's side, who resided in the same county, died around the time she started elementary school. Her paternal grandmother passed away while she was in graduate school.

Mikayla graciously shared stories of her family members' past experiences. In other words, she told me familial "stories about the old times…that [stood] out" most vividly in her mind. First, she spoke about how her paternal grandfather worked as a farmer to make certain her father and his siblings received an education. Much like her grandfather, her paternal grandmother would sell fruits and vegetables to help ensure her children went to school. Her grandparents recognized the importance of education. The stories about her hard-working grandparents led to another "powerful" story her father once told her. Mikayla's father, who is now in his 80s, described his experience as an undergraduate student at a historically Black university in Alabama during the civil rights era. Because there was a fight for basic civil rights at the time, she said,

> he told me he remembered…there was this mandate from George Wallace that if any student on [the University's] campus participated in [the bus] boycott and…was found out by George Wallace or by people in the government…the students would be expelled.

She mentioned that the University's faculty was even discouraged from participating in the bus boycott. He also recollected overhearing people in the University cafeteria talk about several church bombings. The way Mikayla retold his story made it seem like "it was always [an] atmosphere of…turmoil, you know, just as a student." She remembered asking her father how he and his classmates lived without public transportation. He replied by saying, he would often "hitch rides with people" as a convenient method for getting around. Listening to her father tell stories from his past "was interesting to [her] to just hear another perspective and to know

someone who went through that, but in a different way, particularly as a student…during the bus boycott. She said, "We focus a lot on Rosa Parks, but this is something people had to endure every day."

The Influence of Familial Role Models

The role models in Mikayla's life have encouraged her to grow spiritually and achieve true greatness. As far back as she can remember, her family has "focused on [their] religion, upon spirituality, [and] upon God." Mikayla and her family have always attended church regularly and realized the importance of prayer in their lives. Prayer was such a priority that, her paternal grandmother, a woman who struggled to help support her family, spent most of her time sharing her worries and anxieties with God. Mikayla admired her grandmother's commitment to prayer, and in our conversation, seemed to really think about how it has changed her family's life for the better. She said, "I look at what her grandchildren have done and what her children did despite what she lacked as an educator. I think I really understand the power of faith and of prayer." Because a family of prayer warriors, too, surrounds me, I could not help acknowledging her sentiments. Prayer is powerful, and has always been of critical importance in my life.

Ever since Mikayla was a little girl, her mother, in particular, would ensure she strived for excellence. Her mother was critical of everything she did, from the way she held a pencil to the way she prayed. Mikayla firmly believed that "she [her mother] just wanted [her] to do things the best way that [she] could." She was not only grateful for her mother's momentous push to greatness, but also the freedom her family afforded her to "explore" the world through reading books at an early age. Mikayla read books with mature content including Alex Haley's *Roots: The Saga of an American Family* and Margaret Mitchell's *Gone with the Wind*, primarily

"because [she] wanted to look at two different perspectives of the civil war." Being able to explore differing perspectives provided her insight and information to draw her own conclusions.

When I learned of Mikayla's intention to become a biochemist at five years of age, it was then that I knew she had always been a visionary in her own right. She distinctly remembered telling her first-grade class about her future career during a conversation regarding their long-term goals. She said, "I didn't know what a biochemist was at the time, but my grandmother had died of cancer…[and] I wanted to be a biochemist because I wanted to…find the cure for cancer." During her second-grade year, Mikayla aspired to become Alabama's governor. I wondered, though, about her reasons for wanting to take such a political stance at a young age. But whether Mikayla showed an interest in becoming a biochemist or a state governor, she embodied remarkable drive and determination, two very important characteristics of a visionary.

Although she considered different career fields, all paths always led back to science. Mikayla gravitated toward the field of "science because [she] wanted to solve problems. So just anything else connected to solving problems, that was important to [her]." As I stated earlier, the political arena piqued her interest, too, more so because she dreamed of assuming a leadership position one day. She said, "I felt like I could be anything…at different points. I always wanted to just do something and I felt like I could do it all." There came a point in time when Mikayla thought she might want to become a writer or even a lawyer because she liked to argue. By the time she reached the age of 19, she finally pinpointed exactly what she wanted her future profession to be. Mikayla hoped she would become a university president. Once she figured out what she wanted to do professionally, she said, "everything just kind of centered around that," and still does today. She knew, back then, that her lifetime career goal of becoming a university president would be a difficult task for her to accomplish, but she has always been focused. She

said, “I have a goal in life and…I don’t get distracted because the goal is bigger than the circumstances.” I thought, at that moment, she is absolutely right. Life’s circumstances are temporary, but life’s goals can stand the test of time.

Committed Teacher Role Models

For the most part, Mikayla had positive recollections of her former teachers. Although her teachers were not “the best academically,” she thought they were still top-notch educators. She said, “I had a lot of teachers of color, just really positive role models, people who were involved in civic organizations, spiritual organizations, people who were just leaders in the community.” Based on her comments in our conversation, I could tell she felt her teachers took an interest in her and the other students. She said, “there was just a deeper support that came from my teachers. They were just caring people and they pushed me a lot.” Her teachers would contact her parents if there were ever an issue in school, and acted cohesively to support students: “It was that…environment that helped me…as a student more so than any single teacher I think.”

However, she did talk briefly about her eighth-grade English teacher, who had moved from a large neighboring city to her small, rural town. She crossed Mikayla’s mind because of the way she assigned coursework. Mikayla would receive a rather extensive book list from her eighth-grade teacher, choose several interesting books from the list, and write book reports about them. She said, “I just found myself being very happy to not have someone confine me and tell me exactly what to read or what to learn.” I was not surprised by her sentiments regarding her eighth-grade English course at all, especially given that she was such a particularly curious youngster. Mikayla’s eighth-grade English teacher set an example for her. She demonstrated

that, teaching and learning does not have to occur the exact same way all the time. It can look different.

Mikayla's parents began their teaching career in her community's racially segregated school system; then, when the decision was made to integrate K–12 schools, they taught in the newly integrated school system. She spoke a bit about the integrated system and her parents' experience in it, saying:

> I know that there was something about that environment that was really endearing. I think the teachers were very committed and those were teachers who I had also, so they [her parents] saw what it was like to engage with…minority students, but then see what that looked like in the school system, and I almost felt as if they were stewards in a way to make sure that many of the students had a quality education, too.

Her educator parents had the inimitable capacity to educate young minds. They were truly her first teacher role models. Because Mikayla's parents witnessed the commitment of teachers in their hometown, and because of her own teachers' example throughout her K–12 schooling experience, she knows the role an educator plays in the life of a student.

Earliest Childhood Memories of Mathematics

One of Mikayla's earliest memories related to mathematics involved stacking and counting small, three-dimensional wooden blocks. She recalled sharpening her mathematical skills with the help of worksheets and flash cards. Because her father was a mathematics teacher, it was always incorporated into her daily life. Although Mikayla found herself reading and writing the majority of the time, she recognized her mathematical talent early on. She admitted, however, that she "didn't love it [mathematics] more than [she] loved anything else." Because

she was inquisitive and simply enjoyed learning new things, she developed a liking for mathematics, along with each of the other core academic subjects in school.

As Mikayla went through school, she demonstrated academic excellence, especially in her mathematics courses. Because she was enrolled in honors courses, she told me she did not fit in with her Black or White peers at the time, and she recalled feeling "somewhat isolated" at school. She remembered trying to befriend a group of White students who were in those courses, while simultaneously attempting to associate herself with Black students who were, for the most part, taking non-honors courses. She felt like she did not belong because "people would say [she] talked white or [she] thought [she] was better than the other people, and then the white people had their own cliques." Thinking back to her childhood and about that feeling of isolation made her suddenly realize "that there's something there about [her] not being afraid to branch out because it's something [she has] known [her] whole life." Mikayla's courageous nature helped her achieve academic success. Her support system and "always being stellar" in the classroom ultimately aided her in becoming her high school's valedictorian.

She remembered having Black mathematics teachers in elementary and middle school, but she had no recollection of having Black teachers in high school. Given that Mikayla was the only Black student in her high school mathematics courses, taught by White teachers, she often felt the need to prove herself. She refused, however, to "think that math was a race thing at all"; she thought her experience, as a secondary mathematics student was decent. Mikayla commented on the relationship between her and the other students and her feelings regarding what she had gone through in the mathematics classroom:

> There were other really smart people and we just did math. I've never had any issues in high school with my peers when it came to doing math or math problems or trying to solve something. I just did my work, so it wasn't bad. It was fine.

When I asked if she could recall her most memorable experience in the mathematics classroom, she openly shared what she referred to as a "negative experience." Despite thinking "it's really weird" to share such an experience, it seemed Mikayla thought it might provide me with a better sense of who she really was/is and stood/stands for. She began by providing me with the full backdrop of her mathematics story. Mikayla remembered it was her senior year in high school and she, of course, was the only Black individual in her mathematics class. She recalled one particular day when her teacher requested her presence at her desk. Mikayla's teacher wanted her to review her course grade. When she saw her numerical score in her teacher's "little math grade book," she knew it should have been a 98, not a 95. After Mikayla told her teacher about the potential grade discrepancy issue:

> I don't know if she [her teacher] was having a bad day or what was going on, but she got her book…and she threw it on my desk. So, I remember getting my little pencil erasing the grade, putting the right grade down, and I threw it back on her desk.

Hanging on her every word, I wondered how her teacher responded in that situation. I thought to myself, it takes an incredibly bold person to take the kind of action she described that day. She knew it was a gutsy move, too: "You know, and thinking about me throwing something back at her, that was really sassy, but I felt disrespected." The lack of respect shown by her teacher stuck with Mikayla. That day became forever etched in her mind. This very frustrating mathematical experience made her understand the importance of being "really assertive about certain things," in certain situations like this one. From that day on, she had no problem "saying this is what I

deserve, this is what I earned, and challenging people, even in high school, to make sure that [she] got what [she] needed as a student."

On the Road to Spelman

All the pamphlets mailed to Mikayla's home were responsible for introducing her to Spelman. Because she had no desire to attend a PWI, she considered applying to the small, Liberal Arts College in Atlanta, Georgia. Mikayla no longer wanted to be the lone Black student:

> I had so many issues in high school. I was the only black one. I said I am tired of this like I need a break because people are getting on my nerves and I need to find a place where none of y'all will be.

The fact that she could attend a predominantly Black institution was "a wild encouragement" for her at the time. She looked forward to the opportunity to interact with all the Black faculty and students.

When she made the decision to attend Spelman, cost was a very important consideration. Mikayla was unwilling to spend four years at an institution that did not offer her full financial support. She told me she thought about committing to other institutions because Spelman had not offered her a scholarship package. In anticipation of detailed correspondence about her financial package from the College, she said, "I knew I was admitted, so I just decided to go." Once Mikayla received the official word that she had been given a full scholarship, she made her final decision. She was, indeed, going to become a Spelman woman. Toward the end of our first conversation, Mikayla recounted:

> I had never been to Spelman physically until the day I moved to college. I did not visit it. I looked at pamphlets, and based on the scholarship…I was able to work at a [large independent space agency] every summer and that was great, and I said, I'm going here

> because this is the best package, it makes sense, it looks good on paper, this is where I'm going, and that was it.

Her family supported her decision to attend Spelman, especially given that she had the opportunity to study engineering. Initially, she said, "I thought I was going to do chemistry and chemical engineering, but…I think I was allergic to the chemicals, something happened to my eyes and they would always burn…and I realized I cannot stand this." Because majoring in mathematics also appealed to her, Mikayla joined her peers in the mathematics department, and pursued a dual degree.

I asked Mikayla if she had gone to any summer enrichment programs prior to attending Spelman and she told me she went to a minority introduction to engineering program at a large research university in Alabama. However, she really did not care for the program at all. Mikayla said, not only was the campus too big, but also "too much like high school," an environment she was very much trying to escape.

The Importance of Hard Work and Mentorship

Becoming a member of the Women in Science and Engineering (WISE) Scholars Program was one of Mikayla's earliest memories of her undergraduate career. As a newly admitted undergraduate student and WISE scholar, she became increasingly frustrated because the material in her mathematics courses was covered at such as rapid pace. Given that Calculus was not offered at her Alabama high school, she found herself looking to her peers for help. According to Mikayla, her roommate and other students in the WISE program really excelled at mathematics:

> They were the best. They had AP [Advanced Placement] classes. They had IB [International Baccalaureate] classes probably and I went to this one student down the

> hall…and she would tutor me. She was just so patient and wonderful, and she would encourage me because I had never seen this. So I'd gone from being valedictorian in a small place to a place where something was accelerated and I was working with new context also.

In order to grasp mathematical concepts, unlike other WISE scholars, she would spend most of her nights completing assigned homework and studying for examinations. Mikayla's frustration seemed to overwhelm her, moving her to tears at times. She said, "It was a lot for someone who had never seen that content." Ironically, when she presented at Spelman several years back, one of her old professors mentioned she used to cry often. But, it was evident that, although she experienced difficult times, she was incredibly proud of what she had accomplished over the years. She said, "I need to probably contact them [the mathematics faculty] now that I'm a department chair because I was that struggling student, but when I got to the program, I did pretty well."

She recalled her peers having different perceptions of professors in the mathematics department at the time. After taking a number of required mathematics courses, Mikayla and her peers came to know each of their professors' approach to teaching and learning, and all their classroom quirks. She stated, "Some people [mathematics professors] had really good reputations for being very student-centered. Some people seem to have like personal issues." Mikayla told me she remembered a point in time when it was rumored that one of her professors had been physically beaten. Once the rumor had spread throughout the department, she said:

> People were just trying to figure out is she being abused…and I just remember us always trying to figure out the stories of our professors. Why were they mean or why were they short-tempered? Why were they certain ways? What made them that way? And we did

> not, out of respect, ask people things, but we kind of saw them holistically, but sometimes we wanted to know more personal things, and unfortunately, I think some people made up stories because they just didn't know.

It seemed as if the imagination of those around her got the better of them. People would actually make a determination about how professors were living. They would say things like "this person has a great home life or this person doesn't have a good home life." It never failed; it was always imagined stories about the department's professors.

There were two professors in the department that served as mentors to Mikayla. The first mathematics professor she spoke to me about was Dr. Theresa Campbell. She was from Mikayla's home state of Alabama. Because she and Dr. Campbell were both from the Deep South, they had an immediate "connection" from the beginning. Dr. Campbell would share stories about her husband and children with Mikayla. After connecting, they began working closely together: "[Dr. Campbell] was the first person who I did undergraduate research with. So that was important to me." Dr. Campbell encouraged her to conduct thoughtful, independent research. As Mikayla described the impact she had on her undergraduate education, I thought about my own relationship with Dr. Campbell. I knew her to be an extraordinary listener, not to mention a supportive faculty advisor. I successfully graduated from Spelman with an undergraduate mathematics degree, due in large part, to Dr. Campbell's mentorship. I told Mikayla about my frequent trips to Dr. Campbell's office and the inspiring words she bestowed upon me each time I visited. When we spoke that day, I mentioned to Mikayla that there were some folks that did not expect me to return and finish my bachelor's degree after taking a year off. That is the reason her support was so important in my academic life. Even when I had come to teach at Spelman after my stint as a doctoral student at UMBC, Dr. Campbell did not want me

to get comfortable in my instructor position. She always believed I could complete my doctorate, and wanted me to believe it was possible, too. Because she was at the "forefront of that push" to get me back in school, I am nearing the completion of my doctoral degree. I often wonder if I would be where I am today if Dr. Campbell had not been at Spelman. It seems highly unlikely.

Mikayla also depended on the support of Dr. Evelyn Gold, a staunch leader and advocate for Black women in the mathematics community in general, and for those majoring in mathematics at Spelman in particular. Like Dr. Campbell, Dr. Gold had the experience of growing up in the South and serving as one of Mikayla's mentors. She explained to me that, during her final year at Spelman, Dr. Gold prompted her to pursue engineering in graduate school. In response, she said:

> I don't know if I could do it because I was dual degree…I just decided to do math and now she's telling me to go from an undergraduate math degree into an engineering program, and I was like I'm not the 4.0 student. There were other students who were 4.0 students…and I was like, are you sure I can go to grad school?

That day Dr. Gold told her that she "always underestimated [herself]," and that, yes, she could attend graduate school and become an engineer. She was, indeed, the reason Mikayla had applied to multiple programs and been accepted to all of them. Dr. Gold always believed in Mikayla; she had the utmost confidence in her. After she told this story about Dr. Gold's mentorship, she said,

> there are so many people who maybe don't have an idea of what it takes to get to the next level. They think well, I'm not the best within this cohort or I don't think I'm the best in this cohort. So surely I'm not qualified to go into this next phase, but she [Dr. Gold] really saw that [potential in me] and I appreciate having that opportunity.

After Mikayla described her two mentors and their importance in her life, she detailed what she remembered about a couple of other professors in the mathematics department. She mentioned a White, male professor by the name of Dr. Steve Hudson. He apparently talked a bit about his wife because Mikayla recalled her profession as well as where she had gone to school. What struck me the most was when she said that "he just did stuff after hours for anyone who wanted to learn more"; because I know him personally, and have always held him in high regard, I had hoped she would tell me he put forth extra effort into ensuring his students thrived mathematically. When he received a teaching award at her graduation ceremony, Mikayla could not have been happier for him; she screamed with excitement. She said, "I remember I'm on the [graduation] video at that moment when Dr. Hudson got his teaching award, and it's just because he was fun and he showed a part of himself that few people show." Mikayla was not only proud of him for getting the teaching award, she was proud she could call him her mathematics professor.

She then spoke about Dr. Richard Banks, another White, male professor in the department, known for his card tricks. Mikayla recalled him being very passionate about performing magic card tricks. I have actually had the experience of seeing him draw students into his office and show them his skills. Most students seemed impressed by him. And it's funny, thinking back, I have never known him not to share his magic with others. Mikayla liked the fact that he showed his passion for card tricks: "I think those are the things that mean a lot because anyone can take a class, anyone can learn something, and say someone is a phenomenal teacher." However, it takes courage to show your true self. As she thought about her former professor, she stated,

> it's very special when you feel comfortable sharing who you are, but also maintaining that professionalism, and I think that that has influenced who I am as a person, and how I teach in a classroom, and how I interact with my faculty and my staff.

Negotiating Identity and Undergraduate Student Life

When she thought back to her first year as an undergraduate mathematics major, one of the memories that came to Mikayla's mind involved the Atlanta-based hip-hip group, OutKast. Because this two-person group was from the metropolitan area, they would come to campus to promote their music. Mikayla voluntarily helped them by passing out compact discs to other undergraduate students attending Market Friday, an event where local vendors sell an assortment of merchandise and students take pleasure in music and student-led activities. Because OutKast was a fairly new hip-hop duo at the time, they knew student support could be key to their longevity in the music business. Music was a hugely important part of the college culture and Mikayla's college experience. She recalled playing their music and thinking it was unlike anything she had ever heard before. But, although Mikayla aided OutKast in accomplishing their musical endeavors, her steadfast commitment to her undergraduate studies remained:

> I was focused though. It's like I have to do math. I'm here for my studies. I'm here to just really get this education, and sometimes I felt a little resentful because I felt that students in other majors had a chance to do more and to be involved, but I had to focus on my degree. I had to focus on my discipline.

Mikayla knew her undergraduate mathematics experience did not happen in isolation. She understood that there were "cultural things" occurring simultaneously, too. Mikayla told me that the weekly Market Friday event on Spelman's campus commenced at the same time as her

afternoon mathematics courses. That being the case, there came a point in time when she rarely ever enjoyed the festivities of Market Friday with her peers.

Mikayla recalled a time when circumstances prevented her from having fun with the other students. She specifically remembered asking another student about who was performing at a Market Friday event one particular day, and they responded by saying, "Usher." Because she was in her early twenties and he was in his late teens, Mikayla was less than thrilled he had come to campus. She said, "Is that little boy back over here again? Like why, nobody wants to see him." Mikayla somehow never forgot that. And on those Friday afternoons, when the campus filled with people and hip-hop music blared from every direction, one thing was for certain, she said, "I had to go to math class."

It behooved Mikayla to align herself with students majoring in closely related fields. She benefited from working in small groups throughout her undergraduate years. During our second conversation, she reflected about one of her most memorable study partners. She was an exceptionally talented biology major, but quite proficient in mathematics. Mikayla said, "She and I would study a lot." It seemed she thought highly of small group work and appreciated the closeness of their friendship. Mikayla went on talking about another student who had offered her mathematics expertise to her during Spelman's summer Science and Engineering program. This particular student helped to improve her mathematical skills. She noted: "I always had somebody to study with or I got tutoring in the math lab. And then, sometimes I would tutor as well, but it was all about the group, all about the community."

Mikayla did spend time, however, observing those around her. She wanted to be surrounded by "good people." I understood, because vetting your college professors and classmates "was a part of the [undergraduate] experience." The majority of the people she

befriended at Spelman helped her make sense of the goings-on at her alma mater. But, in any situation, she demonstrated her independence. It seemed she was in control; she could handle unforeseen circumstances and overcome adversity.

Although she thrived academically working in groups, she still experienced much difficulty as a mathematics major. Her upper-level courses were complicated by its overwhelming content, and her familial support system was hundreds of miles away. It took time for Mikayla to fully connect to her new environment and the people in it. She admitted, "There's just a lot that you're dealing with." However, when difficult times arose and she was unsure of her next steps, she relied on her faith. She asserted: "My faith was really important to me. I did go to a church, a couple of churches there in Atlanta, and that was great." Although her family lived some distance away, they all supported her. It seemed Mikayla knew she could persevere because she was "well-grounded in [her] family" and their values. With the support of her close family and friends, she was able to endure the pressures and politics of college life.

For example, she recalled a time in her junior year when she struggled to perform at a high level in her abstract algebra course. Mikayla was not the only one, though, another one of her classmates found the course to be problematic, too. She told me that because her classmate was pledging a sorority that semester, her course grade really suffered. The whole situation frustrated Mikayla because her classmate got clearance to drop the abstract algebra course after the add/drop period had ended. Her classmate sought out the dean of students, who was a member of the same Greek-lettered sorority she was pledging, and approval was granted. When Mikayla tried to drop the course, however, her request was denied. Rightfully so, she was upset:

> I just felt it wasn't right just because someone was pledging that they were able to get out of something and the rules. They were given like second chances to do something, but I

> didn't have that, and it was really me just seeing…black woman politics…[and] sorority politics. We're in a place that's supposed to be really focused on sisterhood and it was just interesting, which is eye opening for me.

But, despite not being able to drop that course, she still found a way to complete all its requirements. Her willingness to rise above that situation made her the real victor.

When I asked Mikayla if she identified as a mathematician, she responded in the affirmative: "I always do, definitely. It's the foundation. It's who I am. So I can't deny that at all." Everything Mikayla had been through, since she was a little girl, allowed her to develop such an identity. Her affinity for mathematics comes from the way in which she experienced the mathematics classroom in her hometown of Alabama and at Spelman. I believe her confidence, perseverance, and faith was strengthened by her mathematical journey, and ultimately drove her to fulfill the requirements of her undergraduate mathematics degree.

During Mikayla's senior year, she became a more passionate student scholar. She vividly recalled a story about a time when Dr. Hudson called her into his office. He wanted to share "a really cool problem" with her. Mikayla thought, "No, I don't want to see a cool problem." But given that he was working a financial engineering problem, she took a seat and indulged him. While she sat waiting for him to finish, she had an epiphany. Listening to Dr. Hudson explain his problem made her realize his "passion for what he wanted to do," and the fact that, she desired the same thing for herself. She described exactly what she was feeling and thinking in that moment:

> I finally realized that instead of trying to memorize, instead of just going through the motions, I needed to focus more on mastering of the material. I feel like I went from this performance mentality into more of a mastering mentality and when I started doing that, I

> became really passionate about research and about pursuing things that were important to me…I became stellar at that point. I know the exact point when I feel that I transitioned from just a regular student into a scholar and someone who wanted to just really learn and use my knowledge to help other people.

This was, indeed, a pivotal point in her undergraduate experience at Spelman. Dr. Hudson and the rest of the mathematics department's professors greatly influenced her scholarly development. Mikayla told me that transforming her thought process about teaching and learning brought her a sense of "peace."

Her ultimate goal, from the very start, was to earn her bachelor's degree. Aside from that, though, she really did not know where her path might lead her after graduation. Mikayla said, "I wanted to just make it through. That was my thing." She was not so much concerned about life after Spelman at the time; but she did mention, however, that graduate school had most certainly been under consideration, even before she became interested in engineering. It was either: pursue a degree related to higher education, or pursue a mathematics education degree. It seemed as if Mikayla's dream of becoming a university president focused her, and gave her more to think about in terms of her academic pursuit. She talked briefly about the College's seventh president and all that she gleaned from her tenure in office, saying, "At the time, Johnnetta Cole was there at Spelman and I just said there's something about higher education, there's something about being able to make an impact with people that I think is really important." As she thought more about her professional goals and plans for the future, she was confronted with a life-changing decision. She said, "I knew I needed a Ph.D., but I just didn't know the area that I wanted to go into." It was then I realized just how "goal-oriented" Mikayla really was. She told me that her

future goals had always been "bigger than math. Math was [just] a means…to get to where [she] wanted to be."

It became obvious to me that Mikayla benefited from meeting and becoming acquainted with faculty and other Spelman women with starkly different backgrounds. At Spelman, she had spoken to and worked with faculty who had received a number of accolades due to their success in the professional arena. She had talked at length to her peers about their life experiences. Making connections and building relationships with whom she came in contact was of the utmost importance, according to Mikayla. She believed the people she engaged spoke words of wisdom. Mikayla explained, saying:

> There are people who come from different walks of life. And maybe a person has never thought of earning a Ph.D., but more than likely there's going to be someone there who has gone through that process or…has parents who have Ph.D.'s or you just have so much exposure to new things that will help you right there at your fingertips.

Particularly, connecting with her peers who were also in pursuit of a bachelor's degree in mathematics exposed her to "different career paths." She never felt like she had to compete for information regarding internships and fellowships, or employment after graduation. She said, "I think that math is such a foundation for so many of the careers, that this allows students to identify…what they wanted to do, not just from their professors, but from each other."

Mikayla has stayed somewhat connected to her alma mater through the years. She returned to Spelman's campus some years back for her ten-year reunion. During her campus visit, she took great pleasure in touring the new science building, home of the Mathematics Department. Mikayla told me she still communicates with a few of her Spelman sisters. But, she said, "I don't do anything extensive with Spelman." In recent years, she has gone back once to

speak with students. The last time we spoke, I mentioned my lack of involvement and why I'm still trying to negotiate my relationship with Spelman. Having had the experience of teaching in the department from which we both graduated, I realized the need to distance myself a bit. Giving so much of myself, inside and outside the classroom, wore me down. But, my hope is that this project demonstrates my unwavering commitment to Spelman, and to Black women's education. As I sat and listened to Mikayla talk about her most recent campus visit, it became clear to me that, although we are not connected to Spelman like we once were, our affection for our beloved alma mater is strong as ever; a bond like no other—one that cannot be broken.

Learning from Experience

Mikayla's undergraduate experience empowered her to think differently. Once she completed her bachelor's degree, she embraced her Black heritage, more than ever before, and considered herself a very "proud black person." Because her parents were brought up in Alabama around the time of the civil rights movement, Mikayla felt as though she had been given "a lot of insight about…the real life experiences of people, of black people in the South within the civil rights movement." She gave me the impression, however, that her Spelman experience pushed her not only to expand her mind by teaching Africa's history, but also to think beyond her southern hometown. Spelman provided her with an opportunity to engage people, most of whom were "trying to develop their identity," raised in major cities and small towns across the nation, and around the world. She said, "It was just our space. It was a space of people who came from being the first and the only coming together and realizing they had similar experiences, and we would form communities and do really amazing things."

Attending an HBCU like Spelman taught Mikayla a valuable lesson. Thinking back to her high school days, she described memories of being the only Black person in her core courses.

Interestingly enough, there were absolutely no Black women in her high school courses until she reached college. Once she began taking courses for her degree program at the College, she said,

> I realized that I was no longer alone…but I know even if I am the only one here, I know how to tap into a network of people who have similar experiences, and when I need to escape from here, I can. I know it's possible.

She had learned to trust in this network and rely heavily on the Black students who were a part of it for guidance and support. She was confident that, if and when she called on them, they would most definitely be there for her.

Like the majority of people she engaged, Mikayla herself was trying to reshape her identity in college. During our final conversation, she commented specifically about her existing identity and the role Spelman played in remolding it:

> I always had a sense of identity, a strong sense of identity and history, but at Spelman I realized that it was okay to be authentic. It was great to be free, and I think by having that validation, I was able to always take that with me.

The encouragement she received from her immediate and extended family members, and other members of her hometown community, not to mention her Spelman family, has inspired her all these years. Her motivation comes from being encouraged:

> There are people who will ask me all the time why I am so bold, why I am so confident, what is it about my background that makes me this way? I think it's just having that from the first part of my life, not knowing anything different, and Spelman helped to reinforce that. It's like I needed that after my upbringing just to kind of seal it in a way…so that when I went into adulthood, this is my identity. I am not going to change it.

All the time she spent majoring in mathematics prompted her to shift her thinking, especially when it came to actually doing mathematics. She said, “I’ve learned to focus on math strength, not just performance; so really working and learning from situations, not just in arising situations, but digging deep and reflecting is also something I’ve learned.” She referred to the aforementioned skills as both “gifts” and “tools” that could be used in future situations.

Next Stop, Graduate School

Upon graduating from Spelman in 1998, Mikayla made the decision to pursue a master’s degree in industrial engineering at a large, predominantly White, research institution in the South. It was then that she realized that her HBCU undergraduate experience as a Black, female mathematics major was unlike that of other students. Prior to attending Spelman, she said, “I didn’t exclusively think about black women and math education, and afterward, I never really saw that again.” To see Black women pursue degrees in STEM was a rarity. Mikayla told me that, although there were only two other Black women in her graduate program, she believed she had a support network there. She said, “We [she and the other black women] had strong bonds, and we had very similar experiences, southern experiences. It was very good because we all liked each other, and we were able to support each other. That was really great.”

After completing her master’s degree, she applied to a Ph.D. program in leadership and policy studies at another research institution in the southern United States. Once Mikayla started, she built relationships with several people in her program. Because they shared “common experiences,” she looked to them for encouragement as she strived to meet her program’s milestones. She said, “I was no longer the mathematician or the engineer, but I did have supportive women, particularly black women who were with me.” The way she talked about their relationship, prompted me to think, having their support made her Ph.D. process realizable.

Our conversation made me wonder, though; what might have happened if she had not met such supportive Black women while she earned both her master's and doctorate? How different would the story of her experience be then?

Moving Forward and Starting Anew

The first faculty position she accepted after completing her Ph.D. forced her to make some real adjustments. Mikayla called, the very beginning of her tenure at one of the nation's most well respected universities in the Midwest, "a terrible experience." She felt very isolated in her new faculty position because there was no one she could relate to. She had to navigate her path as budding academic on her own. Moving to the Midwest from the South seemed to complicate the situation, too. Living in a Midwestern state as a southern Black woman presented a serious "cultural issue" for her. Some of the people with whom she came in contact, had more "exposure to black people" than others. She commented about her experience, saying, "There were a lot of different things that were going on and it was just crazy."

She did, however, receive one of the most prestigious awards while she worked at the research institution. In 2010, she was awarded the Presidential Early Career Award for Scientists and Engineers. Meeting the President of the United States and being presented with such an award was the most memorable highlight of her professional career to date. She mentioned that out of the 13 mathematics majors in her graduating class, only three of them have received that particular award. She told me the other two graduates were always top students. She said:

> They came from places with families who are Ph.D. professors, and the thing that will forever stay with me about my colleague is that she said, [Mikayla], you may not have been the 4.0 student, but you're at the same place.

Mikayla currently holds the position of academic chair and professor in the Department of Engineering Education at a large research institution in the Midwest. She assumed the role and responsibilities of her new leadership position with great pride. Becoming the first chair of the institution's newly formed department is one of her life's major accomplishments, especially given that it was not even in existence prior to her coming there. Mikayla seemed to recognize the work ahead of her, though. She said, "I am trying to help grow up an infrastructure and build a research program, communicate with senior administrators, and just build the brand that is our department." Fortunately, her colleagues support her in building the department's infrastructure. Mikayla told me that most of the institutional leaders take part in an organization focused on diversity issues. This particular organization, led by White men, provides "a place where people [can] talk about the privilege that white males have and how to somehow work with diverse people in their environments." Because those in leadership positions have shown their support for and are engaged in such an organization, she feels "very blessed" to be working so closely with them. Mikayla appreciates the fact that "they [the institutional leaders] are years ahead of traditional environments, particularly with STEM areas."

She exhibited incredible enthusiasm as she described her first days as academic chair. Mikayla spoke in such a positive tone about how she was faring, I remember wanting to say, "Right on!"—because I, too, was proud of her for accomplishing such an outstanding feat. In fact, I have admired all she has accomplished. The more we shared in our conversations, the more I knew and understood about her transition from tenured faculty member to academic chair and full professor. I recalled thinking; her first days could not have been easy. But to my surprise, she said, "They're wonderful, excellent, excellent, excellent just because I know what my gifts are and I'm really operating with those professional gifts." Mikayla went on to say:

> I know some of my gifts are to lead, to be futuristic, to be strategic, to be rational, and I'm able to do all that with no apologies. I…had this revelation recently about the importance of being in a place where your gifts and talents line up with the expectations of the people around you and having an opportunity to grow into a person where you can use your gifts.

After Mikayla told me about a chat she had with her new colleague, I was convinced that those around her had already begun to acknowledge her leadership efforts. In their conversation, her colleague recognized her as a burgeoning activist. Mikayla transparently admitted to me that she had not viewed herself as an activist at all. And so, it was unexpected when she spoke about her in that way. She said:

> I've never seen myself to be an activist, but she [her colleague] talks about how I'm just so bold and I'm so confident with who I am and I have such authority in my leadership…so to get that feedback is wonderful.

Her family is still very much a part of her personal and professional journey through life. When she first took her new position, her husband worked full-time in a different state all while he prepared to defend his doctoral dissertation in music. They planned to reunite at the conclusion of the academic year. He is, without doubt, one of her biggest supporters. She said, "He asks me about my day even though we're long distance." Her parents always show their support and how proud they are of her. Mikayla made it a point to say, they are truly the ones "who have interest in [her] and want [her] to succeed, and so, that's just constant."

Aside from working toward her dream of becoming a university president, she is developing and growing her business website, which is, indeed, a passion of hers. She explained, "It was birthed because I got to a point, and I said, you know what? I was prepared to be a

professor because you have all the graduate training that goes on, but I said, I wasn't prepared to be a pioneer." So Mikayla created a website focused on "what it means to be a pioneer." She writes about everything from graduate advising and her working environment to character development. It seemed to me that detailing her experiences for people to read has been very therapeutic for her. Writing about all the thought-provoking moments in her life made her a more "transparent" person. Mikayla told me she even wrote about a recent miscarriage in her blog. She said, "I want to launch it in lessons that you learn when you lose a child…just really talk about the three or four things that kind of bubbled to the top." She maintained that the reason she is able to reflect so deeply on her miscarriage experience is because of her blogging. Mikayla takes pride in mentoring people virtually by sharing not only the lessons she has learned, but also the knowledge she has gained from her life experiences, especially her professional experiences as a department chair. She believes it is of the utmost importance to "develop other people" and help push them forward. All her subscribers "really appreciate [her] writing." For Mikayla, it is more than just advising students and aiding them in their academic journey:

> These are working people and faculty, just anyone and even my administrative assistant came in a few days [ago] and she has a business degree…. She said, I just really appreciate how there's a spiritual perspective to it [her blog], and she said, I can relate to what it is that you're saying.

Nurturing her business website will not be an easy task, but Mikayla is more than willing to accept the challenge. She is fully committed to sharing her professional experiences, engaging in virtual mentorship, and empowering those around her.

When we talked about how she dealt with competitiveness, she did not hold back her feelings. Mikayla told me that it is quite natural to be competitive. She stated, "We fight that

natural tendency to say I need to identify how I'm superior to you." Instead of working together toward a common goal, people operate on the premise that "there's one shot…and you have to be the one that gets [that] shot." She argued that, because individuals are rarely ever satisfied with the world around them, they tend to set and reach their own life goals in attempt to outshine the rest. She said, "They [competitive people] have to always find a way to separate themselves, but when we as a people get to a place where we can say…there's enough pie for us. It's just that I have a different piece than you." Then we know we have truly moved forward together. Mikayla believes her own success comes from the unswerving confidence she has in herself:

> I don't have to knock someone else down to get to where I am. I don't have to compete even within my community. It's not even a race or gender thing. I have unique gifts and talents…because of my spirituality, too. I believe you can't compete with the anointing. My anointing is what my anointing is and nobody can do what I do like I do it, and if I'm in the place where I'm supposed to do it, then, I'm okay. But so many people get caught up in there's just one thing and I have to get that one thing. No, your thing may be somewhere else, stay in your lane and perfect that. So that's where I'm going to make my billions. I'm going to have to teach my people.

My final conversation with Mikayla further solidified in my mind that she is a brave visionary whose courageous leadership and entrepreneurial spirit has inspired those around her to realize their potential and life goals. When we last talked, she insisted on the importance of "having a vision, writing [one's] goals, [and] making a plan." Doing each of these three tasks, she said, allows her to "see the bigger picture" and bring her goals to fruition. With all of her roles and responsibilities, she has to set goals and devise a master plan. She said:

> I'm doing my research. So I have grants; I have to work with my students. I have a plan for when my students are going to graduate. They have contracts for when they're graduating. I get to plan things for the department. You have to have a purpose. You have to have a goal. You have to be focused because you cannot be as effective as you need to be if you are not, but I'm learning.

She understands that she cannot accomplish her goals by herself. Mikayla often delegates responsibility to her team of colleagues in effort to make her visions reality. Nowadays, though, she is focused on her most pressing goal: "to figure out what needs to happen to make sure that [they're] streamlining processes and…to be a good department chair."

CHAPTER 7
NARRATIVE THREADS OF MATHEMATICAL EXPERIENCE

Writing the stories of my participants' life and schooling experiences encouraged me to consider the implications of their mathematical realities, especially in relation to their undergraduate tenure at Spelman. Participants' stories of experience discredited the notion that Black women do not occupy mathematical spaces. Inquiring into their undergraduate mathematics major experiences not only solidified their presence, but also showcased their academic resilience and resourcefulness in upper division mathematics courses. Conversations with participants revealed the complexity of Black women's lives in the traditionally White male-dominated space, and highlighted the extraordinary importance of rallying support for budding female mathematicians.

In this chapter, I present the reader with three different endings. The first ending addresses the latest version of my research questions:

1. What were the life and schooling experiences of Black women who pursued their undergraduate degree in mathematics at Spelman College from the 1980s to 2000s?
2. How did larger socio-historical and -cultural contexts and life experiences (on and off campus) affect their image of themselves as mathematicians?
3. How did relationships with other Spelman students, faculty, and staff influence their short- and long-term goals in the field of mathematics?

I draw on the following resonant threads identified across my participants' stories to respond to the aforementioned questions: (a) familial support, connectedness, and influences on education; (b) innate mathematical ability; (c) familial and teacher role models; (d) pre-college summer programs and "WISE" Scholarships; (e) mathematics majors' role and academic experience; (f)

the Department's "not-so-hidden" agenda; (g) faculty and staff caring, support and mentorship ("professional mothering") and student relationships; and (h) after-college challenges, opportunities, and professional experience. Each of the resonant threads constitutes the most significant aspects of my participants' mathematical experiences. Therefore, I delve further into the resonant threads and discussed them in connection with existing literature. I share my wonderings and the parts of their stories that resonated with me throughout this particular ending. I also invite the reader to wonder and think about my mathematically talented participants' experiences. How do the stories of my participants aid the mathematics community in providing sustained support for mathematically talented Black women and other women of color?

I take the reader to a different kind of thinking-space in the second ending. I rely heavily on Black feminist and womanist theories, which allow me to theoretically interpret my participants' stories of experience. Because theoretical literature has been such an integral part of my own story of experience and doctoral journey, I expound on the ways theory pushed me to consider the impact of telling Black women's mathematical stories and having their voices reverberate through the pages of this dissertation. This ending also affords me the opportunity to link my participants' stories of experience to the larger socio-historical and -cultural contexts of Black education in the United States.

In the third and final ending, I grapple with the first and second endings, and what it means to do the work of narrative inquiry. I discuss the tensions of clinging to the notion that stories are enough, and refraining from using Black feminist and womanist theories as my eclectic lens. Then I describe the moment I came to the realization that as social scientists we are

always theorizing, whether we like it or not. My hope is that this project's next steps will bring even more visibility to mathematically talented Black women.

The First Ending

From the very beginning, I endeavored to examine the experiences of Black women who declared mathematics as their undergraduate major. For this reason, the following was the central question guiding my dissertation research: What were the life and schooling experiences of Black women who pursued their undergraduate degree in mathematics at Spelman College from the 1980s to 2000s? I identified seven resonant threads that characterize the complex nature of Black women's undergraduate mathematical experience: (a) familial support, connectedness, and influences on education; (b) innate mathematical ability; (c) familial and teacher role models; (d) pre-college summer programs and "WISE" Scholarships; (e) mathematics majors' role and academic experience; (f) the Department's "not-so-hidden" agenda; and (g) after-college challenges, opportunities, and professional experience. These resonant threads contributed to my participants' mathematical success and growth as academicians. Although the resonant thread concerning faculty and staff caring, support and mentorship ("professional mothering") and student relationships adds a layer of complexity to the discussion about my participants' undergraduate mathematics experiences, it is important to note that I detail this thread in response to my last research question.

In an effort to better understand the complexities surrounding Black women's experience of becoming a mathematics major, I inquired into my participants' mathematical pasts. I asked each of them to share stories from their childhood, especially those involving family and school. After listening to my participants' personal stories, I began to notice that their familial

background, support, and influence mattered greatly. The one key lesson that participants learned from family early on was the importance of pursuing education.

In my research conversations with Lauren, she spoke extensively about the fact that her parents had been in the education profession for years, and that having educator-parents changed her outlook on school. Her parents earned their bachelor's degree at HBCUs, a feat not uncommon for her closest family members. When Lauren told me about her family's connectedness to HBCUs, I could sense the overwhelming pride in her voice: "Actually both my mother's mother and father went to college as well and her grandmother went to college, and everybody went to HBCUs so that's kind of the thing that we did." Because Lauren's parents and extended family had experienced HCBU culture, shared personal stories about their academic and professional pursuits, and encouraged her interest in school, she understood that if she wanted to attend an institution of higher education, it was of the utmost importance that she achieved academically throughout her K–12 school experience. Lauren said: "I really didn't have any chores as a kid, I really didn't have to work as a kid, so it was like the expectation is you go to school…and do your best." Her educator-parents always monitored her schoolwork and involved themselves in school-related activities. They showed their continued support for Lauren throughout her childhood and adolescent years, and ultimately helped shape her perceptions of school and higher education, teaching her to value education, and all it had to offer.

I identified with this part of Lauren's story because my parents and older sister attended HBCUs and shared parts of the culture with me. When I was a youngster and my parents took me to Hampton's football and basketball games, I knew then that I wanted to experience the HBCU lifestyle. The early exposure to the Black colleges in my hometown made me realize what a safe academic space these institutions were for people who looked like me. Because my

mother and some other family members were schoolteachers, I knew education ought to be my foremost concern. I wonder what my outlook toward school would have been if my parents had not attended HBCUs, and my mother pursued another profession. Would I have known the legacy, mission, and traditions of HBCUs? Would I have realized its importance in the lives of Black college-bound students?

Annette's mother also emphasized the importance of education. Although her mother did not hold a bachelor's degree, she knew it would afford Annette both educational and career opportunities in the future. Her mother privileged studying over engaging in household chores. For this reason, Annette was always busying herself with schoolwork:

> My mom really valued education, so basically if you had anything to do related to school you had to do any homework. So basically…I never learned how to cook…I don't know any of that stuff because any time it was time for that to be done, I would say I have to study.

Homework and studying took precedence over housework, mainly because her mother believed that if Annette stayed focused on school, then she might have a better chance of realizing her academic and professional goals. It was her mother's way of showing that she supported Annette. By the way she spoke, it was obvious her mother as much as the rest of her family wanted nothing but the best for her. She said: "I just never had any doubt that the people in my family loved me. You know what I mean? They just made me feel confident."

Much like my research participant, Lauren, two married parents who were veteran educators raised Mikayla. Ever since she was a little girl, she heard stories about her paternal grandparents. Her grandfather made a living as a farmer to ensure his children had the means to attend school, while her grandmother sold fruits and vegetables. They knew the importance of

education, and Mikayla's parents made sure she received this same powerful message growing up. Her parents would regularly take her to the library and make reading part of her routine. Because she was such an inquisitive child, her parents always nurtured her interests and talents. When Mikayla's father enrolled her in college courses while she was still in high school, she did not back down from the academic challenge. She said:

> I would go to school during the day and then I would take some community college classes…[in] areas of history or music appreciation, art appreciation…so I had about 40 credit hours by the time I graduated from high school.

By the end of her high school career, she had earned the highest grade point average and the title of valedictorian of her senior class. She confidently stated: "It was expected. I always planned it. It was just something that I wanted. I was like; I'm going to be valedictorian. So when it happened, I was used to it because I'd already seen it, already knew it." Her family not only instilled in her the value of education, but also the importance of goal setting, perseverance, and self-confidence. Their encouragement has influenced and motivated Mikayla in her pursuit of academic success, and molded her into the outgoing scholar she became:

> There are people who will ask me all the time why I am so bold, why I am so confident, what is it about my background that makes me this way? I think it's just having that from the first part of my life, not knowing anything different, and Spelman helped to reinforce that. It's like I needed that after my upbringing just to kind of seal it in a way…so that when I went into adulthood, this is my identity. I am not going to change it.

The support my participants and I received from our families influenced our academic trajectories. I am in agreement with Mikayla's quote above; I, too, believe that all the life lessons, and exposure to new and different experiences from childhood to adolescence shaped

our educational pathways. From the time we were little girls, our families showed great interest in our education, and reassured us that we had the intellectual capacity to pursue whatever discipline we wanted. They cared about our education and perceptions of school, as well as the individuals we would become. They sought to provide us with a solid educational base. Because our familial support has been consistent and long-term, we have the confidence to navigate our pathway and overcome adversity. Their influence put us in a position to not only achieve our academic goals, but also exceed our expectations for ourselves.

I was not surprised when my participants talked about their innate mathematical ability, my second resonant thread. When Lauren was a youngster, she mentioned she was not strong in reading, writing, and spelling. She did, however, find that mathematics came easy to her: "I always was good in math…that was always probably my strongest subject area." Although her mother graduated with a bachelor's degree in mathematics, Lauren never outwardly attributed her mathematical ability to genetic factors. She simply discussed her knack for solving mathematical problems:

> I could get the answer but I was one of those people that took a little bit longer to do it so I would never be on like the math competition team because I was never fast at it, but I could always get the right answers so I always did well on my tests, I just wasn't one of those speedy types of people.

Lauren's mathematical talents led her to participate in summer and afterschool programs, mainly because the subject matter "came natural" to her. The afterschool program in junior high afforded her the opportunity to take mathematics courses for high school credit, which primed her for the honors program. Unlike Lauren, Annette and Mikayla took great joy in writing as a child. But it was not long before they began to develop an interest in mathematics and recognize

their talents. The more Annette engaged mathematics itself, the more she realized her innate capacity for mathematical learning: “I was just good at math, math was easy.” Mikayla’s father was a mathematics teacher for some time, so she saw it practically every day. In one of our conversations, she candidly stated that she “didn’t love it [mathematics] more than [she] loved anything else,” but I could tell she took great pleasure in extending her mathematics learning.

Each of my participants discussed their innate mathematical ability as part of their childhood experiences. Much like my participants, I found myself gravitating toward mathematics in school and telling those around me it was one of my favorite subjects. It seems particularly important that we all had the time and space in school to explore our mathematical talent, and that we did not have people dissuading us from studying mathematics, because there was a time when mathematically talented Black people were stereotyped by Whites (“No Need,” 2001) and steered toward other disciplines. In some mathematical spaces, this is still the reality of Black America. Interestingly enough, in each of our cases, we participated in and received high marks in mathematics, and made the decision to pursue it further.

Participants’ role models were instrumental in steering them toward their academic and professional goals. Lauren’s mother was indeed her foremost role model. She had always been very close to her mother: “I was always a mother’s girl…my mom taught math. She had a degree in math so…you know, I’m a mother’s girl, I can relate.” Her mother was the one who helped her grapple with perpetuated stereotypes about Black women’s mathematical ability. Instead of Lauren feeling like she ought to pursue another discipline altogether, she took great comfort in pursuing mathematics:

> I don't feel like as a kid I'm a woman I shouldn't be doing math. But maybe because my role model was in my household, she did math, she was math, so I don't think that concept of like, oh this is crazy that you're into math.

From her perspective, there should be more women doing mathematical work. Because Lauren grew up idolizing her mother, a highly talented Black woman mathematician, it did not seem out of the ordinary for young women who look like her to participate in mathematics-related courses and activities. All she knew was that her mother had earned a degree in mathematics, and was an established leader in her community committed to education. Lauren's mother set a strong example for her. She made sure Lauren knew she could do anything she wanted, including pursue mathematics. Once she developed an interest in mathematics, she did exceptionally well and performed at a high level.

There were several role models that guided Annette along her academic path. Mrs. Mitchell, a White mathematics teacher, was one role model that made quite an impression on Annette in high school. When she talked about being in Mrs. Mitchell's classroom, she distinctly remembered engaging in board work, and how efficiently she ran her classroom. But most of all she admired Mrs. Mitchell's patience and the way she delivered content. She became engrossed in the mathematics. Annette told me she "developed [her] love of math in high school." Mrs. Mitchell may have inspired her to participate in mathematics, but Mrs. Simpson, her high school English teacher, encouraged her to attend college and become more career-focused. Because her mother had great respect for Mrs. Simpson, Annette took heed of her advice:

> She was…young and single and educated and my mom didn't have a college degree so my mom was all about the college degree…you've got to have a college degree. So you

know this woman, my mama liked her too, she was single, she seemed to have her life together, you know what I mean? So…what she said carried a lot of weight with me.

In a conversation they had about college, Mrs. Simpson suggested she attend Spelman. Annette told me, "she's the one who told me to go to Spelman…she [Mrs. Simpson] told me that would be a good place for me." Annette's teacher believed in her intellectual capacity, and ability to navigate the liberal arts college. Because Mrs. Simpson was such a positive role model in her life, Annette aspired to be "a single professional woman like her." Being named valedictorian of her senior class was a testament to her dedication and hard work, not to mention all the people who invested so much time and energy into her.

Family members and former teachers served as Mikayla's role models. When she was a youngster, her family impressed the importance of religion and spirituality. In fact, she told me she went to church every Sunday. Mikayla remembered seeing her paternal grandmother's commitment to prayer and being inspired by her example. She would give all her worries to God and have complete faith in Him. It was then that she realized the power of prayer in her life. She mentioned that her mother was another person who pushed her during her childhood years. Mikayla knew that "she [her mother] just wanted [her] to do things the best way that [she] could." Much like her mother, her former teachers set high expectations and demonstrated exemplary qualities. She said, "I had a lot of teachers of color, just really positive role models, people who were involved in civic organizations, spiritual organizations, people who were just leaders in the community." She went on to say, "there was just a deeper support that came from my teachers. They were just caring people and they pushed me a lot." For example, when Mikayla was a fifth-grade student, she remembered participating in her class spelling bee. To her great dismay, she spelled the word "ambitious" incorrectly. Her teacher responded by saying,

"I'm surprised that you don't know the word because that's what you are. You're ambitious." The moment Mikayla's teacher referred to her as ambitious, it became one of her favorite words. She appreciated her taking those few minutes to tell her that she possessed ambition. Her teacher's words inspired her to set and accomplish her short- and long-term goals.

The role models in my participants' lives set very strong examples for them. After listening to the stories of my participants' experiences, I was awed by the influence their role models had on them. They believed in my participants and provided them coping mechanisms that support them in navigating life's toughest situations. Having (Black) female role models interested in mathematics afforded my participants the opportunity to see someone who looks like them in the field. This particular point brings me back to Henneman's statement about why she never thought to pursue mathematics:

> In high school another reason I never considered math as a career was that I always had White male teachers for my math courses. I can only remember one female teacher. I never thought of it as a career for me, because I never saw anyone who was like me teaching math or doing things in math. (Solow et al., 1994, p. 17)

Black girls and women need to bear witness to Black female professionals engaging in mathematics. To inspire Black girls and women to pursue a discipline, often characterized as a White, male-dominated field, we must show them examples of Black female mathematicians, mathematics educators, and mathematics teachers. They ought to know the stories of these women's experiences. Sharing these women's stories might create a viable pathway for Black girls and women who aspire to a career in mathematics.

Participating in pre-college summer programs and becoming WISE scholars prepared my participants for their undergraduate work. Before Lauren began her freshman year at Spelman,

she attended a preparatory program supported by the WISE Scholars Program. Although she was not yet a part of the program, they allowed her to participate. Lauren met women of different backgrounds who identified as both a mathematics major and a WISE scholar. The pre-freshman program afforded Lauren and the other college-bound women time to get acquainted with one another and build good working relationships:

> So it [pre-freshman summer program] formed a community before you even entered there which was really helpful. Particularly coming from New York to Georgia, so that shock of being in a new town I think was buffered because we had that summer program. It was very intimate too, so I think that was helpful.

It was also very beneficial because it afforded her access to faculty members. Familiarizing herself with the Spelman community made her transition from high school much more bearable. When Lauren received her WISE scholarship in her first semester, she began participating in even more activities and summer internships.

Annette and Mikayla participated in pre-college enrichment programs at other higher education institutions. The program Annette attended was engineering-focused, a field she really did not know anything about:

> I never really heard of engineering before. I mean, it's hard to believe. But, I took some aptitude tests and it said that because I was good in math I could easily be an actuary or an engineer, and so I said well engineering sounds pretty good.

Once Annette had reached the end of the program, because she had really taken to engineering, she was unsure about where she wanted to attend college, but, of course, she ultimately chose Spelman. Much like Annette, Mikayla went to a minority introduction to engineering program. However, she did not speak highly of the program. She told me it reminded her a lot of high

school. She became a WISE scholar at the very beginning of her tenure at Spelman, and appreciated all the opportunities the program afforded her.

Therefore, coincidentally, each of my participants participated in a pre-freshman summer program. It is, however, important to note that Lauren was the only one who attended Spelman's pre-college program the summer before her freshman year. Because the Pre-Freshman Summer Science Program was originally designed to boost Black women's academic achievement and groom them for graduate school (Falconer, 1978), it was no surprise that Lauren received intensive instruction and engaged in enrichment activities during the summer months. But, after inquiring into Lauren's story of her pre-college summer program experience, I realized that these kinds of programs have more impact than once thought. Pre-college summer programs bring together highly motivated college-bound students and offer them a glimpse into college life. In many instances, they introduce students to new fields of study and members of the faculty. These programs also prompt students to build supportive relationships within their newly formed community and begin creating safe academic spaces. It is my belief that Lauren and Annette would say their pre-college summer program experience was invaluable. Mikayla, on the other hand, had an underwhelming experience to say the very least. So I began to wonder if she chose one of Spelman's summer programs, would her experience have been different? Would it have felt less like her high school and more like her college campus? It seems to me that choosing a pre-college summer program designed especially for Black women who are interested in engineering would have been a much better fit for Mikayla.

The stories of my participants' pursuit of an undergraduate degree in mathematics varied quite a bit. Lauren, for example, began the mathematics major by taking courses in the department her freshman year. She experienced some difficulty in her mathematics courses along

the way, but managed to maintain a B average. Lauren usually did not attend faculty members' office hours; she would simply ask her peers for help instead. It seemed to me that she felt as if she should have received more support from faculty, like the time she failed to pass one of her examinations. Because the instructor never made contact with Lauren about her failing grade, and she received no guidance about how to improve her standing in the course, she withdrew:

> I would say that he equally wasn't like necessarily invested in me as a student because I would think that if you are really vested you would notice that the student struggles…. But some faculty members are like that and I think in the sciences it's just like okay.

The continued lack of support disappointed Lauren. Because it was more than just the course withdrawal, she also felt slighted by Dr. Hudson, a faculty member in the mathematics department. He did not speak highly of her mathematics ability to WISE staff. When she learned he did not tell them about all her hard work in the department, it really "left a nasty taste in [her] mouth." She also told me this same instructor coincidentally ended up teaching his favorite students when the course group for Real Variables split into two classes one year. Because she was not considered one of his favorites, she was assigned another course instructor. After Lauren shared the stories about Dr. Hudson, I was not surprised to hear her say, "I don't think I ever saw myself as a mathematician." Although she felt like she was surrounded by a good number of supportive people, especially the Black faculty members, her interactions with professors like Dr. Hudson still impacted her perception of herself. She did not perceive herself as being a mathematician, nor was she passionate about the subject matter. Lauren was, however, proud of the fact that she had completed the requirements for her bachelor's degree in mathematics by senior year's end. But, it was not until her commencement ceremony that she truly realized her great accomplishment. When the audience gave her and the other graduating mathematics majors

a rousing applause, she knew they had done "something that was pretty cool and respected by [their] peers."

Annette began her undergraduate tenure on Spelman's campus in the dual-degree engineering program. Initially, she really did not have any expectations for her undergraduate career because she was the first member of her family to attend college:

> I didn't know what to expect. I just knew that I needed to do well and I was pretty intimidated because I came from such a small school in Alabama and I knew that we didn't have the resources that everybody else had, but I did well, but I studied.

She was most intimidated by her roommate freshman year. Her roommate was she ranked number six out of more than six hundred students in her senior class. Although Annette was valedictorian of her graduating class, there were less than eighty graduating seniors. Once Annette realized she might be at a disadvantage, she started studying by herself every single night. She worked really hard to earn higher marks than her roommate: "I think with her, I think she was probably the only person I really felt competitive with…. I took great pleasure in doing better than she did on anything." Because of her stellar study habits, she tutored those around her. It became obvious to me that studying was Annette's way of finding her niche in the mathematics department. When faculty and students began to take notice of her mathematical prowess, she said: "That kind of made a place of for me, you know what I mean? Everybody knew that I was a good student and I was a nice person. That kind of made a place for me."

Like Annette, Mikayla also entered in the dual-degree engineering program. When she joined her peers in the mathematics department at Spelman, she began working with peers in small groups to meet the challenges of upper-level coursework. Despite all the studying outside of class, Mikayla experienced difficulty majoring in mathematics. During those times, she relied

on her spirituality: “My faith was really important to me. I did go to a church, a couple of churches there in Atlanta, and that was great.” She also found herself reaching out to her family who very much supported her. With their help, she was able to persevere through challenging times. In one of our conversations, she told me she identified as a mathematician: “I always do, definitely. It’s the foundation. It’s who I am. So I can’t deny that at all.” It is my belief that her undergraduate mathematics journey was made possible because of her foundational background and mathematical giftedness.

Each of my participants’ told different stories about their undergraduate mathematics experiences. Lauren told stories about the lack of support she received from faculty and realizing her greatest accomplishment as a mathematics major. Annette talked about the intimidation she felt freshman year and how she made a place for herself in the mathematics department. Mikayla discussed drawing on her faith during challenging times and identifying as a mathematician. I reflected on the role the Math Lab played in my undergraduate career and the peer camaraderie within the mathematics department. The range of different experiences is indicative of the fact that there is no one common experience of a mathematically talented Black woman of Spelman. This does not mean, however, that we do not have the same tensions, or have to overcome the same challenges. It just means that we negotiate our experiences in different ways. Because of these differences, we must continue to tell the stories of our experiences and support each other in navigating the field of mathematics.

The mathematics department’s “not-so-hidden” agenda resonated with me for several reasons. It became apparent to me that faculty members’ agenda was to encourage undergraduate mathematics majors to pursue a Ph.D. after earning their bachelor’s degree. If, for some reason, the student preferred not to pursue a doctoral degree, the faculty member suggested pursuing a

master's degree in the days after Spelman. Lauren believed professors pushed them to get a Ph.D. degree in mathematics because of their experience. They were always willing to share personal stories from their experiences and help students navigate the admissions process. Lauren commented on how faculty members pick and choose students: "If they [mathematics faculty] see a special interest in you, then they definitely want to push you towards Ph.D., I would think. Because that's what they do. And if you're struggling they probably just want to help you get out." She thought they could have provided students with some career guidance, but because she knew the agenda, she did not really expect it. Faculty focused on getting their top students into graduate school. It was said that they did not put as much time and energy into the "middle of the road math" students. The only reason Lauren traveled to a large, public research university in the southeastern region was because she had friends that were interested in pursuing their master's degree in statistics. In addition to Lauren's account of the agenda, Mikayla told me that she was strongly encouraged to study engineering in graduate school. As soon as her professor recommended an engineering program, she became very reluctant:

> I don't know if I could do it because I was dual degree…I just decided to do math and now she's telling me to go from an undergraduate math degree into an engineering program, and I was like I'm not the 4.0 student. There were other students who were 4.0 students…and I was like, are you sure I can go to grad school?

Thinking back to when I was an undergraduate mathematics major, I remember faculty impressing the importance of pursuing an advanced degree. Their agenda was "not-so-hidden" because it seemed they were always talking to us about the Ph.D. experience. They made sure we had all the information we needed to make an informed decision about graduate school, and did not hesitate to offer us unsolicited advice. Faculty even brought alumnae (who had earned their

doctorate in a mathematics-related field) back to share stories about the nature of their Ph.D. process. I believe they thought if we engaged alumnae enough, we would be inspired to pursue a Ph.D. in mathematics, too. Their example may not have encouraged us all to pursue a doctorate, but I can almost guarantee, they left the most indelible impression.

After earning their bachelor's degree in mathematics from Spelman, each of my participants went on to pursue highly successful careers. Lauren pursued a two-year master's degree program in teaching back home in New York. She was a classroom teacher for approximately three years. Then she began her doctoral journey at the flagship University in the state studying middle school education. Lauren held a full-time assistantship, and for the most part, felt very supported: "I don't feel like I experienced any strong negative things, particularly relating to race as a Black graduate student there." After completing her Ph.D., she pursued a tenure-track position as Assistant Professor at a mid-sized research university in the Midwest. Her research interests include teacher education and teaching for social justice and equity.

In the days after Annette earned undergraduate degrees in mathematics and industrial engineering, she sought her master's degree in operations research. Then she worked at a large telecommunications company as a systems engineer. Not too long after Annette left the telecommunications company, she earned a second master's degree in HRD as a part-time student. She then pursued her Ph.D. in Instructional Technology on a full-time basis. Annette finished the program in 2001. She accepted her first appointment at a Big Ten research institution as an assistant professor in the Human Resource Education department. There came a point in time when she realized that this position was not a good fit for her. For this reason, she interviewed for a couple of faculty positions during her fifth year at the Big Ten institution. She

began working at a large public university in Alabama as associate professor of instructional technology, and is still there today.

Although Mikayla doubted she would be a good candidate for graduate school, she decided to pursue her master's degree in industrial engineering at a PWI in the South. Once she completed her degree, she began a Ph.D. program in leadership and policy studies. She told me she drew inspiration from her doctoral peers: "I was no longer the mathematician or the engineer, but I did have supportive women, particularly Black women who were with me." With their support, she met each of the milestones in her program. Upon graduating, she accepted a faculty position at an institution in the Midwest. It was not a pleasant experience at first; it took some time for her to adjust. While there, she received one of the most prestigious awards of her career to date, the Presidential Early Career for Scientists and Engineers. Mikayla recently started a new position. She is the first chair and professor of a newly established department at a large research institution in the Midwest. In addition to her faculty position, she is continuing to build her business website about "what it means to be a pioneer." All of this, she hopes, will prepare her for her ultimate dream of becoming a university president someday.

These are the life and schooling experiences of Black women who majored in mathematics at Spelman from the 1980s to 2000s. By developing each of the aforementioned resonant threads, I demonstrate the complexity of Black women's mathematical lives. For example, my participants' stories highlight the importance of the family's role in supporting Black women. Without familial and teacher role models, they might not observe Black women professionals in the mathematical arena. Their stories teach us that there is not one version of a Black female mathematics major's experience. The stories of their experiences are remarkably unique, evoking wonderings around the parts and pieces that resonate.

My second research question addresses the impact of context on my participants' image of themselves at Spelman. More specifically, I posed the following research question: How did larger socio-historical and -cultural contexts and life experiences (on and off campus) affect their image of themselves as mathematicians? I identified the four resonant threads that speak to how my participants' perceived themselves during their undergraduate tenure: (a) familial support, connectedness, and influences on education; (b) innate mathematical ability; (c) familial and teacher role models; and (d) mathematics majors' role and academic experience. Faculty and staff caring, support and mentorship ("professional mothering") and student relationships also provide a layer of complexity to the response of this question, but I detail this thread in my last research question.

Each of the aforementioned resonant threads contributed to my participants' image of themselves as mathematicians. It is my belief that their image was affected by the familial messages they received when they were youngsters. For example, when Lauren was a little girl, she was made to feel confident about her capacity for mathematics. Because her family encouraged her participation in mathematics, she began to identify with her mathematical talent at an early age, much like my other two participants. Furthermore, they were all naturally gifted with the ability to perform mathematics at a high level. Lauren and Annette mentioned that mathematics came very easy to them. Given that mathematics was of interest to them and they performed it well, this might have contributed to their positive self-image as it related to mathematics. The familial and teacher role models in my participants' lives set an example for them. Their (Black) female role models showed them that they could engage in a traditionally White male-dominated profession and become highly successful, too. It is my belief that this boosted their self-confidence and shaped their image of themselves a bit more.

My participants' experiences at Spelman significantly affected their image of themselves as mathematicians. For example, when Lauren and Mikayla started to take mathematics courses in the department, they experienced much difficulty. Lauren, in particular, seemed to think her image was darkened by the challenging times. She said:

> It's like yeah I don't know if I'm really this math person. I mean I'm getting this degree, I get this scholarship and because I am a math major it does the type of identity that people can respect, a black woman who is getting a degree in mathematics so maybe from the outside world, particularly the outside world who aren't math people it's like oh, yeah you're math, you're good at math. You're majoring in math. But then I don't know how it—I partially internalize myself as having that identity but then partially it's like yea I doubt I'm going to get a degree in mathematics after I leave here. So I don't know how much of me seeing myself as a person who is really mathematically inclined versus a person who is a mathematician.

It is almost like after Lauren tried on the image of herself as a mathematician, she really did not like how it fit. She was unsure if she wanted to keep it or not. Those challenging moments in her undergraduate career lessened her confidence and negatively affected her image. On the other hand, when Annette had begun to study and the people around her took notice of her mathematical talent, she felt she had finally found her niche in the department. And I believe it positively affected her image of herself as a mathematician.

My third and final question focuses on relationships and my participants' goals. The following question guided my narrative inquiry: How did relationships with other Spelman students, faculty, and staff influence their short- and long-term goals in the field of mathematics? I identified one key thread that allowed me to respond to this question: faculty and staff caring,

support and mentorship ("professional mothering") and student relationships. I first draw on details from my participants' stories of experience, and then note some implications of relationships between my participants and Spelman's faculty and staff.

Lauren began building positive relationships with her peers and mathematics faculty early on in her undergraduate career. Most of her peers were either mathematics majors, WISE scholars, or identified as both. Because she was in the honors program, she associated herself with both honor students and mathematics majors in the WISE Scholars Program. They supported each other academically, and maintained close relationships. Lauren built even stronger relationships with her classmates. She treasured the time she spent taking mathematics courses with them. She spoke about their supportive relationship saying, they made her feel like a member of the departmental mathematics community. In one of our conversations, Lauren talked briefly about her perceptions of their relationship today: "It's funny I don't see them as like these are my math major friends, I just see them as these are my friends so I don't really categorize them in that sense." She made mention of several faculty members who stood out in her mind, too, including Dr. Evelyn Gold. Lauren said she was a well-respected abstract algebra professor with an "old type of personality." She told me she connected the most with Dr. Yolanda Powell. Lauren took several courses with her because of her teaching style. We talked at length about her relationship with Dr. Soraya Ali because she called her a "lazy" student. It seemed Lauren knew exactly why she told her this:

> Because I probably was lazy. I mean...if I could chill and get a B or really work hard and get an A I probably was going to chill and get that B. That was the type of student that I was. So I think she saw that in me.

Despite her brush with Dr. Ali, she said, "I had a real positive experience with most of the faculty members there [at Spelman]." But what struck me was that she said: "If you wasn't that A math student…a professor's investment in you was slightly different." I then wondered if I might observe this theme in my conversations with other participants.

Annette seemed to thrive as she became more acquainted with her peers and mathematics faculty members. She and her peers worked alongside, and genuinely cared for one another. She spoke highly of her peer group by saying, "We could all be good and it didn't have to be bad. Just because I excelled didn't mean that you, my excellence didn't take anything away from your excellence. We could both be excellent." Annette also established a caring relationship with her dormitory directory, Ms. Brady. Because she was an open-minded individual who helped her think through problematic situations, she could not say enough about her:

> I think Ms. [Brady] kept me at Spelman. She kept a lot of us there. She would pray for us. She was funny though. She would talk about us, telling us stuff not to do, and how this is going to have a bad end and if you had a problem, you could go to her room and talk to her.

In addition to Ms. Brady, Annette spoke about the secretary in the dual-degree office. She referred to her as the "heart of the program" because she always worked very hard attending to students' needs: "Even if you had personal issues, you could talk those over…. She was wonderful. She really, really was. I bet she was like a surrogate mom for a bunch of us." After hearing about her supportive nature, it was obvious to me that she meant a great deal to Annette.

Annette took pride in her relationships with mathematics faculty. Much like Lauren, when I inquired into these relationships, she first mentioned her memories of Dr. Gold. She remembered her being a "good person" who was incredibly "supportive." Although Dr. Gold

was known for being very "stern," I could tell she cared for those around her, especially students. Annette would ask her advice and discuss other issues. She told me faculty and staff always showed they cared about her, and had her best interests in mind.

Mikayla began aligning herself with like-minded peers during her first days on campus. Because her high school did not offer calculus, she asked her roommate and some other students to help her with the mathematics:

> They were the best. They had AP [Advanced Placement] classes. They had IB [International Baccalaureate] classes probably and I went to this one student down the hall…and she would tutor me. She was just so patient and wonderful, and she would encourage me because I had never seen this. So I'd gone from being valedictorian in a small place to a place where something was accelerated and I was working with new context also.

Fortunately, people who were willing to support in learning the calculus content surrounded her. She worked with a number of students in small groups: "I always had somebody to study with or I got tutoring in the math lab. And then, sometimes I would tutor as well, but it was all about the group, all about the community."

Two mathematics faculty members, Drs. Theresa Campbell and Gold, mentored Mikayla throughout her undergraduate career. Both of her mentors were brought up in the South and guided her as she thought about life after Spelman. She relied heavily on Dr. Gold's support. She was actually the person who told her to pursue engineering in graduate school. To Mikayla's surprise she was accepted to all the schools she applied to. She commented on Dr. Gold's mentorship saying:

> there are so many people who maybe don't have an idea of what it takes to get to the next level. They think well, I'm not the best within this cohort or I don't think I'm the best in this cohort. So surely I'm not qualified to go into this next phase, but she [Dr. Gold] really saw that [potential in me] and I appreciate having that opportunity.

From the very beginning of my participants' undergraduate tenure at Spelman, they began to develop relationships with other students majoring in mathematics and related disciplines. It seemed they realized that they could not pursue a bachelor's degree in mathematics in isolation. My participants knew they had to lean on others for support to complete all the course requirements for the mathematics major. Back when I was at Spelman, my peer group came to the same realization. We studied together regularly, learning with and from each other. If any one of us performed poorly on an examination, or in an upper-division course, we rallied around the person and encouraged her to persist in learning. We found ways to support each other academically and emotionally. I am in agreement with Annette that it was never about being better than someone else. If you performed exceptionally well, it was not an attempt to outshine your peer. You could both be equally excellent mathematics learners. Building strong peer relationships meant that you did not have to navigate the mathematics major on your own. It meant that you were a valued member of a mathematics community of learners.

Faculty and staff supported my participants in their academic pursuit throughout their undergraduate mathematics program. The high level of care provided by faculty and staff made participants feel as if they had "professional mothers" on campus. This notion of professional mothering came about in a research conversation with one of my participants whose stories of experience were not included in my dissertation research. This particular participant told me, at the time, the majority of her mathematics professors were women of color who expressed a keen

interest in her educational trajectory. For this reason, she referred to her female professors as professional mothers. She shared her perception of their role as professional mothers by stating,

> I never felt like they were overstepping bounds personally by any means, but the motherly guiding type of caring. This is good for you, you should do this. That's the way that my professors were and not just in class because in class it was just expected. It was expected that you come to class. It was expected that you pay attention. It was expected that you do your homework. The academics, I can say that of other institutes I've been to, that level of expectation was not there.

After writing my participants' stories of experience, it was obvious faculty and staff served as their professional mothers. They set high expectations and cared for participants. For example, Dr. Ali called Lauren a "lazy" student, not because she was trying to shame her, but because she expected her to put forth maximum effort into her mathematics courses. She was concerned her lack of effort might preclude her from reaching her short- and long-term goals. Annette derived support from her dormitory director, Ms. Brady, and the secretary in the dual-degree office. Each one of them committed their time and energy to ensure she had the support, encouragement, and resources she needed to thrive academically. The fact that she regarded the secretary as "a surrogate mom" for her and others speaks to Annette's respect level for her. Dr. Gold was yet another professional mother for participants. Her mentorship inspired them to endure challenging times and push forward their undergraduate work. She even advised Mikayla to attend engineering school because she believed in her and her ability to excel in mathematics (and engineering). Her care for Mikayla extended beyond the classroom walls; it transcended her undergraduate career to help carve out her professional pathway.

The care faculty and staff provide undergraduate mathematics majors have often been referred to as coddling. In one of my conversations with Annette, I mentioned exactly what I have heard people say over the years: "They [Spelman faculty and staff] care so much for their students, that when they get out into the real world or they go to graduate school…it's just a difficult adjustment because…they were coddled prior to coming to graduate school." I do not subscribe to the notion that undergraduate mathematics majors have been excessively coddled. It is my belief that Black women need to hear messages of encouragement and support throughout their undergraduate tenure. Because there are still a large number of mathematically talented Black women who have not seen people that look like them in the mathematical arena, these messages need to be reinforced again and again. Faculty and staff at HBCUs like Spelman ought to provide students with a high level of care so they can boost their self-confidence, because, in all likelihood, they will never experience the support Spelman's faculty and staff provides again.

There are many complex layers of my participants' life and schooling experiences as it relates to mathematics. Each of the questions guiding my dissertation research inquires into their experiences before, during, and after Spelman, and I respond to each individual research question by describing the resonant thread(s) that constitute their complex experience. The resonant threads identified across my participants' stories assisted me in better understanding the implications of Black women's mathematical realities. My hope is that when readers engage my dissertation research, they, too, are inspired by my participants' stories of experience.

The Second Ending

While taking coursework for my doctoral program, I was introduced to Black feminist and womanist theories. I initially gravitated toward Black feminist standpoint theory because I thought it might help me find language to discuss and make sense of aspects of my own

mathematical reality at UMBC. But when Dr. Joyce King introduced me to womanist theory prior to my comprehensive examination, I began to wonder how Black feminist standpoint theory compared to womanist theory, and about the core characteristics of the womanist theoretical approach. For this reason, I began to consider an eclectic theoretical approach consisting of both Black feminist and womanist theories. I thought combining elements from these two major theoretical perspectives might afford me the opportunity to provide theoretical explanations for my participants' stories of their life and schooling experiences in pursuit of mathematics.

According to Collins (2000), mathematically talented Black women have experienced oppression for quite some time. Although Black women have confronted oppression in this country for years, it is still very prevalent today. Collins commented on the necessity of Black feminism: "As long as Black women's subordination within intersecting oppressions of race, class, gender, sexuality, and nation persists, Black feminism as an activist response to that oppression will remain needed" (p. 22). Because oppression relentlessly continues to affect Black women and this particular theory is designed to combat it (Collins, 2000), I employ Black feminist standpoint theory to guide a portion of my work. In what follows, I discuss one core theme of Black women's standpoint theory, "a legacy of struggle." By doing so, I hope readers understand the extent to which oppression has shaped Black women's mathematical reality.

Black women experience rampant gender and racial discrimination. The discrimination they face subject them to common experiences, and those experiences set them apart from those who do not identify as Black and female (Collins, 2000). Collins mentioned "these ties between what one does and what one thinks illustrated by *individual* Black women can also characterize Black women's experiences and ideas as a *group*" (p. 24, emphasis in original). Taken together,

their collective consciousness accounts for a Black women's standpoint. However, Collins warned against assuming there would be a group consciousness:

> Historically, Black women's group location in intersecting oppressions produced commonalities among individual African-American women. At the same time, while common experiences may predispose Black women to develop a distinctive group consciousness, they guarantee neither that such a consciousness will develop among all women nor that it will be articulated as such by the group. (p. 25)

There is a multiplicity of core themes of a Black women's standpoint. I explored the legacy of struggle using historical literature describing mathematically talented Black women's background and experiences. Black women share a "legacy of struggle against the violence that permeates U.S. social structures" (Collins, 2000, p. 26). This legacy began decades ago when Black female students were discouraged from participating in mathematics ("Young Blacks," 2009). The majority of women were precluded from doing mathematical work due to forces of oppression, including both racism and sexism ("No Need," 2001). The discrimination they faced made it extremely difficult to engage mathematics teaching and learning: "For all women, and especially for black women, the field of mathematics was essentially shut tight ("No Need," 2001, p. 70). Black women began to earn undergraduate and graduate degrees in mathematics around the mid-to-late 20th century, despite the pervasiveness of oppression. Family members and teachers pushed Black female students to refine their mathematics skills, so that they were more visible to those around them. White academics continue to discriminate against Black women pursuing undergraduate mathematics degrees. According to "No Need" (2001), "Even today, many white scholars in the natural sciences hold deep-seated beliefs in the incapacity of

black intelligence to deal with the complexities of advanced mathematics" (p. 70). Female mathematics learners are still being stereotyped and their abilities questioned.

Black women have endured a long history of oppression in this country. They have been severely mistreated because of sexism and racism. It seemed to me that Black women who were in pursuit of a mathematics degree decades ago were aware of the discrimination they could experience due to immovable social structures. Black women have had to combat the fact that the field of mathematics has been traditionally White male-dominated. Their lack of access to mathematics teaching and learning made it extremely difficult for Black women to participate in the mathematical arena. Despite the messages they were getting from the mathematics field, they continued to pursue it. These Black female students were a part of Black women's legacy of struggle.

The Third Ending

Conducting a narrative inquiry alongside six mathematically talented Black women who attended Spelman College from the 1980s to 2000s was unlike anything I had ever done before. Prior to conducting my dissertation research, I endeavored to use either oral history or some other qualitative research methodology within an "eclectic" theoretical framework (Stinson, 2009) consisting of Black feminist standpoint theory and womanist theory. It was not until my prospectus defense that I began considering narrative inquiry as my methodological framework. After much thought, I came to the conclusion that Black feminist standpoint theory and womanist theory played a significant role in my scholarly development, but did not push my dissertation research forward. For this reason, I initially planned to end my dissertation with the first ending. I had no intentions of overlaying my participants' experience with my theoretical

interpretations. But a conversation with my dissertation committee inspired the second ending that incorporated a bit of theory in it.

The first and second endings represent two different types of research. The first ending aligns with the way a narrative inquirer might write up the analytical portion of her or his dissertation and the second ending aligns with a more traditional qualitative research study. In the first ending, I drew on chunks of my participants' stories of experience and used each of the resonant threads to respond to the latest version of each of my research questions. I then considered some implications. In the second ending, I used core themes from Black feminist theory to talk about Black women in mathematics.

Because I was a member of a newly formed narrative inquiry group around the time I made the decision to use the methodology, I grappled with the methodology itself and conducted a narrative inquiry into the experiences of preservice teachers with a team of researchers. I was even afforded the space to discuss my tensions around whether participants' stories are enough (or not). I was not until my dissertation defense that I realized that social scientists are always theorizing. I theorized throughout each of my participants' stories. So why are we still hung up on applying theory if we have already theorized? I believe my participants' stories are science—without the theoretical jargon. But, how could I conduct a dissertation without being grounded in some theoretical framework(s)? Are the implications from using the resonant threads to answer my research questions enough? I am still grappling—still trying to come in to my own narrative inquiry identity … … …

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APPENDICES

APPENDIX A

RECRUITMENT LETTER

DEPARTMENT OF MIDDLE AND SECONDARY EDUCATION

P.O. Box 3978
Atlanta, GA 30303-3978

Phone: 404/413-8060
Fax: 404/413-8063

Georgia State University

Morgin Jones Williams
Doctoral Candidate – Mathematics Education

September 14, 2015

STUDY TITLE: Mathematically Talented Women of Spelman College, 1960s–2010s

Dear (Insert Participant's Name):

My name is Morgin Jones Williams; I am a doctoral candidate in the Teaching and Learning with a concentration in Mathematics Education degree program at Georgia State University. I am writing this letter to invite you to participate in my dissertation research on Black women who pursued their undergraduate degree in mathematics at Spelman College from the 1960s to 2010s.

My interest in this research stems from the fact that I, too, am a Spelman mathematics alumna (class of 2006), and that I am passionate about learning the intricacies of your undergraduate mathematical experiences. My hope is that by conducting this research, I highlight the stories of your life and undergraduate schooling experiences and help other mathematically talented women of color, particularly budding Black women mathematicians following in your footsteps.

I am in search of approximately six participants, and through a couple of web-based sources have identified a list of graduates of Spelman's undergraduate program in mathematics. Because you completed your bachelor's degree in mathematics at Spelman during the specified time period, you have been chosen as a prospective participant for this study. If you decide to participate in this research, you will be asked to participate in three audio-recorded interviews each lasting approximately 45–60 minutes, share photographs and artifacts from your academic tenure at Spelman to help reconstruct stories of your past undergraduate experiences, and provide feedback throughout the research process. In total, your participation will require approximately 5–6 hours of your time.

Thank you so much for your consideration with regard to this study. If you have any additional questions or would like to discuss participating in this research, please contact me at the phone number/email address listed below.

Sincerely,

Morgin Jones Williams
(757) 450-3321
mjones137@student.gsu.edu

APPENDIX B

INFORMED CONSENT FORM

Georgia State University
Department of Middle and Secondary Education
Informed Consent

Title: Mathematically Talented Black Women of Spelman College, 1960s–2010s
Principal Investigator: Dr. David W. Stinson
Student Principal Investigator: Ms. Morgin Jones Williams

I. Purpose:

You are invited to participate in a research study. The purpose of the study is to explore the life and schooling experiences of Black women who earned an undergraduate degree in mathematics. You are invited to participate because you majored in mathematics at Spelman College from the 1960s to 2010s. A total of 20 participants will be recruited for this study. Participation will require approximately 5 hours of your time during September 2015 until September 2017.

II. Procedures:

If you decide to participate in this research project, you will be interviewed either in person, over the telephone, or via Skype. You will be interviewed 3 times for approximately 45-60 minutes each time. The student principal investigator, Ms. Morgin Jones Williams, will conduct each of the interviews. If the interview is conducted in person, it will be at a location most convenient for you. During the initial interview session, you will be asked to share photographs and artifacts from your academic tenure at Spelman to invoke stories about your undergraduate experiences in mathematics. You might also be asked follow up questions about them in subsequent interview sessions. Ms. Williams will take the photographs and artifacts at the conclusion of the initial interview and return them promptly after research results have been written up. All the interviews will be audio recorded with your permission. The audio-recorded interviews will be transcribed, and a verbatim copy of the transcription will be sent to you for your review. At this time, you will be invited to make any additions, deletions, or changes to the interview transcript that you deem necessary. After summarizing the initial research findings, you will be sent an initial summary of your data set for further feedback. Toward the end of the study, you will be sent a narrative and picture analysis of your undergraduate mathematics experiences at Spelman and asked to provide additional feedback on and/or make clarifications to the study records.

III. Risks:

In this study, you will not have any more risks than you would in a normal day of life. There is, however, a risk with regard to confidentiality if the interview transcript, initial summary of data, and narrative and picture analysis are sent to you via email. If you do not want these study records sent via email, I will send you the items either through the mail along with a postage-paid return envelope or via fax.

IV. Benefits:

Participation in this study may not benefit you personally, except maybe the opportunity to reflect on your past experiences in Spelman's undergraduate mathematics program. Overall, we hope to gain information about your life and undergraduate schooling experiences in effort to help other mathematically talented Black women in pursuit of a future in the field of mathematics.

V. Voluntary Participation and Withdrawal:

Participation in research is voluntary. You can choose not to participate in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions during the interview or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VI. Confidentiality:

We will keep your records private to the extent allowed by law. Only Dr. Stinson and Ms. Jones Williams will have access to the information you provide. Information may also be shared with those who make sure the study is done correctly (e.g., GSU Institutional Review Board [IRB], the Office for Human Research Protection [OHRP]). To keep your identifying information separate, all identifiers will be removed from the data and a pseudonym will be used on study records rather than your name. The information you provide will be stored in a password- and firewall-protected computer. A code sheet linking your name to a pseudonym will be stored in a password-protected folder. All audio recordings will also be kept private in a password-protected folder. The code sheet and audio recordings will be preserved until the study has come to an end. After study results have been written up, study records including the code sheet and audio files will be deleted. Your name and other facts that might point to you will not appear in study presentations or published results. The findings will be summarized and reported in group form. You will not be identified personally.

VII. Contact Persons:

Contact Dr. David W. Stinson at 404-413-8409 (dstinson@gsu.edu) or Ms. Morgin Jones Williams at 757-450-3321 (mjones137@student.gsu.edu) if you have questions, concerns, or complaints about this study. You can also call if you think you have been harmed by the study. Call Susan Vogtner in the Georgia State University Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu if you want to talk to someone who is not part of the study team. You can talk about questions, concerns, offer input, obtain information, or suggestions about the study. You can also call Susan Vogtner if you have questions or concerns about your rights in this study.

VIII. Copy of Consent Form to Participant:

We will give you a copy of this consent form to keep for your records.

If you are willing to volunteer for this research and be audio recorded, please sign below.

_____	_____
Participant	Date
_____	_____
Principal Investigator or Researcher Obtaining Consent	Date

APPENDIX C

TENTATIVE SEMI-STRUCTURE INTERVIEW QUESTIONS

Background and Early-Life Experiences

1. Describe your early childhood experiences learning mathematics.
2. Tell me about your most memorable experiences as a learner of mathematics.
3. Describe any major challenges you experienced in your childhood with regard to mathematics and how you overcame them (or not).
4. What impact, if any, did your K–12 teachers have on your mathematical growth and development? What about familial and societal influences?
5. Did you enroll in any courses or special programs prior to college that piqued your interest in mathematics?
6. Were there any obstacles preventing you from engaging in mathematics?
7. How did you make the decision to attend Spelman College?
8. Did your interest in mathematics prompt you to seek out this institution? Or did your interests lie elsewhere?

Undergraduate Schooling Experiences

9. What factors influenced you to major in undergraduate mathematics?
10. Describe your first days as an undergraduate mathematics major.
11. How did you acclimate yourself to all the faculty and staff, and mathematically talented women in your undergraduate program?
12. At what point did you begin to develop relationships with the other Spelman women, faculty, and staff in the Mathematics Department?
13. Describe the relationships that were most important to you throughout your tenure in the program?
14. What was it like working with other Black women who shared your affinity for mathematics?
15. Looking back, how would you describe Spelman's undergraduate mathematics program? What were the program's strengths and weaknesses?
16. What was your involvement in the program? Within the department?
17. How did you delineate your goals for the undergraduate program? Did it meet your expectations?
18. How did the undergraduate mathematics community support your work as a budding mathematician? Did you work with faculty to conduct research?
19. Did you participate in any off-campus service projects, internships, etc. related to mathematics?
20. Tell me about your experience as an upper-class woman.
21. How did you cope academically during times of hardship?
22. Did you identify any helpful resources in your undergraduate program? If so, who/what were they? How did you benefit from these resources?
23. Describe your most memorable moments in the program.
24. Did the program prepare you for a future in the field of mathematics?
25. Did your experience impact any of your beliefs about the teaching and learning of women in mathematics? Black women in mathematics?