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The Experiences of Panamanian Afro-Caribbean Women in STEM: Voices to Inform Work with Black Females in STEM Education.

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THE EXPERIENCES OF PANAMANIAN AFRO-CARIBBEAN WOMEN IN STEM:

VOICES TO INFORM WORK WITH BLACK FEMALES IN STEM EDUCATION

By

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B.A., Psychology, Nyack College, NY, 1985
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DISSERTATION

Submitted in Partial Fulfillment of the
Requirements for the Degree of

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Dedication

I dedicate this work to my grandmother, Mary Marcelina Cain. She came to this country and found her first job cleaning at the Doral Hotel in New York City. All the while, she had a dream for her family and for me, and saved tips from work so that she could bring me and my mother to the United States. This work is the fulfillment of her dream – I have received the highest degree possible in my field. Her faith in me as a 'young lady', as a student and as her grandchild, has been a constant guide and motivating factor for me.

Mama, I know that you are able to see me from heaven. This is for you.

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Began, June 24, 2012

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ABSTRACT

This grounded theory case study examines the experiences of Panamanian Afro-Caribbean women and their membership in STEM (Science, Technology, Engineering and Mathematics) training and careers. The shortage of Science and Math teachers in 48 of 50 States heightens the need for those trained in STEM. Females of African phenotype have persistently been underrepresented in STEM. However, this trend does not appear to have held for Panamanian Afro-Caribbean women. The current study explores issues related to STEM participation for these women by addressing the overarching question: What key factors from the lived experiences of Panamanian Afro-Caribbean women in STEM careers can be used to inform work with females of African phenotype in their pursuit of STEM education and STEM careers? Five women were identified for inclusion in the study's purposive sample.

The study draws upon assertions and implications about the relevance of self-identity and collective-identity for membership in STEM. Data for the study was gathered through qualitative interviews, surveys, and observations. The grounded theory approach was used to

analyze emergent themes related to participants' responses to the research questions. Two models, the STEM Attainment Model (SAM) and the Ecological Model of Self-Confidence and Bi-Directional Effect, are proposed from evaluation of the identified information.

Socio-cultural values and learned strategies were determined to influence self-confidence which is identified as important for persistence in STEM training and careers for females of African phenotype. Evidence supports that the influences of parents, country of origin, neighborhood communities, schools and teachers are factors for persistence. Through the voices of these women, recommendations are offered to the gatekeepers of STEM academic pathways and ultimately STEM careers.

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Chapter 1

Introduction

The United States is no longer a leader in producing workers for science and engineering jobs (Wagner, 2011). The decline in White males in science and engineering, as well as the growth in science fields, has meant that there has not been a sufficient pool of White males to fill all the available positions. As a result, science jobs in the U.S. are being filled by immigrants and non-U.S. citizens (National Academy of Sciences, 2011). The lack of qualified workers who are U.S. citizens for these science careers means that the educational system that has been the channel for the production of these workers is now being questioned. The concern is that K-12 science and mathematics education in the U.S. is not producing students who will be employable in future science, engineering, or technology jobs (National Academy of Sciences [NAS], 2007). This may be a result of the lack of qualified teachers; 93% of middle school students in the United States receive instruction in math and science from out-of-field teachers who do not have formal training in these disciplines. This problem extends into high school, where instruction is presented by those without qualifications in disciplines such as biology, chemistry, and physics (NAS, 2007).

Despite the present national recession and high unemployment in the United States the demand for people with science training continues. It is predicted that science, technology, engineering, and mathematics (STEM) careers will be among the fastest growing sectors in the labor force in the coming years (National Academy of Sciences, 2011). To best meet this demand it will be important to look at members of the society who are under-represented in these fields.

Figure 1.1 represents the population data per racial group for 2006 in comparison to the population of those groups in the science and engineering workforce. In 2006 the White population was 67.4% but held 74.5% of science and engineering careers; Asians were 4% of the population but held 16.4% of science and engineering positions (for this reason Asians are not considered underrepresented); in comparison, the Black population in the United States was 12.5%, but only held 4% of science and engineering positions; and American Indians were 1% of the U.S. population, but only were only 0.4% of the represented STEM workers. Unlike Black, Hispanic, and American Indian populations, White and Asian participation in science and engineering was greater than their total percentage in the population.

A STRONG SCIENCE AND ENGINEERING WORKFORCE   25

FIGURE 1-1 U.S. population and U. S. science and engineering workforce, by race/ethnicity, 2006.
SOURCE: National Science Foundation, *Women, Minorities, and Persons with Disabilities in Science and Engineering*, Tables A-2 and H-7. Available at http://www.nsf.gov/statistics/wmpd/ (accessed June 12, 2009).
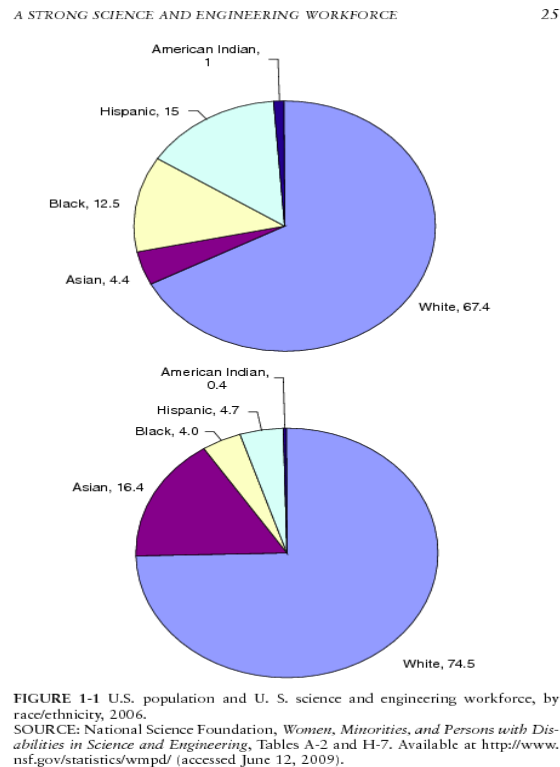
Figure 1.1 **U.S. Population and U.S. science and engineering workforce, by race/ethnicity, 2006.**

Female participation in STEM careers has shown a steady increase over the years, but men significantly outnumber women resulting in the latter's under-representation (Hill, Corbett & Rose, 2010; Lee, 2002; Michaels, Shouse, Schweingruber, 2007; Price, 2010). Despite these findings, it is clear that White females, like their White male counterparts, have been able to gain access to science and engineering careers in greater numbers than their non-White peers. In response to this present trend, the National Academy of Sciences (2011) notes: "Diversity is both a resource for and strength for our society and economy....to increase diversity in a population, therefore, strengthens its activity contribution by increasing the number of perspectives and the range of knowledge brought to bear" (p. 24). In so doing, the scientific community would be wise to consider women as a potential resource but also women who are from under-represented groups.

Public education has seen changes in the racial and ethnic group composition of schools. Between 1972 and 2007 public schools have seen a decline of White students and an increase, from 22% to 44%, of students from other racial and ethnic groups. This has been the case specifically among Hispanics (National Academy of Sciences, 2011). Therefore, teachers in primary and secondary education who have traditionally fostered White males in STEM education and careers must acknowledge that 20% of the students they will teach will come from other racial and ethnic groups. Further, they will have to include women and specifically women who are not White. As a result, the onus is on teachers to reconsider the ways in which they foster and support students in STEM education, and how they may be denying access to under-represented groups of students who are Black, Hispanic, or Native Americans.

Persons of African phenotype in the United States are an important underrepresented group in STEM careers. Subgroups of this population, such as persons of Caribbean descent, have persisted in STEM careers while others, such as African Americans, have remained excluded. It is important to note that although racialized as African Americans, not all people of African phenotype in the United States are African Americans. This is the case despite the fact that being of African phenotype often means being categorized and limited to the privileges of the African American community in the United States (Kasinitz, 1992). Black immigrants, including those from Africa and the Caribbean, are often categorized as African American or part of the Black community because they share a common phenotype.

Caribbean immigrants of African phenotype are the largest non-African American Black population in the United States, comprising 4.4% of the total Black population (Williams, Haile, Neigbors, Gonzalez, Baser, & Jackson, 2007). Caribbean immigrant children, when compared to African American students, are more likely to attend college and to remain there until completion (Jenkins, Harburg, Wissberg, & Donnelly, 2004). Caribbean males are more likely to major in science and engineering (Glenn, 2007). In a study comparing the earnings of women of African phenotype in the United States, Corra & Kimuna (2009) found that Caribbean women were the highest earners when compared to African Americans and African, French, and Spanish immigrants of African phenotype. This earning advantage could be due to their career choice in STEM related fields; however, the authors did not disaggregate the careers based upon these categories. From these studies, it is clear that Caribbean immigrants of African phenotype seem to be gaining success in areas, although they are members of an under-represented group in STEM.

Afro-Caribbean women face a double bind in accessing STEM: first, they are women; and second, they are of African phenotype. As women, they must overcome the challenges encountered by all women entering science careers where men historically have dominated. Additionally, they are affected by the limitations and perceptions from the hegemonic racial system that permeates American society and is perpetuated by the educational system.

The focus of this study is to understand how five Afro-Caribbean immigrant women from Panama gained access to STEM careers. It is hoped that through their stories we may begin to understand how to support all female students of African phenotype who have interest in STEM careers. This hope is voiced despite the challenges that are associated with gender in a male dominated workplace (Hill, Corbett, & Rose, 2010) and with race in a society where hegemony restricts access to those other than the majority (Massey & Denton, 1993; Rothstein, 2004;Thernstrom & Thernstrom, 1997). Through their stories it is hoped that educators from K-16 institutions might be challenged to examine the ways in which they facilitate access to STEM careers for female students of African phenotype.

Ultimately, if the United States is to compete effectively in the global science, engineering, technological, and mathematics market, then it is important to challenge views regarding gender and phenotype. The next section further addresses the STEM shortage in the U.S. and its economic effects. Specific attention is paid to people of African phenotype in order to understand the differences within this group and gain an understanding of those of Caribbean origin, and specifically Panamanian immigrants, who have gained success in STEM.

Background

  Higher education and the STEM shortage in the United States. The importance of

pursuing higher education has been an important middle class value in the United States

since the end of World War II (Goldin & Katz, 2008). As a result, the U.S. has emerged as a

world leader in science and technological advances, research, and development (National

Academy of Sciences, 2011; Wagner, 2011). Due to global advancements in science and

technology, many countries seek an educated work force (Goldin & Katz, 2008). Other

countries have realized that in order to compete in a global market, their citizens must be

educated in a manner that allows them to participate in STEM careers. They understand the

correlation between an educated workforce and citizenry and income and national wealth

(Goldin & Katz, 2008).

  There has been a decline in educational attainment in the U.S. since the 1970s. The

United States has fallen to a ranking of 11th among nations where 25-year-olds to 34-year-

olds hold a post-secondary degree (National Academy of Sciences, 2011). Underrepresented

minorities show a more pronounced decline due to the racial barriers that prevent people of

African phenotype in the United States to have equal access to education. Cases such as

Brown v. the Board of Education of Topeka are reminders of the historical educational

system that limited the educational attainment of African American citizens (National

Academy of Sciences, 2011)**.** Although considered United States citizens, today these

citizens of African phenotype are often offered an educational system that is inferior to their

White counterparts in such areas as educational funding, educational services, and supplies

(Coleman, 1988; Kozol, 1991). This is particularly the case in many large urban centers

where high poverty schools are staffed by teachers who do not hold full teaching certifications (Fuller, 2009).

The effect of the past nine years to meet the requirements of the No Child Left Behind Act (NCLB) has meant that students who are now in high school and have attended schools where the emphasis was on increasing reading and math scores are showing diminished science literacy. This program, which was designed to increase the performance of all students and close the achievement gap between Whites, Blacks, and Hispanics, has created a new problem (Freidich, 2003). Results from the National Assessment of Educational Progress (NAEP) 2009, show that 40% of high school students tested below proficiency in science (Mervis, 2011). Denying these students access to scientific literacy in their formative years means that they will be unprepared for the rigor of secondary education training in STEM. When specifically addressing the underrepresented groups, the National Academy of Sciences (2011) states that in order to close the gap, Blacks and Hispanics would need to triple their access to higher education degrees in order to have their representation equal, in comparison to their total population.

There are those who would like to believe that this is a matter of ability and choice on the part of this underrepresented group. However, those of the underrepresented group enter STEM training in equal numbers as those who are highly represented. Unfortunately, there is disparity in their rates of completion. A study done over a five-year period with a cohort of students entering science and engineering majors found that Whites had a completion rate of 33% and Asians 42% while Blacks and Hispanics had a completion rate of 22% and 18.8%, respectively (National Academy of Sciences, 2011). Clearly, there is an issue with the

completion rate among members of the underrepresented groups and not their interest in the field.

Differences in immigrant status seem to affect STEM participation in ways that differ from the statistics for underrepresented populations. Children of immigrants in general often choose math and science classes as part of their college study in far more significant numbers than their American-born peers. A sample group that included first, second, and third generation immigrants from European, African, Afro-Caribbean, Asian, and Latin American backgrounds showed that the Afro-Caribbean group entered math and science fields with the same proportions as other immigrants from around the world. Also noteworthy was that the sample student groups from all the populations that were second and third generation showed a significant decrease in selecting math and science fields of study. Therefore, the more assimilated the immigrant population becomes in the American educational system the greater the likelihood of decrease in STEM related subjects and careers (Tseng, 2006).

The question that arises is whether the educational system begins to marginalize students based on phenotype once they become assimilated into American society. Despite these findings, Caribbean immigrants of African phenotype appear to be successfully accessing STEM careers. In the next section, Caribbean immigrants will be discussed to illustrate how this group, who are of African phenotype, have persisted in STEM education and participate in STEM careers.

Afro-Caribbean immigration. Caribbean immigrants of African phenotype are the largest Black immigrant population to the United States comprising 4.4% of the overall Black population (Williams, Haile, Neigbors, Gonzalez, Baser, & Jackson, 2007). Of this number, about 8% of Black immigrants are from Spanish speaking countries, including the

Dominican Republic, Mexico, Panama, and Cuba (Kent, 2007). With regard to Panama, one third of those who immigrated to the United States in 2005 self-identified as Black (Kent, 2007).

Prior to 1965 only 100 people from colonized nations of the Caribbean islands were allowed entry into the United States (Levine, 1987). This policy was designed to limit the entry of people of African descent while favoring those of European descent. The few Black immigrants that were allowed entry received it in order to fulfill shortfalls either in nursing careers or in service and domestic jobs (Clarke & Riviere, 1989). During the Civil Rights Movement, this policy was seen as racial discrimination, and Congress fought to have this changed (Levine, 1987). The result was the passing of the Immigration and Nationality Act of 1965 which stated that people from independent countries such as Jamaica, Trinidad, and Barbados could immigrate to the United States (Levine, 1987)**.** This Act allowed persons from predominantly Black nations to migrate to the United States in a manner that was equitable to that of immigrants from predominantly White nations. Thus, between 1960 and 1980, the foreign-born Black population grew seven fold in the United States from 1% to almost 8% (Kent, 2007).

Afro-Caribbeans share the same racial classification as African Americans and are vulnerable to the same forms of racial discrimination (Rogers, 2006). First generation Caribbean immigrants are often recognized as such by their accents or social values. However, first generation children who migrated to the country at a very young age and second-generation children who were born in the United States may not have discernible accents, and, therefore, may be identified as African Americans. Imposed upon them are often the same stereotypes and expectations that limit the experiences of African Americans

(Kasinitz, 1992). They may be coerced into assuming an African American identity in order to fit in with their peers and new community (Woldemikael, 1989).

However, the differences between African Americans and Black immigrants are drastic on two levels: the effects and form of slavery endured and the relative freedom of choice in entering the United States. African Americans have been designated as involuntary minorities who were brought to the United States as a result of slavery. Black immigrants are described as voluntary minorities who chose to enter the United States and knowingly accept the terms of its racialized hegemony (Ogbu, 2008). Black immigrants know another home other than the United States and, therefore, can choose to exit (Rogers, 2001). African Americans endured a slave system that was globally among the most brutal. When this ended, they were subjected to over one hundred years of Jim Crow laws that imposed systematic discrimination that served to cement them as part of the underclass (Becknell, 1987; Rothstein, 2004). This treatment is often foreign to the Black immigrant who comes from a nation where they are the majority and an integral and valuable member of the place they call home (Rogers, 2006).

Foreign-born Blacks and U.S. racism. The problem for many Black immigrants in coming to the United States is that for the first time they are racialized because of their African phenotype. Taiwo (2003), a Nigerian immigrant describes his arrival to the United States: "I became [now] Black!" (p. 42). Immigrants from other countries where they are the majority or where race is not a defining factor, identify themselves by their tribe, family or ancestral origin (Taiwo, 2003). For example, I, as the researcher and author, identify as Panamanian, Afro-Caribbean, and Latina. When I am in Panama among people that look like me or are Latin, they do not see it odd for me to speak perfect English, Spanish, or revert to

the Creole-English of my ancestry. They may assume I live in the United States, but they recognize my rights to be at home among them as well.

Taiwo (2003) further adds, "If race is no longer as determinant as it once was in black life, then recent immigrants from Africa or the Caribbean, the "newly-minted blacks", would either not experience the confining influence of race or be spared the experience of being raced on arriving in the United States" (p. 43). Thus, not only do newly arrived Black immigrants experience racism, but, in the United States, people of African phenotype are forced to choose among two categories: White, which those of African phenotype are not, and being part of the existing Black population, of which we racially identify with, but with which we are dissimilar in culture and values. Additionally, for Black immigrants who migrate from countries where they are the majority, to take on the status of minority and assume the role of underclass is contrary to the purposes of their migration (Ostine, 1998).

This headline appeared recently in the Wall Street Journal: "U.S. Nears Racial Milestone." The data from the census revealed that the United States is nearing a racial milestone where in many states the once majority White populace is now the minority (Dougherty, 2010). The data grouped Asians, Hispanics, and non-Whites together as representing minorities who are now the majority. It did not matter if immigrants came from Croatia or Russia; so long as they identified as White or Caucasian they were racialized as majority or White. By this standard every person of Caucasian phenotype is privileged into being able to join the category of majority. They are accepted as Americans. They may choose to recognize their place of origin and hyphenate their identity to be "Irish- American" or "Polish- American" but they are placed into a category that automatically holds relative privilege and power. The racialized system within the United States that is based on skin

color seems to imply that if you are White, you are an American, and if you are Black, you are African American.

This limiting social positioning creates a conundrum for Caribbean immigrants. Caribbean immigrants, like other immigrants, are entering the United States with the belief that with hard work they can advance economically, provide educational opportunities for their children, and increase social power (Mortimer & Bryce-Laporte, 1981). Because of this immigrant belief in hard work and ascendancy, they often choose to maintain their cultural identities while relinquishing or de-emphasizing their racial identity, which may serve to limit their ascendancy (Guy, 2001; Waters, 1994). It therefore, seems unlikely that immigrants, whether Black or White, would attach themselves to any group identity that has pre-existing social limitations in improving their economic and social lot.

Caribbean culture, identity, and class. Culture is defined as what an individual needs to know in order to operate in a manner that is acceptable to other members in a given group (Geertz, 1973). Culture is a part of the human experience and is interdependent with human community. The individual in a given community is expected to know the rules and ways of being that represent the group. Culture is demonstrated through the actions and words of the individuals (Van Maanen, 1988). Language is the way in which culture is transmitted verbally. Dialect is the version of the language that is spoken that represents the group (Goodenough, 1981).

With regard to culture and language for Caribbean English speakers, their English is in the form of Creole-English. This is a mixture of European English and West African linguistic features (Thomas, 1992). Because many Caribbeans from Panama are from islands colonized by the British, they also use more formal, British English. This is due to their

educational training. Since Panama is a Spanish country, Panamanians who are of Caribbean descent, also speak fluent Spanish. Education and social interactions in the larger community are in Spanish. However, Caribbean gatherings and interactions often include code-switching between Creole-English and Spanish. Bilingual speakers demonstrate an ability to engage in single conversations that use words or phrases from two or more languages (Myers-Scotton, 2006). Language mixing is very common among bilingual speakers and the codes, or language may switch back and forth within one sentence (Gumperz, 1972).

Although Afro-Caribbeans may speak English, their accents and dialects often set them apart from the African American community in the United States. Woldemikael (1989) found that Haitian students in Evanston, Illinois were pressured by their African American peers to speak and behave as African Americans. These students were forced to adapt the dialect of the peer group in order to assimilate into the community. Additionally, native African American students pressured this group to adapt the behaviors that seemingly allowed Haitian students to project like Black Americans. Ogbu (2008) informs us that collective identity of the African American community imposes an expectation on foreign-born Blacks that demand that they conform to the African American ways of being. Often, this is a resistance to behaving or "acting white." As a result, foreign-born Blacks are expected to adapt and use Black dialect and language.

Identity refers to the sameness of people; the sum of the ways in which they are bound together is more than their differences (Wildavsky, 1989). African Americans expect that Afro-Caribbeans and other Black immigrants will assimilate in language and behavior in order to have a common identity, namely a Black identity. However, this expectation is inaccurate; the historical differences between African Americans and other Black immigrants

are greater than the existing phenotypic similarities. Those of African phenotype who enter

the United States have not had to face a history of slavery, Jim Crow laws, lynching and

other violence, and the psychological violence that African Americans have been made to

endure (Becknell, 1987; Rothstein, 2004). For Black immigrants this experience is foreign

and many accept that the history of African American oppression is one that they do not share

(Waters, 1994). Thus, Caribbean culture, history, and language create a divide between Afro-

Caribbeans and African Americans. Caribbean slave history and emancipation as it relates to

identity will be discussed in greater detail in the review of literature. These historical

dissimilarities lead to differences regarding class and class mobility and may impact career

choices. Over seventy years ago Reid (1938) described the problem for foreign born persons

of African phenotype entering the United States: "Every foreign-born Negro must redefine

the concepts of 'class' and 'caste' to which he has been accustomed in terms of the United

States' racial pattern" (p. 412). Therefore, class is a distinctive issue.

　　　Weber (1994) describes class as any group of persons who occupy the same class

situation. He describes two class structures that will be used in this dissertation to explain

Caribbean social behavior: the property class and the acquisition class. The property class

consists of members who own property, have political control, and have access to resources.

These resources include the ability of members to take advantage of educational

opportunities for themselves and their children. This study recognizes the ways in which

Afro-Caribbeans have used migration as a means to move up in social class. The second

group is the acquisition class. Members of the acquisition class do not inherently begin with

advantages like the property class. But, they are determined to use all the opportunities they

have to acquire services and goods that are available to the property class. This study will

explore how Caribbean immigrants behave as members of the acquisition class who strive to become members of the property class (Weber, 1994).

Caribbean immigrants use hard work to acquire opportunities that are afforded to the property class (Bryce-Laporte, 1972). Therefore, it can be interpreted that they have identified educational attainment as an advantage that must be garnered for their children in order to secure a more privileged future. Since educational attainment is a value of the property class and Caribbean immigrants are striving to move into that class, educational attainment becomes a value, and STEM careers that are stable forms of employment become a desirable choice.

Educational attainment and Caribbeans as the model minority. Caribbean immigrants who migrate to the United States do so for educational attainment and economic gain (Mortimer & Bryce-LaPorte, 1981). Teachers in the United States often racially categorize students as African American, White, Hispanic, or Asian based on stereotypes. Unfortunately, these racial categories bring expectations and beliefs about student ability (Tettegah, 1996). These preconceived expectations are known as stereotype threats. Stereotype threats are the negative stereotypes attributed to a group by society and are transmitted through media, peers, teachers, and the society at large (Smith & Hung, 2008).

When enacting stereotypes, teachers also impose their expectations based upon the racial and gender beliefs of the society in which they were raised. Stereotypes, such as Blacks are lazy and girls do not do well in math and science, are often communicated loudly and effectively to students of African phenotype (Reyna, 2000). "Stereotypes represent a host of prepackaged expectations that have very real consequences for the beliefs and behaviors of both the user of stereotypes and for those being stereotyped" (Reyna, 2000, p. 86).

Teachers knowingly and unknowingly transmit these stereotype threats, which impact the persistence and participation of females and minorities in STEM education.

For the immigrant of African phenotype to align with his racial peer is to accept all the stereotype threats associated with this group. For the Caribbean student in the American educational system this often means isolation from their racial peer group in academic pathways**.** Caribbean immigrants often will live in communities with other Caribbean immigrants or in communities that are predominantly White. By living near Whites they ensure they have access to better housing and schools for their children. The choice is not made to racially identify but to culturally identify with other immigrants in order to move up in class. As a result, they are more likely to be prepared for higher education. However, this further isolates them from members of society that look like themselves (Kasinitz, 1992).

Caribbean parents, when compared to American born Blacks, are more likely to promote educational attainment by setting strict rules regarding homework and the maintenance of adequate grades (Kao & Tienda, 1995). Many Caribbean parents emigrate from their home countries after completing high school or attaining higher degrees (Model, 2008). Therefore, they expect that their children in the United States will have even greater educational attainment than they have had.

Relevant to this study is that Caribbean immigrant children, when compared to African American students, are more likely to attend college and to persist through to graduation (Jenkins, Harburg, Weissberg, & Donnelly, 2004). In their three year study, Jenkins, Harburg, & Donnelly (2004) found that only 41% of Caribbean immigrants dropped out of college, versus 64% of African American students. Black immigrant male students had higher SAT scores than African American males (Glenn, 2007). However, when looking at

the data of their college grade point averages (GPA), the GPAs for Black Caribbeans did not show a significant difference from the African American students. Glenn (2007) hypothesized that this could be because the Caribbean students were found to major, in larger numbers, in engineering and science which would mean taking harder classes and thus may have resulted in lower GPAs.

In spite of the data supporting the higher educational attainment of Afro-Caribbeans, teachers and educators in higher education continue to be gatekeepers who may use stereotype threats. Lopez (2003) found in her study of a poor neighborhood in New York City that Caribbean girls were steered into 'pink' careers and not encouraged into math and science. Systems promoting honors classes versus vocational work classes still serve to reinforce racial hegemony through the belief that people of African phenotype are not smart enough for honors classes while those in middle class White schools are offered honors classes as a regular part of the curriculum. Additionally, Lopez noted that honors classes were not equal across the city of New York: honors classes in poor neighborhoods did not offer the same level of academic rigor that was found in more affluent schools (Lopez, 2003).

Caribbean women and economic attainment. Historically, Caribbean women from countries like Jamaica immigrated to the United States to fill nursing shortages during World War II. According to the 1980 census, nursing careers were where the largest group of Afro-Caribbean immigrant women could be found (Clarke & Riviere, 1989). Like other immigrants, Caribbean immigrants value career choices that will produce economic empowerment and offer job security (Bryce-LaPorte, 1972). STEM careers offer both of these benefits.

As a result of their educational attainment and possible participation in STEM careers, Afro-Caribbeans are the highest earners in the United States when compared to other members of African phenotype (Model, 2008). Specifically, Caribbean women were the highest earners when compared to African, French, and Spanish immigrant women and African American women (Corra & Kimuna, 2009). The earnings of the Caribbean subgroup showed a pay differential that was several thousand dollars per year higher than the other groups. However, the researchers did not disaggregate the data to include the types of employment by category for STEM and non-STEM careers.

In summary, the demand for highly qualified workers for STEM has left a shortage that needs to be addressed. Although White and Asians are adequately represented in STEM, people of African phenotype are not. Within the United States, as a result of immigration, there are people of African phenotype who seem to be gaining access to STEM careers. Black immigrants from Panama who enter the United States for economic and educational pursuits appear to be making inroads into STEM. It is for this reason that this dissertation focuses on the experiences of five Afro-Caribbean women from Panama, who are members of STEM careers, so that strategies can be used to inform teachers, schools, and educational training institutions regarding the needs of females of African phenotype who desire to pursue STEM training and participate in STEM careers.

Problem Statement

With the shortage of STEM workers in the U.S. and the lack of students selecting STEM pathways in higher education, there is currently a need to bring in qualified workers from other countries to fill STEM jobs**.** In the United States today there is a need to hire science and math teachers and 48 of 50 States have indicated a need for science and math

instructors for middle and high school (Westerlund et al., 2011). Other nations have increased spending to educate their citizens in science and technology to meet demand in the ever growing STEM fields, but the United States has remained relatively unchanged (National Academy of Sciences, 2011; Wagner, 2011). In the U.S., barriers exist that continue to exclude Americans of African phenotype in STEM education and career pathways. People of African phenotype in the United States are underrepresented minorities in STEM careers representing only 4% of STEM workers (NSF, 2011). Diversity in STEM in this country is occurring only because of the immigration of non-White citizens from other countries.

Caribbean immigrant women have a long history of being in STEM careers in the United States (Clarke & Riviere, 1989). Additionally, they represent the highest earners when compared to other females of African phenotype. At a time when the United States is seeking STEM workers from within its ranks and desiring to create a diverse STEM workforce, there is a group of immigrant women of African phenotype, who have overcome gender and race barriers and have persisted in STEM educational training in order to participate in STEM careers. Afro-Caribbean women from Panama, and specifically those in this study, seem to be able to overcome the obstacles resulting from their gender and racial identity. It is from these immigrants that perhaps we can learn strategies to help K-16 females of African phenotype persist in STEM education and provide their teachers with strategies to support them.

Purpose of the Study

The purpose of this grounded theory case study is to explore and understand the experiences of Afro-Caribbean Panamanian immigrant women who work in STEM careers. These women can lend insight into ways in which females of African phenotype navigate racial and gender barriers to persist in STEM education and gain access to STEM careers.

These findings can be used to present strategies to educators, schools and teacher training institutions, in order to support all females of African phenotype who are interested in participating in STEM careers.

Significance of the Study

This study is important because the information from these Panamanian Caribbean women may offer strategies to teachers, schools, and the institutions that train teachers, so that all females of African phenotype interested in STEM may overcome the present barriers found in STEM educational training. Gender and phenotype are barriers that affect the attrition of women of African phenotype in STEM. From these narratives, teachers and institutions of K-16 education may be challenged to reevaluate the ways in which they limit access to their female students of African phenotype. In so doing, the U.S. would be better equipped to reduce the shortage of STEM workers and increase diversity in STEM by drawing from the pool of those who are presently underrepresented. Secondly, these females could further serve to reduce the deficit within STEM educators—in response to the call from President Obama, upwards of 10,000 science and math educators are needed (Westerlund et al., 2011). Finally, the indirect result of this study is the historical and cultural information obtained from the Afro-Caribbean women of Panama who have immigrated to the United States. This research presents a unique opportunity for these women to define themselves as independent from the often limiting racialized categories used within the United States.

Research Questions

The overarching research question for this qualitative study is: What key factors from the lived experiences of Panamanian Afro-Caribbean women in STEM careers can be used to

inform work with females of African phenotype in their pursuit of STEM education and STEM careers?

The sub-questions are:

1. What socio-cultural elements identified by these Afro-Caribbean women from Panama were most important in shaping their identity and resulted in their success in STEM?

2. What specific advantages, skills, attitudes, and strategies learned from their cultural identity enabled these Afro-Caribbean women from Panama to negotiate the barriers in STEM classrooms and workplaces (such as gender, socio-cultural differences, or African phenotype)?

3. What strategies and skills from the lived experiences of these Afro-Caribbean women from Panama might be used to inform educators in order to support all females of African phenotype in STEM education and careers?

Theoretical/Conceptual Framework

This grounded theory case study was conducted using the lens of Ogbu's (2008) collective identity theory. Collective identity refers to a group's sense of belonging based upon cultural symbols, attitudes, beliefs, language, and dialect (Ogbu, 2008). Collective identity can develop as people share similar experiences around such things as colonization, conquest or enslavement (Castile & Kushner, 1981), and for oppressed minorities the collective identity forms around status problems and the response to status problems (Ogbu, 2008). It will also relate to their sense of place in the social structure which is often referred to as class.

Status problems are those that the collective group find difficult to overcome due to the systemic ways in which these problems are adhered to by the dominant group. For example, the dominant group in the United States brought African Americans to the country as slaves and they were treated as chattel; after slavery, they were still put in a position as second class citizens because of their phenotype. This history has resulted in a collective group identity that positions those Americans of African phenotype as being less than their White counterparts. This history also created a continuing problem of identity for both African Americans and White Americans in that for African Americans there is this expectation of limitation and for White Americans there is this expectation of privilege (Ogbu, 2008). Another status problem is social subordination where a systemic societal structure is in place. Examples of this would be the prohibition of inter-marriage with Blacks, the limitations of neighborhoods they could access resulting in large poor Black neighborhoods, and economic restrictions determined by the jobs they could hold (Ogbu, 2008). All of these social and systemic structures are set by the dominant group.

Additionally, social discrimination sets the rules for interaction with Whites. For example, African Americans were not allowed to look a White person in the eye. Whites could speak to older African Americans as children calling them 'boy,' but African Americans were never allowed to be disrespectful to Whites. Further, by stigmatizing minority food, language, and values it cemented a tiered model where 'dominant preferences are good' vs. 'minority preferences are bad' (Ogbu, 2008).

Although Caribbean women seemingly break through the STEM gatekeepers, they are still expected to know and follow the rules of the racialized system. Waters (1994) found that African Americans perceived that Caribbeans did not understand the rules regarding

racial relations in the United States. African Americans described Caribbeans as being naïve and not having a 'sixth sense' to know when they were being insulted by Whites. Interestingly enough, Whites viewed the Caribbeans as more easy going and easier to get along with than African Americans (Waters, 1994). The history of discrimination against African Americans is different from the experiences of Afro-Caribbeans. Caribbeans are not intentionally ignoring the racialized struggles. They simply do not have the same historical reference and memory of oppression as their African American counterparts. This will be expanded upon in the Review of Literature section.

Definition of Terms

In this study I will use the terms *Afro-Caribbean* and *West Indian* interchangeably to refer to those from the Caribbean islands who are of African phenotype. When referring to those of African phenotype from Panama I will be referring specifically to those of Afro-Caribbean heritage. Spanish words or names will be italicized throughout this dissertation.

African American will refer to those of African descent in the United States who are involuntary minorities brought to the country as slaves (Ogbu, 2008). The history of oppression, discrimination and human degradation that African Americans in the United States have endured is incomprehensible to many of African descent from around the world (Wilson, 1987). Although immigrants of African phenotype may choose to self-identify as African Americans, immigrants, when subjected to racism, make a conscious choice to tolerate the poor treatment in order to improve their class status (Ogbu, 1990).

African phenotype or Black will refer collectively to people who have dark skin and whose ancestry is from Africa.

Caribbean immigrant/Afro-Caribbean will refer to those of African phenotype who were brought to the Caribbean islands as a result of the slave trade. However, as immigrants to the United States they are voluntary minorities.

Class will refer to the acquisition of power and opportunities for economic gain and educational opportunities for children (Weber, 1994). In this way, class mobility is not restricted simply to those having great wealth or money. A family can belong to the property class and have a meager income, but have the ability to educate their children. It is not static and there are multiple levels of power and wealth within the property class.

First generation will refer to those who were born in a country other than the country of residence (Fuligni, 1997). Second generation will refer to those who were born in the country of their residence while their parents were born elsewhere (Fuligni, 1997). It is the interest of the researcher to consider women who immigrated to the United States from Panama and thus were not born in the United States.

Foreign-born immigrants will refer to those who enter the United States after being born in a country other than the United States.

Gender will refer to the sex of an individual and refer to male or female.

Genotype refers to the genetic makeup of people.

Identity will refer to the sameness of the group in regards to the culture which includes their language and dialect. It is the construction of the self from interaction with the outside world (Lindholm, 2007), family, and ancestry.

Involuntary minority, according to Ogbu (1992), will refer to those minorities who were brought to their present home country against their will by a dominant group from within the country.

Phenotype refers to the physical appearance. A person of African phenotype would, therefore, have dark skin, curly hair, and flat nose; they would represent the population of people from Western to Southern Africa. In this study, the people to be studied will be characterized as Caribbean immigrants of African phenotype.

Race, although a social construct, will be used to refer to the color of individuals in a particular group (Portes & Zhou, 1993). I will use the dictionary definition of *racism,* which is the belief that there are differences among groups of people whereby one group feels superior to another and feel it their right to rule over others; this belief further justifies the discrimination imposed.

Socio-cultural/cultural factors will refer to those social factors that affect how people behave such as their values, educational system, religious institutions, economic status of the family, and political system. Cultural factors will refer to those factors that are important to know in order to be acceptable to the members of a group (Goodenough, 1981), specifically, those that will affect beliefs about gender and race.

STEM will refer to Science, Technology, Engineering, or Mathematics positions or training. This will include biological, agricultural, physical, and engineering, computer science, and technology (Hill, Corbett, & Rose, 2010). Expanding on their definition, however, I include in this group all teachers of STEM since the communication of educators from K-12 will affect the choices of students in their aspiration for STEM training and careers. Additionally, doctors and nurses are included in this definition.

Stereotype threats and assumptions are the ways in which self-identity is constructed based upon assumptions of inferiority or superiority. It is the transmittal of ability based upon a set of accepted assumptions constructed primarily by the dominant class and then imposed

on others (Martens, Johns, Greeberg, Schimel, 2006). These are often negative for the student of color and serve to limit their participation in STEM.

Voluntary minorities are those who choose to enter a country that they will call home (Ogbu, 1992). Afro-Caribbeans enter the United States as voluntary minorities.

Limitations of the Study

A limitation to this study is that I am using a very specific group of people, or a purposive sample; therefore, findings cannot necessarily extend to other people or even to other groups of African phenotype. This study only seeks to understand Afro-Caribbean women and does not seek to explore all women of African phenotype in STEM. However, it is still my hope that the findings will be used to support all females of African phenotype pursuing a STEM career.

The sample size for this study is small. This is intentional so that narratives from the participants can be gathered from thick descriptions. Future research is needed in order to expand this query to women of Afro-Caribbean heritage from other islands and regions to fully explore the extent of their impact and presence in STEM education and careers. Further study that includes females of African phenotype in STEM can also be an important expansion to this research.

Summary

The shortage of qualified STEM workers in the United States has resulted in a need to fill these positions from countries such as China and India (National Academy of Sciences, 2011). With the United States no longer the leader in producing STEM workers, diversity within the STEM fields is occurring as a result of participation from these nations. However, there is a population of untapped talent who are American citizens that could fill this

shortage. Those of African phenotype are underrepresented in STEM. Females in particular are underrepresented due to gender and race.

Afro-Caribbean women have participated in STEM careers in the United States since World War II. They have successfully persisted in STEM education even though they are an underrepresented group in STEM. Teachers are the gatekeepers for the STEM pipeline and may be denying access to females of African phenotype. The schools that have historically provided the workforce with candidates for these jobs are now being evaluated. The results of this study may help teachers reflect on the changes that may be needed in their beliefs, attitudes, and behaviors towards females of African phenotype. It is also the intent that institutions that train teachers also consider ways in which attitudes and beliefs that continue to deny access are being reproduced in another generation of teachers. The researcher hopes that through the narratives of these Afro-Caribbean women from Panama, who successfully work in STEM careers, strategies may be identified and used to support all females of African phenotype who are interested in pursuing STEM education and participating in STEM careers. In telling their story, I share and explore my own.

Chapter 2

Review of Literature

The purpose of this chapter is to provide an examination of the literature as it relates to the dissertation inquiry (Boote & Beile, 2005). The chapter is presented as a conceptual framework that weaves together the process that influenced the development of the study's main question, as well as the theoretical concepts and empirical findings used to inform the focus of the study (Maxwell, 2006). Toward that end, the chapter takes a look at several theories that were identified as relevant to the presented assertions. Relevant empirical evidence from the literature is also summarized and implications are discussed. The chapter concludes with an overview of Afro-Caribbean history. The purpose of the historical overview is to provide a reference for locating and better understanding the experiences of the Afro-Caribbean women who participated in this study.

Ultimately, the literature reviewed is drawn upon to support the main question for the study: What key factors from the lived experiences of Panamanian Afro-Caribbean women in STEM careers can be used to inform work with females of African phenotype in their pursuit of STEM education and STEM careers?

The sub-questions are:

1. What socio-cultural elements identified by these Afro-Caribbean women from Panama were most important in shaping their identity and resulted in their success in STEM?

2. What specific advantages, skills, attitudes, and strategies learned from their cultural identity enabled these Afro-Caribbean women from Panama to negotiate

the barriers in STEM classrooms and workplaces (such as gender, socio-cultural

differences, or African phenotype)?

3. What strategies and skills from the lived experiences of these Afro-Caribbean

women from Panama might be used to inform educators in order to support all

females of African phenotype in STEM education and careers?

Organization of Sections

Several headings are used to organize the sections for the Review of Literature: (a)

search process/journey, (b) theoretical framework, and (c) historical related information.

Empirical findings from various studies are included throughout (Glatthorn, 1998). The

scoring rubric developed by Hart (1999) is used to justify the rationale and criteria for the

inclusion of various research components. Empirical findings are discussed in order to

present the overt gap in literature (Hart, 1999).

The search process/journey section provides an explanation of how the overarching

question and related research questions for the study were developed and refined. The

theoretical framework section focuses on identity theory for persons of African phenotype in

the United States. Following this is a discussion of education attainment and its relationship

to identity development, as well as educational opportunity. This section considers the ways

in which teachers may enact an identity that bars females, and specifically those of African

phenotype, from participating in STEM education and careers. The final section examines

Afro- Caribbean history in order to lay a foundation for better understanding how the

identities of the five participants supported their persistence and participation in STEM.

Search Process/Journey

My inquiry into this topic began in 2008 during a qualitative research class taken as part of the University Of New Mexico College Of Education Doctoral Program. I was asked by a classmate about STEM membership for African American women. It was then that I had to share that I was not African American, but Afro-Caribbean and that my experiences might be different because of my status as an immigrant to the United States. The fact is that although I speak Standard English and have been racialized as African American, due to my African phenotype, I am Panamanian of Afro-Caribbean descent. Therefore, my historical experience and perspective do not include the systemic social and psychological violence that has affected African Americans in the United States. As a result of the question posed by my fellow student, I wanted to find out how Afro-Caribbean women who are from Panama and who are working in STEM careers have been able to find success in a country that racially divides its citizens and limits their opportunity based on phenotype.

In the summer of 2008, I began reading about the Afro-Caribbean people of Panama. This early process included research at the Schaumburg Center Library for Research in Black culture in Harlem, New York. The Schaumburg Center's collection included information on Blacks from the global African Diaspora. Further, because the founder of the Center, Schaumburg, was Puerto Rican, there was extensive information and manuscripts on Afro-Caribbean people. This information included items such as Caribbean migration, Caribbean assimilation, and Caribbean history.

That summer I also visited the Caribbean Institute that was housed at Medgar Evers College in Brooklyn, New York. There I met with the director of the Institute to discuss my developing research ideas. The resulting conversation helped me understand various

influences of the Caribbean community both in the Caribbean and in the United States. The discussion also helped me to see the specific ways in which the Caribbean community has been established in New York City.

Additionally, beginning in 2008 and continuing to the present I have had numerous opportunities to present implications from my study. This process included two Caribbean conferences in Cartagena, Colombia, and San Juan, Puerto Rico during which I was able to formally present my emerging work. I have also made yearly trips to Panama where I conducted a pilot study. An important outcome of my travels was that I purchased seminal readings that were published locally in the regions of Panama, Columbia and Puerto Rico.

In the spring of 2009, I conducted a pilot study that addressed my main research question. I conducted interviews and field observations with three women in New York City as the core of an Advanced Research course taken at the University of New Mexico. I also conducted an ethnographic pilot study in Panama, during the summer of that same year. The goal of the ethnographic work was to better understand the cultural context and social backgrounds for women in STEM living in Panama. The second study was conducted under the formal approval of the Institutional Review Board for the University of New Mexico.

While I was in Panama, I visited the *Museo de Afro Antillanes* in Panama City. The *Museo* was started by a group of Panamanians, living abroad who wanted to preserve and record the history of the Afro-Caribbean people who had migrated to Panama to help build the Canal. I was allowed to use the Museum's collection of books, articles and original letters from both the Afro-Caribbean people and Americans who participated in the Panama Canal project.

I also had the opportunity to attend a meeting at the *Sociedad de Amigos Del Museo Afro Antillano de Panama*, or SAMAAP. I presented my research project to this group and using their personal contacts, I was able to identify potential participants for the present study.

In 2010 and 2011 I visited the Canal Zone Museum, which holds official records of those who worked on the Canal project. I looked at historical records of the building process, the development of the Caribbean townships, and the interaction between the Afro-Caribbeans and the Americans. I received a video documentary made by a local group that was based on a firsthand account provided by the men and women who worked on the Canal.

An additional factor that influenced my process was how learning about the history of Caribbean experiences in the United States affected the development of my study question. This learning included information about Caribbean migration, Caribbean transnational habits (Kasinitz, 1992), Caribbean immigration and Caribbean assimilation patterns in the United States. As I gathered information about these processes, I found evidence that Afro-Caribbeans have been considered to be model minorities in the United States (Model, 2008). This insight led me to question how and why this designation might have influenced this group of Black immigrants' experiences of economic success in the United States. As part of this inquiry, I chose to focus specifically on Afro-Caribbean women in STEM; they seemed to be well represented in science fields. This group appears to be experiencing success in STEM despite existing barriers related to race and gender. This relative success seems to occur despite their status as immigrants to the United States.

Of note here is the fact that historically Afro-Caribbean women came to the United States and Canada to fill shortages in nursing and to work as domestics (Clarke & Riviere,

1989). I therefore focused my research on STEM or science careers for Afro-Caribbean women. The term "STEM" was searched interchangeably, in relevant literature databases, with "Science and technology", as well as "Science careers". These initial searches provided little information, so the search was broadened to include the search terms "Black females and STEM" and "STEM educational training". There is a great deal of empirical data, which identifies women in general as underrepresented in STEM, and women of African phenotype as disproportionately underrepresented within this group (National Academy of Sciences, 2011).

It is important to note that research findings regarding Afro-Caribbean females' or African females' participation in STEM are relatively sparse. Perhaps this is due to the fact that in the United States Afro-Caribbeans and Africans are grouped or racialized into the categories of Black or African American. Therefore, little research focuses specifically on females who are Afro-Caribbean immigrants in STEM training or careers.

Theoretical Framework

This section first presents information on the nature of grounded theory and the reasons why this theory is used as a form analysis of this research. The section then reviews relevant identity theory and addresses the ways in which social values, cultural values, and class relate to identity. I then focus on how these values are formed and transmitted to the individual as part of a group. Presented last is an examination of the theories from two identity theorists as they relate to persons of African phenotype residing in the United States. I then link issues raised by these theorists to educational outcomes for persons of African phenotype residing in the United States.

Grounded theory. Grounded theory or generating theory results in the development of an emergent theory that is inductively derived from the study itself (Lincoln & Guba, 1985; Strauss & Corbin, 1990). The theory is not forced upon the study nor is it simply added at the end. The theory for the study is driven by the examples from the data and there may be multiple theories that emerge. The data and the emergent themes are then tied to the research findings that are presented in the Review of Literature (Glaser & Strauss, 1973; Lincoln & Guba, 1985). The goal of the grounded theory approach is to test logico-deductive theory and generate new theory from the data thus generating a new theory (Glaser & Strauss, 1973).

There are several criteria for grounded theory. Researchers who use grounded theory must first ensure that concepts are all grounded in the data. Concepts must systematically relate to the data and matched through coding. Next, there should be a categorical link that relates actions and interactions with consequences within the data. Third, there should be sufficient specificity within both the data and the espoused theory. Finally, the researcher must determine if the findings are significant (Strauss & Corbin, 1990).

Studies that have used grounded theory are often qualitative in nature. They include those that have open-ended questions with no previous study from which to draw. Collins (2011) used a grounded theory approach in order to find out the educational issues faced by different generations of African Americans. He used historical information, interviews, artifacts, and observational fieldnotes to compile an account of the experiences of participants and their families from a Texas community as they related to the participants' educational experiences. Throughout the text the data was used to support his findings. Theories at the time would not have adequately explained the findings from this study.

Similarly, present theories would not adequately explain how the experiences of these women led to their success in STEM. Existing research does not present adequate information that can be used to inform educators on how to support females of African phenotype to persist in STEM training because it does not take into account that there are differences in identity of those of African phenotype. Therefore, a grounded theory approach was selected for the current study.

Identity theory. Two perspectives on identity formation that emerged in the early twentieth century were used as a primary conceptual foundation for the study. The first was developed by Charles Sanders Peirce, an American philosopher educated at Harvard. He posited that the self and identity are formed as the child interacts with the outside world. The child is understood to connect sounds and facts together to learn language (Peirce, 1991). He further asserted that self-consciousness and identity evolve as a result of ignorance and error from these interactions. An example of this is when a child touches a hot stove. Ignorance about the result, namely getting burned, was expected to produce a reaction that then leads to knowledge of the world, fire burns. Peirce further states that not all ideas that evolve from the individual are true. Instead he believed that ideas should be clear and communicable to others (Peirce, 1991).

These assertions were later amplified by another American philosopher, George Herbert Mead. Mead (1934; 1982) states that the self develops through social experiences and activity; this occurs indirectly as interactions occur within a social group. Mead explains that as individuals begin "taking the attitudes of other individuals toward himself within a social environment or context of experience and behavior in which both he and they are involved, the self develops" (Mead, 1934, p. 138).

Mead addresses the self as it relates to a society and ultimately to class membership. He states that class membership develop when people perform different social roles such as laboring, managing, as well as being a professional or a role-performer such as teachers, doctors, and lawyers. Further, when members of one class presume superiority over members of another class a caste system is formed. Therefore, he believes that it is the function of a democratic society to give members of varying classes the opportunity to choose professions that may move them into different levels of power; this allows for changes in class membership (Mead, 1982).

Mead believed that in a democratic system, members within each caste should have the opportunity to increase in power, and elevate to a higher status. In the following subsection, I use Ogbu's collective identity theory (1978) to expand on Mead's social caste system by arguing that it is the educational system that perpetuates the caste structure. I argue that although citizens in the United States participate in a democratic system, there are some members who are denied opportunity to improve their class status and are seemingly bound to a low-caste membership.

Ogbu's caste-like minority vs. immigrant minority status. Ogbu (1978, 1992) argues that social structures are designed to privilege one group while others are assigned to service-level castes. He explains that in the United States, those who are characterized as the dominant class are of European decent or Caucasians and those who are characterized as minority are of other phenotypes. He also identifies two major minority status groups that are comprised of Caucasians. The first are autonomous minorities who because they are not attempting to assimilate they may face discrimination by members of the dominant group

who are similar to them in phenotype. Autonomous minorities are usually a subset within the dominant group; examples would be Mormons or persons of Jewish descent.

The second group of minorities is comprised of two subgroups: caste-like or involuntary minorities and immigrant or voluntary minorities. This distinction is particularly useful when identifying differences between members of groups that share similar phenotypes. Involuntary minorities are those who were included in their country of residence against their will. For the United States this group represents African Americans, Native Americans and Hispanics of the Southwestern United States. Involuntary minorities have to learn the language and culture of the dominant group. They must learn the dominant culture system in order to survive; whereas, the dominant group is not compelled to learn the culture or language of the involuntary minority group (Ogbu 1978, 1992, 2008).

In contrast, immigrant minorities have voluntarily moved from their home country to the host country and are therefore referred to as voluntary minorities (Ogbu, 1978; Rogers 2001). Voluntary minorities are those who entered a country and call it home by choice knowing that they may leave or select another host country (Ogbu, 1978; Rogers, 2001). They accept that they may be treated poorly or unfairly, but they choose to accept this treatment in order to gain economic or political power. Their identity is shaped by their choice. Voluntary minorities believe that stereotypes imposed by the dominant culture do not necessarily include them. They also tend to view educational attainment as a means to secure good jobs that in turn will lead to economic gain. They additionally retain the option to leave the new-home country and return to their ancestral home (Ogbu, 1978; Rogers, 2001).

Voluntary immigrants of African phenotype do not share a history that reinforces the acceptance of a low-caste involuntary minority identity as is the case for African Americans.

This is because their experiences from their home countries significantly differ from the experiences of African Americans in the United States. For example, Caribbean immigrants may enter the United States and work in jobs where they are overqualified – former teachers may be janitors or security guards – but they do not allow these menial jobs to define their identity nor speak to their sense of self-worth (Waters, 1999). Neither are these experiences perceived as cementing them in the underclass or lower caste. Instead, Afro-Caribbeans most often take these jobs and use them as a stepping stone to greater economic wealth (Kasinitz, 1992; Waters, 1999). Because of this, Afro-Caribbean response to a low-caste like system and identification thereof differs from the response and identity of African Americans.

As a result of the element of choice, Caribbean identity is also shaped by ethnic identity associated with their homeland and culture. Rogers (2001) states:

Although these black immigrants share a racial group classification with African Americans, they also have claim to a distinct *ethnic* identity separate from the *racial* status they share with native-born blacks. While they share racial minority status with African Americans, they have the option of identifying as voluntary immigrants with a distinct ethnic identity. They are thus black ethnics, with access to both *racial* and *ethnic* markers of group identification (p. 165).

Afro-Caribbean identity is therefore often shaped by the islands or country of their birth; they often choose to self-identify by ethnic markers rather than by phenotype alone (Rogers, 2001; Waters, 1999).

These ethnic markers are often diminished when Afro-Caribbeans from varying countries enter the United States. According to Ogbu (1978), the United States social structure is one where there is a White caste and a Black caste, namely one of privilege and

one of less privilege. Within each caste are subclasses that are based upon power, but these classes are not equal. This is because the White caste is considered to be superior to the Black caste. This is particularly the case in regard to education, occupation, and income. Therefore, to be White and middle-class is not the same as being Black and middle-class. The resources within each of these subclasses differ based upon the caste to which one belongs (Ogbu, 1978).

The educational system serves to perpetuate social and class structures ensuring that those of African phenotype in the United States remain in fixed economic and social castes (Aronson, 2008; Gaynor, 2011). Historically, members of the Black caste, mainly comprised of African Americans, were not given equal access to education or employment opportunities. The education they received often served to ensure that they were marginally equipped and could only perform low-level service jobs. They were therefore ill prepared for professional positions that were reserved for the dominant group (Aronson, 2008; Lareau; 2011; Ogbu, 1978; Rothstein, 2004).

A recent study found that even in the twenty-first century, low-income African American parents are still pessimistic about the educational outcomes for their children because they do not believe that the educational system has truly been a venue for movement in class status. Low-income students were identified as receiving job training that prepared them for service jobs whereas those of the upper class received college instruction that allowed for self- reflection and personal growth (Aronson, 2008).

Further, studies by Bailey & Dynarski (2011) and Reardon (2011) found that educational persistence and educational attainment were correlated with family income. Therefore, those who were from low income communities were less likely to have the

coursework needed to be adequately prepared for college; they were less likely to complete college. However, Aronson (2008) and Gaynor (2011) assert that for educational outcomes to shift in the low-income population, global social changes are needed rather than just educational reforms.

The social structure that determines class membership for African American citizens is maintained and promoted by the very educational system that did not train or educate them (Ogbu, 1978). Prior to 1964, this caste system was designed to ensure that African Americans received a curriculum that limited them to the jobs that the society deemed them fit to perform. Additionally, those who did follow the dictates of the educational system found that they were not rewarded with the jobs for which they were qualified. African Americans therefore did not see the benefits of following an educational system that was proclaimed as the path to advance in class (Rothstein, 2004).

In summary, if Mead's (1982) assertions are correct, then the inability of the dominant group within the United States, to allow equal educational access and economic opportunity that resulted in advancement was an intentional act meant to maintain people of African phenotype in the lower caste. The subsection that follows will further discuss how African Americans have been treated as members of a low-caste group and how they have developed their group identity and have lived within a society that continues to deny them access to economic empowerment.

American and collective Black identity. Ogbu (2008) uses the term 'collective identity' to describe a group's sense of who they are as it relates to their sense of belonging within the general population. Collective identity is developed as the result of a peoples' shared history. This history relates to the history of the general population and their sense of

belonging. The shared history is ultimately expressed in the form of the beliefs, feelings, and cultural symbols that inform the shared sense of belonging.

Regarding African Americans, Ogbu explains that historically African slaves were bi-cultural. This was evident in that while they were forced to be aware of White culture, they attempted to preserve their own culture by not speaking as Whites did. Whites also did not expect them to speak proper English since they did not allow them to learn to read and write. When they were with Whites, African slaves enacted these White expectations. However, when alone they used language and behaviors that were culturally their own. This allowed them to develop and maintain a separate group identity. Nevertheless, after slavery was abolished there was an increased expectation for African Americans to 'act White' or take on the dominant cultural behaviors, speech, and education in order to attain upward social mobility (Ogbu, 1978; Ogbu, 2008).

Ogbu (1978) however states that "acting white" did not ultimately result in social equality with Whites. Whites remained as the primary members of the *property class*, or dominant group; that is they were able to accumulate status and power through property ownership. The former slaves continued as members of the *acquisition class*, as low-caste, that is they continued as users and not owners of the resources (Weber, 1994). Therefore, in contrast to other social groups, African Americans were not able to work toward entry into the *property class* (Rothstein, 2004; Thernstrom &Thernstrom, 1997). This outcome was the case because after slavery, Jim Crow laws determined where Black Americans could eat, shop, walk, and live; these laws imposed a structure that limited Black Americans to the low-caste, second-class citizenship. This status outcome was very different from the relatively privileged status enjoyed by White citizens in the United States (Thernstrom &Thernstrom,

1997). Rothstein (2004) supports these assessments stating, "Blacks did not become over-represented in the lower class in America because their genetic make-up was inferior, but because they were enslaved, then segregated and barred from equal opportunity for more than another century"(p.17).

The Civil Rights Movement of the 1960s and the Black Pride Movement of the 1970s brought about a new level of identity and resistance in the African American community. These were in response to the continued caste structure that perpetuated Black status as lower-caste. These movements ushered in a seemingly oppositional collective identity through which African Americans more specifically resisted biculturalism and "acting white" (Ogbu, 2008).This new resistance became increasingly evident in their response to the educational structure in that many African Americans believed that to be successful in White educational institutions meant a loss of some of their African American identity. Especially since many of who had followed the educational pathways presented by the dominant culture found that they could not access the jobs for which they were trained (Mitchell, 1982; Ogbu, 1978; Rothstein, 2004).

Nevertheless, members of the African American community are aware that being bicultural is important to success in the dominant culture and society. Ogbu (2008) illustrates this through an example of an African American woman from his study who explained that she learned to speak proper English in order to cover her African American identity. She explained that she did so in order to receive better services during telephone conversations with utility providers. This woman realized that being perceived as White, garnered greater privilege than being African American. She chose to mask her identity to gain increased

privilege. For African Americans the message from White society is clear; in order to gain access to basic service non-white phenotype is not sufficient, a person must act White.

In the following subsection I contrast Banks' identity theory with Ogbu's. Banks (1972, 2004) who is African American in contrast to Ogbu who is African, speaks of African American identity as it specifically relates it to the Black-White binary within the American social system.

Banks' theory of identity. Banks (2004) proposes that there are stages or typologies that help to construct the identity of an individual. He expects that these will also affect the collective identity of people. The goal of Banks' typologies is to elicit greater insight regarding the development of identity. His ultimate goal is to identify strategies for increasing self-esteem for minority and African American children. In doing so, he also hoped to increase these students' academic performance.

Banks (2004) identifies five stages of cultural identity typology. The first stage is *cultural psychological captivity* during which individuals possess internalized negative stereotypes and beliefs about their cultural group. As a result they express self-rejection and self-hatred. The second stage is *cultural encapsulation* during which the individual participates in limited interactions with their cultural group. During this stage individuals may choose to isolate themselves from their culture and community group. The third stage is *cultural identity clarification* during which the individual develops positive attitudes toward their cultural group. The fourth stage is *biculturalism* during which the individual develops a healthy sense of cultural identity and psychological characteristics that support successful participation in their own cultural community, as well as in others. The final stage is

multiculturalism during which the individual who has developed a healthy sense of his/her own cultural identity is now empowered to participate in the global community.

Banks asserts that the five stages may not be linear. Instead, he argues that there may be times when an individual returns to a stage that they had previously mastered. This regression may be caused by a specific adverse event. For example, children raised in a home that has supported positive African American values and identity may view their culture positively until they are on a college campus with primarily White students who do not hold nor see their values as positive (Tomlinson, 1996). Their response may be that they choose to isolate themselves from other African Americans until they have addressed the inner conflict created by the dissonant experience.

Banks' (1997, 2004) ultimate goal is to promote a multicultural curriculum in which African Americans are able to see themselves positively portrayed. He argues that such a curriculum will enable minority students to be more academically successful. He further argues that there are several stages to this process. Once academic barriers related to cultural identity have been addressed, curricula can then address national identity and finally global identity challenges faced by the individual.

Implications from Empirical Evidence

Several important implications emerge from the assertions made by Ogbu and Banks and empirical evidence from the literature. In this section these implications are discussed as they relate to educational attainment, neighborhood effects, and stereotype threats that affect and limit the movement of African Americans from the acquisition class to the property class.

Identity theory and educational attainment for African American students. Ogbu and Banks differ in their starting points related to how and why identity develops. Ogbu

argues from the comparatively neutral premise that collective identity is formulated based upon the need of the group to survive the historical challenges they have faced. In contrast, Banks begins with the premise that within the African American community, the individuals possess a negative identity that results in a negative collective identity that needs to be overcome. For Banks (1972), the history of Black oppression in the United States and the resulting negative self-concept about African Americans needs to be acknowledged and addressed by White society.

Banks' (1997) is very specific about the historical struggle within the African American community. His assertions are important because they are about the same group, namely African Americans, whom Ogbu has referred to as involuntary minorities. Taken together, Ogbu's assertions about involuntary minorities and not "acting White", as well as Banks' concerns about negative self- concept, strongly suggest the inevitability of poor outcomes for African Americans.

In contrast, outcomes for Afro-Caribbean immigrants as a subgroup of Ogbu's voluntary minorities and who are potentially further along in regard to Banks' typologies appear to be more favorable. The social goal for Afro-Caribbeans is not to seek equality with Whites because they are not the measure for comparison. Instead, their focus is self-defined achievement, as well as educational and occupational attainment in order to create opportunity for future generations (Mortimer & Bryce-Laporte, 1981). These divergent foci have led to divergent outcomes for African Americans and Afro-Caribbeans.

The educational system in the United States has yielded inequities in achievement between White and Black students (Banks, 1997; Coleman, 1988; Jencks & Phillips, 1998; Ogbu, 1978). This outcome is not accidental; it is due to historical differences in the beliefs

about education for Whites as compared to Blacks. White children are educated to reach their social and occupational potential as leaders (Ogbu, 1978). In contrast, African American, or Black children are often locked into an educational system that was originally designed to limit their social and occupational choices.

Wortham (2006) emphasizes the ways in which such beliefs about group and self-identity are transmitted in the classroom. He defines identity as a set of behaviors that others interpret as representing certain beliefs or systems. He offers examples about how African Americans are characterized by the dominant group as lacking in math and science abilities. This labeling is transmitted in the classroom by educators who may view the struggle that African American students have in math and science as an expected or predetermined inevitability imposed on the entire group. These outcomes then serve self-fulfilling prophecies via which African American student test scores in math and science continue to be lower than their White counterpart **(**Jencks & Phillips, 1998; Kao, Tienda, & Schneider, 1996**).**

African American students, who are still significantly overrepresented in the lower economic class, are more likely to perform poorly in grades K-12. They are also more likely to have low college entrance exams and to have been denied access to higher level math classes. Low income parents are also less likely to have children who attend college and, when they do, their children often do not attend full time. These students are often ill prepared for college and are tracked into remedial courses for college, which in turn, deter direct admission into STEM programs (Aronson, 2008).

Further, class status and participation appear to matter in regard to educational experiences. When describing their college experiences, working- or lower-class students

perceive these experiences as scary and stressful. In contrast, those from middle- and upper-class upbringing describe it as a time for self-reflection. Low income youth often do not do well in their academic pursuits because they reject the dominant culture values regarding education. However, in so doing, they recreate the very outcomes of underachievement that they hope to avoid. Additionally, parents who are from low income populations are more pessimistic about their children's prospects for educational attainment (Aronson, 2008).

In the subsequent section neighborhood effects and stereotype threats that perpetuate group identity and thus educational under-achievement are discussed as possible reasons for the limited educational attainment experienced by African Americans. The roles that schools and teachers may play in the persistence of the under-achievement of African American students are also presented.

Neighborhood effects. Much discussion has occurred as to whether the neighborhoods in which students live and attend school have an effect on their educational outcomes. Most major urban cities in the United States are overtly segregated based upon race and class (Massey & Denton, 1993; Harding, Gennetian, Winship, Sanbonmatsu & Kling, 2011). Low income neighborhoods often have poor quality schools, inadequate child care facilities, as well as inferior recreational programs for children (Sastry & Pebley, 2010). Further, because of fewer economic resources, neighborhood schools differ in the general services available to students. Some neighborhoods may offer afterschool programs and homework help while others may not (Harding, et al., 2011).

Wilson (1987) predicted that social isolation for poor African Americans would continue to perpetuate a system where residents only interact with those of their own community of disproportionate poverty. Within these communities, the rate of joblessness

and the loss of well paying manufacturing jobs have eroded the employment base for many African Americans. This isolation has served to further limit access to and interactions with the dominant culture, as well as to limit access to economic and cultural connections (Stewart & Stewart, 2007).

As previously stated, Ogbu (2008) describes this collective identity as an oppositional identity that disavows values promoted by the dominant culture. Manski (1993) uses the economic term *endogenous effect* or *group effect* to further amplify the role and outcomes associated with collective behavior. Endogenous effects are related to the propensity of the individual to behave differently from the majority group. This includes the ways in which individual behavior can be predicted as an outcome of group identity and behavior (Manski, 1993; Manski, 1995). Manski (1995) questions whether the individual behaves like the group or group behavior is common to all individuals who comprise the group.

Wilson (1987) also raises questions about social observations of neighborhood patterns regarding the work habits of adults and how this affects children in the community. That is, in the case of a child who lives in a community in which he or she never sees community members consistently go to work is that child then more likely to believe this is a normative way of being? Additionally, is the inverse of this assertion also true: if a child sees parents who work hard and value education, are they likely to follow suit?

These adult patterns of behavior can also be extended to the education of children. Sastry & Pebley (2010) found that educational attainment for students is strongly correlated with the reading skills of the mother; an educated mother - regardless of income level - will better prepare her child academically. Unfortunately, they also found that children whose mothers are poorly educated and who have difficulty speaking Standard English have poorer

academic outcomes. The identified pattern is that mothers who are poorly educated and who do not speak Standard English serve as the primary educational models for their children resulting in academic underachievement.

Thus, although not a sole indicator of student success, the neighborhoods in which students live matter. The Moving to Opportunity Study (Burdick-Will, Ludwig, Raudenbush, Sampson, Sanbonmatsu & Sharkey, 2011) followed residents of public housing who were moved to middle income communities with fewer low income residents. They found that the students from these families were not always as successful as might be otherwise expected. They therefore concluded that although neighborhoods matter for educational attainment, simply removing students from poorer neighborhoods and placing them in a "better" neighborhood was not a guarantee of success. Students who remained in their low income community were often two years behind grade level. However, the students who moved also did not necessarily test on grade level within the new school system.

These findings seem to imply that student academic success is not only based on the neighborhood in which they reside. It also appears to be influenced by parents whose backgrounds and resources may or may not support the educational process. The authors concluded that creating more economically heterogeneous neighborhoods may be a factor that contributes to increased resources for schools. These increased resources could positively impact the educational attainment of low income students.

Stereotype threats and minority education. Stereotype threats are another factor that affect educational outcomes. Stereotype threats are the ways in which group- and self-identity are constructed based upon assumptions of inferiority or superiority (Martens, Johns, Greeberg, Schimel, 2006). These "threats" are therefore the transmittal of perceptions about

ability based upon a set of accepted assumptions constructed primarily by the dominant class and then imposed on others. Steele & Aronson (1995), the seminal writers on this subject, describe stereotype threats as a social-psychological predicament rooted in the belief system of American society. It is also viewed as a threat to self-integrity that implies a person is inferior or incompetent in comparison to the dominant group (Martens, Johns, Greenberg & Schimel, 2006).

White Americans have bought into the belief that African Americans possess lesser ability and intelligence (Steele & Aronson, 1995). This internalization has been supported by the fact that stereotype threats are transmitted through media, environment, peers, and teachers (Quinn & Spencer, 2001).Thus, when White Americans were polled in 1990, 53 percent indicated that they believed Blacks were less intelligent than Whites (Smith, 1990). This means that when African Americans, specifically students, feel that they are being treated as if they are less intelligent, they may be accurately assessing their circumstances. Therefore, when taking exams in academic settings, African Americans not only bear the challenge of performing well, but if they perform poorly they are also likely to internalize the belief that their poor performance will only serve to confirm the negative assumptions held by their White instructors (Aronson, Fried & Good, 2002).

Race attribution is related to stereotype threats and is significant in the United States. African Americans are constantly being compared to the White population when it comes to academic achievement (Aronson, Fried & Good, 2002). Test scores and economic success for predominantly African American schools and neighborhoods are constantly compared to those of White Americans. White achievement is used in these cases as the measure or the benchmark against which African American's must attain. This constant Black-White

comparison creates a vicious cycle in which African Americans must see how close they can come to acting White- intellectually and economically in order to be confirmed as being successful.

It is also important to note that positive stereotype threats such as those that refer to Asians as hard working also exist (Reyna, 2000). Thus, teachers may communicate faith in these students' ability to be successful even when Asian students are experiencing challenges academically. This process clearly may work in the favor of such students.

Racial stereotypes and gender stereotypes are two types of threats that also affect student self-identity and academic performance. Steele & Aronson (1995) linked race and gender when they tested the performance on the GRE (Graduate Record Examination) of 20 Black and White females attending Stanford University. They found that African American participants did worse on the exam when they were told that the test was a measure of their ability. The researchers also evaluated levels of anxiety using a standardized instrument that identified the students' racial group and quantified their performance scores. The results were used as a measure of students' awareness regarding their designated group as linked to the stereotypes and assumptions that the test givers might have about them. It was identified that the students in the study exhibited greater levels of anxiety. This seemed to be the case because they negatively considered the consequences of their comparatively poorer performance (Steele & Aronson, 1995).

Gender stereotypes, like racial stereotypes, foster negative assumptions about women as compared to men. A 1990 University of Michigan study (Beilock, 2010) found that girls scored worse than boys in math after they were told that girls tend to perform worse than boys. Thus, exposing research subjects to the belief that the group to which they belonged

usually does not do well caused a decline in their general performance. Additionally, Martens, Johns, Greenberg and Schimel (2005) found that females did significantly worse on a math test when they were exposed to the stereotype threat that women are poor math students. One group that received affirmation of their ability in general performed comparatively better. The authors concluded that exposure to this stereotype threat caused females to internalize the belief that they were poor at math. Internalization of that belief became a self-fulfilling prophecy.

Good, Aronson & Harder (2007) also compared the performance of females in an advanced calculus class in order to determine the ways in which females may be affected by 'pipeline' courses that lead to high level science or math careers. They found that females who were told that they were given the test simply to practice (the non-stereotype threat group) outperformed those who were told that their scores would be compared to a mostly male calculus class (the stereotype threat group). Of note was the fact that the non-threat group females also outperformed all the males in the comparison group. The researchers concluded that this was probably because females at this level have mastered the material. In contrast, males may be operating from the paradigm that they are able to succeed in these careers even if they have not fully mastered the subject matter.

Identity, neighborhood effects and stereotype threats. This discussion on stereotype threats indicates that racial assumptions based on phenotype matter. Group identity is strongly tied to the phenotype of the members that comprise the group and to the beliefs that others hold about the group and their phenotype. Group identity is also tied to the beliefs that the group holds about itself (Aronson, Fried & Good, 2001; Ogbu, 2008). I draw upon these implications to link together assertions made about identity, neighborhood and stereotypes.

Based on these assertions, collective identity for African Americans may be affected by their constantly being compared to White America in areas of academic ability, economic success, and status in the communities or neighborhoods in which they live. I expect that these comparisons increase levels of anxiety and perceived pressure when it comes to performance for African American students. I also agree with Banks' (2004) assertions that the need is for African Americans to move from cultural encapsulation to greater cultural identity. I expect that this process will begin with Africans Americans defining their self-construct as independent from the dominant culture and the assumptions made by Whites.

Further, these issues appear to be particularly relevant for assessing the access to STEM careers. STEM careers are currently dominated by Whites both male and female. Therefore if a prevailing assumption is that African Americans are less intelligent, then the related presumption is that they are not capable of participating in STEM programs where the majority of employees are White. There is additionally the compounded challenge for females of African phenotype that is based on the stereotypic belief that females are less able than men in math and science performance. This belief poses particular challenges for females who are attempting to succeed in STEM. In the subsequent section, I take a deeper look at empirical evidence regarding females as these relate to their STEM participation.

Women and STEM. This subsection provides a review of the empirical evidence related to females and their participation in STEM. Towards that end, a general overview is provided. Evidence regarding females' persistence in STEM careers is then reviewed. The subsection is concluded with data regarding STEM participation by females of African phenotype.

Women in STEM careers. Historically, women have systematically faced barriers in STEM education and STEM careers. Ultimately, they were not considered intelligent enough to excel (i.e., succeed or perform adequately) in initiatives involving math or science. They therefore were not allowed the same access and support in STEM education and STEM careers as men (Whaley, 2003).

This pattern of bias against women in STEM has been present since early Western civilization. Ancient Greek society was predominantly patriarchal and therefore held negative views about and debated the utility of education for women. Thus, philosophers such as Plato and Aristotle were compelled to question social attitudes regarding women and education. Although Plato felt that women should be educated and had some capacity for learning science and philosophy, Aristotle did not (Gornick, 1990).

It is this early ideology about the intellectual inferiority of women that have been passed on through the social and cultural values and belief that have historically informed the education systems of the Western World. A key example of the continued adverse outcomes related to this belief is the fact that until recently, Rosalind Franklin, who worked with Watson and Crick, received no credit for the work she contributed to the discovery of the DNA helix (Gornick, 1990).

Women pioneers in STEM working in the United States had described feeling invisible in the workplace. They further identified that they were drawn to the feminist movement as a way of exposing and addressing this problem (Gornick, 1990). Apparently, this feminist approach to STEM participation helped White women to make some headway in science careers. However, this advancement in the field may have been attributed in part to the fact that these women STEM participants shared a similar phenotype with the White men

who already dominated STEM. Thus, these women were able to gain some access (Lewis, 1977; Women's Environment and Development Organization [WEDO], 2000). Additionally, although affirmative action gave access to underrepresented groups in general within the workplace, White women have continued to be the largest beneficiaries of this policy (WEDO, 2000).

The National Science Foundation (2011) identified that in 2006 White males represented 55% of careers in science and engineering. White females held 18% of the positions. This meant that White males and White females combined represented 73% of all science and engineering workers in the United States in 2006.

Despite the relative success of White women in STEM, women in general continue to be underrepresented (Lee, 2002; NSF, 2011). Rayman & Brett (1995) found that White women who persisted in STEM careers did so because of parental encouragement, especially if one parent was already employed in a STEM career. Thus, the advantage of being a member of the dominant group coupled with encouragement from parents seems to give some White women enhanced access to STEM careers.

However, Huebner (2009) also found that females from varying racial groups who are encouraged by parents, exposed to role models, and who received encouragement from teachers, tend to persist in STEM education. Lee (2002) also found that the females who participated in a summer camp and persisted in STEM did so because of parental encouragement, as well as praise of their ability to succeed in math and science. Ultimately, regardless of race or phenotype, female's self-concepts regarding their ability in math and science greatly affect their success in STEM (Lee, 2002; Lloyd, Walsh & Yailagh, 2005).

Females and STEM persistence. Females who enter STEM education training do so because they feel competent in their ability to persist in the subjects that comprise STEM education. This appears to be the case even though there are so few females in these courses. Thus, an important factor in their persistence in STEM may be their ability to maintain a healthy self-concept in the face of increased competition with males (Martens, Johns, Greenberg & Schimel, 2006).

It is the case that a person's negative beliefs about his or her own intelligence can lead to feelings of inferiority and incompetence. These feelings of incompetence can arise from feeling unprepared academically for higher level courses (Martens, Johns, Greenberg & Schimel, 2006). Therefore, understanding the relationship between female's persistence in STEM and their general perception of their competence in STEM is important.

Dweck (2006) asserts that how people view their intelligence affects their subsequent performance and related success. Two ways in which intelligence may be viewed are outlined: gift-oriented intelligence versus growth-oriented intelligence. When intelligence is seen as a gift, the individual believes ability is innate and fixed. Therefore, when they experience levels of academic work that challenges their perception of their competence they lose confidence and motivation. In contrast, the growth-oriented mindset model sees intelligence as evolving. Therefore, persons who hold this view believe that with effort and hard work they can positively affect their academic outcomes. The growth-oriented mindset is generally supportive of the individual's confidence in their ability (Dweck, 2006; Hill, Corbett & Rose, 2010).

Thus, differences between gift-orientation and growth-orientation can therefore strongly affect the persistence of females in STEM education (Dweck, 2006; Hill, Corbett &

Rose, 2010). Grant & Dweck (2003) studied females in a premed Chemistry class in which there were mostly males. They found that if the females believed that their intellectual skills could be developed then they earned higher grades than their male peers. They additionally found that if these females felt that they were capable of learning the material and that they had the self-esteem to seek tutoring help when necessary. This was the case even if they were less prepared academically than their male peers.

Oaxaca, Leslie & McClure (1998) also found that students in college who felt that they were better prepared academically were more likely to persist in STEM education. They identified that White males as compared to Black males and females were more likely to feel prepared for their STEM education and courses. Therefore, the persistency rate of White males in STEM education was higher. Their confidence in their ability and their related persistence in STEM appeared to be based on their phenotype and gender.

An additional factor related to persistence in STEM during college education training was students' ability to participate in the culture or community of practice in STEM settings. Ong (2005) found that to be successful in STEM, females felt they needed to adapt to the community of practice exemplified in their STEM education and internships. That is they felt that they needed to become more like the persons and to imitate the practices of those who were most dominant in their STEM settings. Females from this study wore pants and suits in order to fit into the male dominated STEM community. They attempted to do so in order to appear less feminine in their appearance.

However, it was also found that female students may not persist in STEM if they feel that they do not fit into the STEM community of practice. Herzig (2004) found that the attrition rate for females in doctoral programs in mathematics was due to their difficulties

fitting into the community of practice within the mathematics program. They routinely shared that a primary reason that they left these programs was their overwhelming feelings of isolation. In contrast, those who remained in their doctoral programs cited support from and interaction with their teachers as a significant factor that helped their persistence.

Females of African phenotype in STEM. Access to and persistence in STEM careers appears to be particular challenging for females of African phenotype and especially if they are African American. For example, in 2005, forty percent of all full time faculty in colleges and universities in the United States were women. However, of the 7,000 computer science doctoral faculty in 2006 only 60 were African American women. Also, less than one percent of the 17,150 post-secondary teachers in engineering were African American women. African American women appeared to fare only slightly better in the biological sciences holding 380 out of 25,000 faculty positions (Hill, Corbett & Rose, 2010).

Of note in regard to this data is the fact that the cited statistics do not differentiate African Americans from women of African phenotype who belong to other ethnic groups. Therefore, it may be the case that the numbers cited do not truly represent the percentage of the African American present in STEM related careers. Instead, the statistics may be representative of all women of African phenotype employed in STEM careers within the United States, inclusive of Afro-Caribbeans and Africans.

Feelings of isolation are a significant problem in regard to the persistence of African Americans in STEM education and training that have been clear for some time. Bonous-Hammarth (2000) as well as Jenkins, Harburg, Weissberg, Donnelly (2004) found that African American college females felt isolated during their academic experience. This was determined to be the key factor regarding their rates of attrition from their academic

programs or their decisions to change their majors. Beoku-Betts (2004) presents a possible explanation for this phenomenon in her study of African females who attended colleges and universities in the United States and Europe. These females explained that they felt they were singled out as the "black girl". These participants described feeling that their African phenotype, as well as their teachers' and peers' perceptions of their phenotype impacted how they were accepted within the social context of their programs.

Johnson (2007) also found that females of color reported feeling unwelcomed in STEM education and STEM communities of practice. These women reported that in large lecture classes, they did not feel comfortable asking questions; stating that White males dominated the classroom interactions. These female students also indicated that they felt ostracized by other students who appeared to perceive them as lacking in ability and intelligence. These findings, when considered together with those from the studies previously cited suggest females of African phenotype may regularly be viewed as less intelligent by their White peers.

However, although such perceptions may also be the case for Afro-Caribbean females these women appear anecdotally to exhibit a higher level of persistence in STEM education and careers. Unfortunately, current literature provides little discussion and little empirical evidence about Afro-Caribbean females and their experiences in STEM careers. Despite the gender and phenotypic challenges that have been presented thus far, Afro-Caribbean women appear to have persisted in STEM training and continue to participate in STEM careers. This current study will contribute to the existing literature and evidence by exploring the ways in which Afro-Caribbean women from Panama who experience these gender and phenotype barriers, are able to persist in STEM education and participate in STEM careers.

In educational settings immigrants of African phenotype are grouped and racialized as African Americans. In this next section, I explore expectations that students of African phenotype, and specifically African Americans have regarding their teachers and educational institutions who serve them. These expectations result from the historical experiences of African Americans in the educational process and the stereotype threats that they encounter regarding their intelligence. An examination of the empirical research regarding best practices for African American students is undertaken in order to explore strategies that may support all females of African phenotype in their persistence of STEM careers. In the final subsection, I explore Afro-Caribbean history and culture in order to understand their success in STEM.

Empirical Evidence and Implications for Teachers and Teacher Education

The constant comparison between the test performance and outcomes of students of African phenotype (i.e., mostly African Americans) and White Americans has produced a focus on the underachievement of African American students. This "achievement gap" is often used to maintain the Black-White binary distracting from an equally important concern; that U.S. students, including Whites, are below performance when compared to their global counterparts (Wiggan, 2007).

Previous sections presented information regarding the challenges faced by persons of African phenotype and especially females of African phenotype. In response, this section identifies apparent implications and strategies from the literature and uses these to suggest approaches for teachers that may prove useful to supporting improved educational outcomes for their students of African phenotype.

Three themes from the literature appear to support potential educational success for students of African phenotype:

1. **Students of African phenotype and African American students in particular need to feel valued and have their culture and ethnicity valued and accepted (Harris & Marsh, 2010; Lynn, Bacon, Totten, Bridges & Jennings, 2010; Ladson-billings, 1995).**

   Given the history of African slavery in general and the African American experience in the United States, children of African phenotype need to feel that their culture and history is more than just one of forced servitude to Whites. This value emphasizes Banks (2004) typology of cultural psychological captivity. Students of African phenotype need to advance to levels of cultural identity where they value their unique heritage and also see it positively portrayed in the classroom and thus, valued by others. Students need to feel that their teachers know about, have cultural competence regarding their culture, and value their culture (Ladson-Billings, 1995).

2. **Teachers need to expect that their students of African phenotype and that their African American students in particular can succeed; they need to believe in them (Lynn et al., 2010; Wiggan, 2007;Tucker, Dixon, Griddine,2010; Cholewa, Amatea, West-Olatunji, Wright, 2012).**

   Students of African phenotype need teachers who have high expectations of them and believe in their ability. This is challenging given that according to Smith (1990) most White Americans feel that Blacks are intellectually inferior. Even more troubling, Tettegah (1996) found that White pre-service teachers rated Whites and Asians as equal in intelligence but felt that Hispanics and African Americans were lower in ability. She raised the question as to how

effective these White teachers would be teaching African American students (and by default, students of African phenotype) if they deem them intellectually inferior.

Lynn et al. (2010) conducted an 18 month ethnographic study at a failing school in the Mid-Atlantic region of the United States. Their findings overwhelmingly demonstrated that teachers, administrators and counselors believed the underachievement of the students was due to their lack of motivation and lack of family support. They further believed that the poor outcomes had nothing to do with their performance as teachers or support staff.

These findings are alarming because the teachers in the study, who were predominantly White, did not want to consider that the problem could be related to them as teachers. It was reported that one teacher even walked out of the focus group meeting. Again, student performance will be affected by teachers who do not expect them to be successful. Students in these environments will not positively connect to a school environment in which they do not feel supported.

Tucker, Dixon & Griddine (2010) found that African American male students at an inner-city school where they were academically successful noted that teachers treated them as if they mattered. One student said his teacher noticed when his grades slipped even a little and that she would comment that she expected him to make the needed improvement. This school was designed to reduce the drop-out rate among students in this community. To this end, teachers at this school had worthy focus: success for all students.

Wiggan (2007), in attempting to understand the reasons why some African American students were high achieving, found that having well trained, competent teachers was a major factor. Many inner city schools are often filled with new teachers who have little teaching experience and who are not competent in their handling of the curriculum. The students in

this study noted that they were exposed to teachers who were less competent and who did not seem to care about teaching. They described that these teachers did not assign enough challenging work and did not answer their questions satisfactorily when students wanted to go deeper into the class material.

3. **Students of African phenotype and African American students in particular need to experience a connection to their teachers, their classrooms, and their school (Li & Hasan, 2010; Lemberger & Clemens, 2012;Wiggan, 2007).**

Finally, students of African phenotype need to feel connected to their school. Cholewa, Amatea, West-Olatunjy and Wright (2012) found that highly successful teachers of African American students created a classroom environment of 'we', rather than "you" and "I". These "we"-based classrooms seemed to usefully promote a positive African American collective group identity. African American students as students of African phenotype are seeking a socially supportive structure within the schools they attend (Li & Hasdan, 2010). Lemberger and Clemens (2012) found that when they added a counseling intervention to aid inner city 4th and 5th grade African American students, test scores increased.

Thus, these three factors appear to be relevant for assisting teachers and schools to better support their students who are of African phenotype. Further, these strategies seem to be particularly important for and needed by African American students. Most important to this study, is the possibility that such strategies may prove to be beneficial for females of African phenotype who are attempting to succeed in STEM education and STEM careers. The section that follows presents information about the history of Afro-Caribbeans in Panama. It provides further foundation for understanding the persistence in STEM of the five Afro-Caribbean women from Panama who participated in this study.

Historical background of Afro-Caribbeans. Afro-Caribbeans have a cultural identity and cultural experience that is distinct from the identities and experiences of African Americans and Africans. This is the case because Afro-Caribbeans' historical experiences were different from those experienced by the other two groups. These differences included but were not limited to differences in their experiences of slavery during the African slave trade. Further, the cultural identities and cultural experiences of Panamanians of Afro-Caribbean descent are also distinct from those of their Afro-Caribbean peers who did not immigrate to Panama. These distinctions are discussed in this subsection.

Caribbean history of slavery and development of Caribbean identity. The islands of the Caribbean include such places as Barbados, Trinidad, Jamaica, Haiti and St. Lucia. Each of these islands is located in the Caribbean Sea and are collectively known as the West Indies. San Andres Island, located off the coast of Nicaragua, was also an important location because it was a port for the transfer of slaves to the various Caribbean islands (Woods, 2008).

The Caribbean islands were colonized by different European groups and thus the form of slavery that developed on each island varied in respect to the ways in which these divergent groups viewed their slaves. Colonizers who saw slaves as human beings, who were indentured for service, afforded their slaves more rights in general than those who saw their slaves strictly as chattel (Klein, 1986). Because of the ethnic and national diversity of slave owners, African slaves who were transported to the Caribbean islands were forced to interact with the Portuguese, the Spanish, the British and later Whites from the United States (Klein, 1986).

The methods that African slaves developed for surviving the inhumanity of slavery, as well as for developing and preserving their cultural and personal identities were as diverse as the Europeans who enslaved them. Several factors associated with Afro-Caribbean and African American slave history affected differences in the cultural identities and cultural experiences of these two groups. These factors are discussed here in order to outline the historical development of Caribbean identity.

The first factor that affected the identity of Afro-Caribbeans was their sense of being the phenotypic and ethnic majority (Waters, 1999). African slaves were a clear majority on most Caribbean islands. Slaves therefore could maintain some of their language and African culture because their interactions were largely among each other. They experienced few interactions with White slave owners (Klein, 1986).

When slavery ended, the decision was made, on most islands, to educate Afro-Caribbeans. Further, there were not enough Whites to maintain a hegemonic system in which the better jobs were monopolized by Whites only. Afro-Caribbeans were trained as skilled laborers and many could read and write (Klein, 1986). Thus, the challenges that most Afro-Caribbeans encountered, after the end of slavery, were primarily socio-economic as they worked to move from the acquisition class to the property class, rather than based on attitudes that attempted to cement them in a low-caste status (Bryce-Laporte, 1972: Waters, 1999).

African Americans' experiences, in this regard, were quite different from the Caribbean experience. Whites were the ethnic majority during and after slavery in the United States (Waters, 1999). African Americans were therefore compelled to survive within the parameters and dictates of the White culture (Ogbu, 1978; Waters, 1999). They were forced

to become more dependent upon Whites for their day to day existence than were their Afro-Caribbean counterparts.

The second difference is that Afro-Caribbeans were able to better affect their economics. Although the majority of slaves, both men and women, worked in the fields, some slaves in both the U.S. and the Caribbean were skilled artisans and carpenters. The Caribbean slaves were allowed to lend themselves out for hire and earn extra wages by using their skills. These wages were often used to pay for education or to buy their freedom and move into the free colored island communities that were founded in places like Jamaica, Cuba and Brazil (Klein, 1986; Scott, 2004).

On islands such as Barbados slaves also were allowed to grow food and sell or barter produce for other foods and household items (Beckles, 1999; Klein, 1986). According to Klein (1986):

> In most of the Caribbean and Latin American, plantation slaves were provided with their own separate gardens for raising food, most of which they consumed on their own. These *concucos*, gardens….became the basis for an alternative peasant life style…All adults had access to these "private" plots and were often allowed to sell excess production on the local market (p. 176).

In this way, they could acquire the "luxury" items that they desired. This sense of independence and the ability to directly affect their economic status heavily influenced the identity of Afro-Caribbeans in ways that are still evident today (Beckles, 1999; Klein, 1986).

Further, although plantation owners provided rations, the extra gardens allowed slaves a level of economic ownership and power. This occurred in part, because White society on the islands became dependent upon the produce of the slaves (Beckles, 1999).

Additionally, this opportunity had important cultural implications such as on islands like Jamaica where slaves continued to use the agricultural practices that they had brought with them from Africa (Senior, 1978).

A third difference that contributed to the identity of Afro-Caribbeans was the relative lack of consistency regarding the rules of manumission for Caribbeans (Waters, 1999). The Caribbean islands had a larger colored or mixed race population who had purchased or had been given their freedom. This is also an important issue in regard to comparisons that will be made later between the Caribbean and Panama; Panama had 33,000 freed ex-slaves compared to only 3,000 slaves on the Isthmus (Klein, 1986).

Further, in 1778, some plantation owners on the Islands even considered Afro-Caribbean women, who were the mothers of their children, as wives and referred to them as such (Beckles, 1999). In many cases, educational attainment was extended to these biracial children of slaves and owners.

The fourth factor contributing to Afro-Caribbean identity was the difference in governance and how these affected the establishment of the parameters of the slave system that dictated the behaviors of the slave holders. Plantation owners on the Caribbean islands were obliged to follow the mandates of their home countries i.e., Spain, England and France in regard to their treatment of their slaves. Over time, movements to abolish slavery gained substantial support in these countries (Klein, 1986). Although they generally occurred at different times, each governing country responded to changes in public opinion by imposing restrictions and implementing safeguards to ensure the proper treatment of slaves (Beckles, 1999).

Thus, the 1770's was called the Age of Amelioration in the Caribbean because the governing policy for slave holders became a mandate to invest in the lives of the slaves they had rather than import more slaves to replace them (Beckles,1999). Therefore, caring for and supporting pregnant women and families was a priority on the islands. Plantation owners constantly had to justify the deaths, runaways, and complaints that were levied against them by the slaves (Klein, 1986).

Several key policies were enacted during the Age of Amelioration. The Anglican Church imposed a day of worship for slaves living in British settlements. The church of Spain and Portugal also forced slave owners to allow time for slaves to worship. These early acknowledgements paved the way for later rights such as the Sunday and Marriage Act of 1876, which served to create a semblance of dignity for slaves. This Act enabled slaves to legitimize their marital unions so that families and children could remain intact (Beckles, 1999).

These influences initiated by the Church meant that: "by the late 18th and 19th century, all slaves were Christians and most slaves were guaranteed their Sundays and holidays, which could be used by them for both work and religious purposes" (Klein, 1986, p. 193). These concessions afforded Caribbean slaves privileges that were not extended to slaves in the United States. They reflected a significant change in policy via which Afro-Caribbean slaves came to be viewed as people and not chattel, as a result education was not restricted for reasons of intellectual inferiority.

Caribbean slaves and educational attainment. Differences in goals related to educational attainment identify another important factor that distinguishes Afro-Caribbean and African American slave experiences. Education was far more accessible for Afro-

Caribbeans as compared to African Americans. Although slave owners in the Caribbean were not setting up schools for their slaves, neither was education denied to them (Beckles, 1999).

According to Beckles (1999), "Caribbean slaves considered literacy and the attainment of professional skills to be critical in their pursuit of status and betterment in general" (p. 134). Slave mothers often paid Whites to teach their children how to read and write. They believed that these extra privileges would support their children in achieving freedom. Thus, as the freed slave populations on the islands grew so did their access to basic education (Klein, 1986). Ultimately, these eventualities meant that the ceiling regarding educational and occupational attainment was not as rigidly defined and enforced as in the United States (Ogbu, 1978). Clearly, in the Caribbean, getting an education yielded significant benefits and upward movement in class.

When slavery was abolished in the Caribbean islands, the general interaction between Blacks and Whites in the Caribbean changed from dominance to a more equitable commercial relationship. Whites belonged to the property class – they owned property and had access to and control over most of the necessary resources. After slavery ended, the former slaves were in a position to move from mere participation in the acquisition class to membership in the property-class. They had already begun to acquire resources during slavery. As freed and educated people they were able to gain access to the various forms of economic empowerment (Weber, 1994).

In summary, it is not my intent here to say that being a slave was easier in the Caribbean Islands. Any limits that a society places on the inherent freedoms of any its members, is by definition unacceptable. Nevertheless, the differences between the

experience of slavery in the Caribbean and the United Sates contributed substantially to the individual and collective identity of Afro-Caribbeans in comparison to African Americans.

Slave systems in the Caribbean provided opportunities of which Afro-Caribbeans quickly took advantage. They did so to improve their lives and the lives of their children. Their relative economic independence meant they were less dependent on Whites. These developments would, over time, restructure the class system on the islands and make it less about race and phenotype, and more about economic resources and commercial enterprise.

History of Panamanians of Afro-Caribbean descent. An important artifact of the expansion of Caribbean economic opportunity was that there were not enough jobs for ex-slaves who became a part of the free Caribbean island communities. Many of these Afro-Caribbeans turned to traveling seasonally from island to island during growing and harvesting seasons. For example, many traveled to Cuba to cut cane sugar or to Panama to pick bananas (Klein, 1986). In the 1850's many also migrated from Jamaica and Barbados to Panama to work on the building of the railroad. This exodus from the Islands was significant due to the high unemployment and poverty on these islands. Upwards of 32,000 men from Jamaica travelled to Panama to find work (Senior, 1978). In the next subsections, I provide a fuller discussion of the history of Panamanians of Afro-Caribbean descent and their experiences as participants in this migration to find work.

Caribbean migration to Panama. Panama is often referred to as the "The Crossroad of the World" because of its geographic location in Central America (Lewis, 1980). Panama is an 'S' shaped isthmus that lies between Colombia and Costa Rica. It is about 30,000 square miles and is bounded by the Pacific Ocean to the South and West and by the

Caribbean Sea on the North and East (Perilla, 2009). Panama is a land of dense tropical

forests, rugged mountains and thick jungles.

Today, 70% of Panamanians identify as *Mestizo*, a mixture of indigenous Indian and

Caucasian backgrounds, while 14% are of African descent. The remaining subgroups include

10% White; and. 6%Ameri-Indians which include the Kuna and Darien Indians, who are the

indigenous or Native American people of Panama (Perilla, 2009). Within the latter group are

those identified as *Congolese* Blacks, these are Black descendants of slaves or pirates who

came to Panama as a result of the Spanish slave trade during the 1500s (Lewis, 1980). The

remaining African population are those identified as Afro-Caribbean or *Afro-Antillanes*.

These are the descendants of people from the Caribbean islands who immigrated to Panama

to work on the railroad, banana plantations and later on the building of the Canal (Perilla,

2009).

The city of Colon, Panama was named after the explorer *Christobal Colon* (i.e.,

Christopher Columbus). It was a major port city for Caribbeans arriving in Panama. The

West Indian, or Afro-Caribbean population remained socially and culturally isolated in this

city and maintained their varying island cultures.

In regard to these distinctions, Jamaica and Barbados are Anglophone British islands.

Therefore, Afro-Caribbeans from these islands maintained their British-influenced culinary

preferences, art, and music (Lewis, 1980). However, these cultural distinctions became a

problem because Afro-Caribbeans worked hard to maintain their own language and culture as

separate from the Panamanian society into which they had immigrated. They deliberately did

not fully assimilate into Panamanian Spanish-speaking society, but maintained their

traditions, their English language and their British customs they brought from their home islands (Lewis, 1980).

In regard to the history of Panama, it was not an independent country when the United States took over the Canal project from the French. Instead, it was one of the provinces of Colombia (Park, 2000). President Roosevelt, who wanted a way to expand United States' territory by owning and operating the Canal, met with provincial leaders in the late 1800's. These leaders offered their support for Roosevelt's plan in regard to Panama's declaration of independence (Newton, 2004). As a result Panama became an independent republic in 1903 after a one day war with Colombia, during which they declared their independence with the support of the United States military (Park, 2000). This further resulted in a dependent relationship for Panama with the United States.

The United States quickly proceeded to stake its claim over this newly formed nation. The United States and Panama signed the Hay-Bunau-Varilla Treaty that gave the U.S. control over the land that would later become the Panama Canal and Canal Zone (Newton, 2004). This area was comprised of 45 miles of land within and directly outside the boundaries of Panama City. The treaty gave the United States the right to exist as an independent nation within the country of Panama (Newton, 2004).

In 1904, the Canal project was formally started. In concert with the project, the United States recruited upwards of 150,000 Afro-Caribbean immigrants, between1904 to 1914, to work on the Canal project. These Afro-Caribbeans were from the various Anglophone islands of the West Indies (Conniff, 1985). The Americans allowed the laborers to immigrate with their families. They also built schools and established housing for the newly arriving immigrants. Other community members such as shopkeepers, craftsmen,

ministers, seamstresses, teachers, and doctors immigrated to Panama as the Caribbeans were establishing the basis for a thriving community (Senior, 1978).

The West Indian community expanded to include not only the city of Colon, but also Caribbean townships such as Gamboa, Paraiso, and Pedro Miguel (Brown, 2011). Families who lived in these communities were able to maintain their Afro-Caribbean identity and did not acculturate into the Panamanian society at large. They chose to maintain English as their first language. They were able to do so by bringing in teachers from their home islands to instruct their children (Brown, 201; Conniff, 1985; Lewis, 1980).

The Latin Panamanians who expected to share the wealth and privilege found that they too held a place below White Americans. They were not accepted as equals. Additionally, because they did not speak English, many were not able to work on the Canal and were cut out of the economic opportunity they had hoped to garner (Newton, 2004).

Caribbeans and the United States' hegemonic system. An unfortunate outcome of Panama's treaty with the U.S. was that the United States proceeded to institute the racist rules for Black-White relations that had been implemented with African Americans. This hegemonic structure from the United States privileged Whites and sought to disenfranchise those of African phenotype by relegating them to a lower status in the American established caste system (Bryce-LaPorte, 1972; Ogbu, 1978). In response, the Afro-Caribbean immigrants, who had two generations of freedom prior to coming to work on the Canal, neither understood nor accepted this system (Conniff, 1985). As previously identified, the Afro-Caribbeans simply did not see themselves as racially or economically inferior (Ogbu, 1978; Bryce-LaPorte, 1972).

Nevertheless, their new life in Panama working with the Americans presented them with a system where only those who were employed by the Americans who ran the Canal could enjoy certain privileges. The Canal Zone boasted a commissary which offered foods and goods at cheaper costs than the rates at the local stores (Bryce-LaPorte, 1970). The hospitals on the Canal Zone were better equipped and the schools were preferable to those in the provinces of Panama (Bryce-Laporte, 1970). However, despite the advantages, this new system was reminiscent of the southern plantation system developed in the United States (Bryce-Laporte, 1970). Further, the Americans had recreated the privileges and social structure of home that separated by phenotype by erecting signs that designated places as for "Whites only"(Bryce-LaPorte, 1970).

Frank (1912) was a self-proclaimed vagabond, from the United States, who traveled throughout the world writing about the local people with whom he lived. He included in his journals his experiences as a Canal Zone policeman working with Afro-Caribbeans in Panama. He acknowledged that the West Indians were often better educated than their White Southern supervisors. However, because of the hegemonic system of which he was a part, he both condoned and justified the treatment of the Caribbean workers as second class citizens:

> For the American Negro is an untractable creature in large numbers, and the caste system that forbids White Americans from engaging in common labor side by side with Negroes is to be expected in an enterprise of which the leaders are not only military men but largely southerners. (p. 59).

Thus, he made it inevitable that as Caribbean immigrants interacted with Whites from the United States that they would refer to this hegemonic behavior as "Yankee racism" (Newton, 2004).

The Canal Zone supported a continued hegemony of racism in which Whites were privileged with power and authority over people of color (Bryce-Laporte, 1970). The Canal Zone police force was a separate entity that was run by Whites who could arrest and charge Blacks at will. In contrast, Black police officers could not arrest or detain Whites on the Canal Zone. All the judges and judicial authorities were White Americans (Bryce-Laporte, 1970).

Resisting racial hegemony. Engineer John Stevens was an example of Yankee racism. He was originally in charge of the Canal project and complained that the Afro-Caribbeans were lazy. He also complained that their work was inferior to the work produced by the European workforce (Newton, 2004).

The truth was that the Afro- Caribbeans were not used to the insults and harsh treatment that was endemic to the American hegemonic system. For example, facilities that segregated Blacks from Whites while eating and drinking were unfamiliar to the Caribbean workers. White America attempted to treat the Caribbean people as they did the African American community at home but the Caribbean workers did not know the rules for this system nor did they know their "place" in regard to which the Americans insisted that Afro-Caribbean's remain. As a result, the Caribbean workers did not accept or listen to the White foremen's orders and resisted the resultant poor treatment (Newton, 2004).

According to Newton (2004), White foremen who mistreated workers found that they not only resisted them by talking back, but, because many were educated, they wrote letters of complaint to supervisors and even to the President of the United States (Newton, 2004). Perhaps an outcome of this was that Stevens, whose behavior was the most reprehensible, was soon replaced by Colonel Goethals (Newton, 2004). Further, when the workers later

complained about the poor quality of food, President Roosevelt insisted that their food requirements be met (Newton, 2004). The collective identity demonstrated by these Afro-Caribbeans was such that they believed they could affect a change through their resistance, and they did.

A major shift was that Colonel Goethals allowed Caribbean foremen to oversee the workers, this resulted in higher productivity. The Caribbean workers were often skilled artisans who were equally as adept, if not more adept, than their White counterparts. These changes sent a clear message to the remaining foremen that American racialized behavior would not be tolerated by this group of Caribbeans of African phenotype. This was a major victory for the Caribbean workers and would prove to be a major breakthrough in regard to the existing hegemonic system (Newton, 2004).

The workers proved that they would not accept the racial treatment that White Americans assumed could be given to those of African phenotype. They also helped White Americans to see that due to their history, their collective identity was one that did not accept nor believe the assumptions regarding racial superiority based upon phenotype (Newton, 2004). They had created a new level in the caste system.

As a result, they were now prepared to challenge the economic system where Whites earned more than Blacks. They would later decide to immigrate to the United States where seemingly there was more opportunity for better wages. In the United States they would have opportunity to earn wages that were equal to their White counterparts. Thus, following the Civil Rights Movement and the passing of the Immigration and Nationality Act of 1965, countries such as Jamaica, Trinidad, and after 1966, Barbados, were able to gain access to the

United States in larger numbers than in the past. From 1961- 1970 almost 500,000 Caribbean immigrants entered the United States (Levine, 1987).

Robert Kennedy was able to get the Act passed because he convinced Congress that although they had access, the numbers of Black immigrants to the United States would not be significant (Kasinitz, 1992). He did not realize that he was giving access to a transnational group of people who saw immigration as an economic and occupational empowerment opportunity (Bryce-LaPorte, 1972). Today Caribbean immigrants of African phenotype are the largest immigrant Black population subgroup in the United States comprising 4.4% of the population (Williams, Haile, Neigbors, Gonzalez, Baser & Jackson, 2007).

United States and economic inequality. Hegemony not only affected the treatment of the Afro-Caribbeans it also affected their income. The Caribbeans were paid in what was called the silver roll, while White Americans were paid on the gold roll. This meant that White Americans and White Europeans were paid in American dollars based on the American pay scale. Black Caribbeans were paid in Panama silver according to the current exchange rate for local Panamanians based on the Spanish economy. Therefore, the same work and position yielded different pay and was based on phenotype (Newton, 2004; Conniff, 1985; O'Reggio, 2006).

An example of this disparity and inequity in pay was that if two men were doing the same job, the Black Caribbean was paid $80 per week, while his White counterpart was paid $150 per week (Exhibit of Canal workers. *El Museo Afro Antillano*, 2009). Although these wages were greater than the average Afro-Caribbean immigrant might have earned for work on his home island, the wages were nevertheless rooted in a racialized system that undermined equality.

Conclusion

As voluntary minorities to the United States, Caribbean immigrants are more similar to other immigrants than to African Americans of whom they share a common phenotype. The freedom to choose and the knowledge of a separate homeland is a significant part of their immigrant and Afro-Caribbean identity (Ogbu, 1978; Rogers, 2001). As immigrants they are interested in educational attainment and economic opportunity (Bryce-LaPorte, 1972; Ogbu, 1978). Their goal is not to compare themselves with Whites or hold them as the standard of comparison, but rather the standard is that of their home country and the life that was left behind. They have not internalized the stereotype threats that serve to limit the African American community. There is a greater freedom to compete and gain access without the extra burden of first disproving the beliefs and stereotypes that those of African phenotype are less intelligent (Smith, 1990).

Teachers seldom know the history of the students who are entrusted to their tutelage. For those of African phenotype many teachers tend to see slavery and its effects through the lens of United States slavery and racism. However, Afro-Caribbeans did not experience the same effects of bondage as their American counterparts. Their experiences with White Americans are often tolerated as a means to the end which is economic improvement (Bryce-Laporte, 1972). However, their tolerance is tempered by their self-identity.

Research has not addressed the strategies used by Afro-Caribbean women who participate in STEM careers. Through their persistence in STEM training they are able to participate in careers that render higher salaries and job security. As women, they have overcome the barriers due to African phenotype and the isolation that contributes to the attrition rate of women in STEM. The goal of this study is to identify specific strategies

that can be used to inform those that work with all females of African phenotype in their persistence of STEM in order to fill the shortage of STEM workers with those from underrepresented groups of women of African phenotype. In the next section the methodology will be discussed.

Chapter 3

Methodology

This chapter presents the methodology for this dissertation research. Several tasks are undertaken in order to usefully do so. Related methodological literatures that give evidence for the selection of the accepted qualitative research practice are reviewed and the specific qualitative approaches that are used for the current study are outlined. Next, the processes that guided the selection of my study participants are described. A brief discussion of the selection of the site is also provided. I then presented the protocol that was used for data collection, and finally, the procedures for the analysis of the collected data. The chapter concludes with a discussion of my study's relevance and contribution to the current knowledge base.

The role of the researcher is to determine which research design and what particular methodology will yield valid and reliable answers for identified research questions. Research questions may be broad or they may include rather specific hypothetical concerns (Creswell & Clark, 2007). My broad question would best be served through the lens of a qualitative approach.

Quantitative research seeks to answer questions that test a hypothesis through deductive methods (Creswell & Clark, 2007). Toward that end a general research question is developed. From this question several hypotheses are formulated. These hypotheses are then operationalized and made concrete in the form of a data collection tool (i.e., an interview, survey, pencil and paper form). The questions which comprise these tools are primarily closed questions. The rationale for this design is to limit the potential for extraneous

confounding variables. Quantitative data is analyzed through statistical processes using either parametric or nonparametric hypothesis tests (Creswell & Clark, 2007).

Qualitative designs are inductive. Knowledge is constructed from multiple observations and then a conclusion is drawn (Marshall & Rossman, 1989). Qualitative researchers attempt to use thick description in order to express as fully as possible the varied and nuanced meanings related to the events or observations they are attempting to explain (Geertz, 1973).

The exploration and understanding of how women of Afro-Caribbean descent are successfully in STEM careers and how they manage to overcome obstacles based upon gender and phenotype is not in the range of quantitative design methodology. The selected qualitative approach is the most beneficial way to address my research question because it creates an opportunity for women in STEM to share their experiences that are relevant to the supporting of other females who may choose STEM training and careers. Toward that end, I use a case study approach with a grounded theory design for data collection and procedures for analysis.

Case Study

In case study research the issue is explored through one or more cases within a bounded system (Creswell, 2007). A case study is an examination of a particular group, entity, or case within a system in order to understand their response to a particular event or their behaviors within a particular system (Merriam, 1988). The first step the researcher undergoes prior to conducting a case study is determining the number of cases, and the type and extent of the data sources. The data sources for a case study may include observations, interviews, or reports and documents (Creswell, 2007).

There are four properties of qualitative case study: particularistic, descriptive, heuristic, and inductive. These properties are not mutually exclusive and can all be seen in a single research study. The particularistic case study focuses on a particular situation or event such as looking at how a particular group of people may respond to a particular event in time (Merriam, 1988). A descriptive case study is often longitudinal in nature and will produce a "thick description" of a particular event or case being observed (Merriam, 1988). It includes a thorough description of the context and inquiry focus (Lincoln & Guba, 1985). The heuristic case study focuses on the emergence of new information, vocabulary or a new way of looking at a particular situation (Merriam, 1988). Last, the focus of the inductive case study is the emergence of hypothesis, key concepts and theories from the data at the conclusion of the study. For this study I employed particularistic and heuristic case study model while including the aspects of thick descriptions from descriptive cases.

The rationale for my use of case study is to explore the lived experiences of a particular group of Afro-Caribbean women from the country of Panama. My goal is to better understand the strategies that enabled these women to persist in their STEM training and participate in their STEM career. The selected case study approach affords the opportunity to focus on this small group, to thickly describe their reported strategies and to see what concepts and theory emerge from the data. My stated goal is to use this new information to train teachers to better support females of African phenotype in STEM education.

I followed Bogdan & Biklen's (2007) life history design in order to gain a firsthand account of the lived experiences of my participants. The life history approach allows the participants to use their own voice in the telling of the narrative. According to Schneider (2002), "the two most common reasons for writing life histories are to portray the events and

experiences of an extraordinary person and to emphasize a person whose life illustrates the experiences and history of others in the region"(p.118). Life histories are different from oral histories. An oral history is an account of collective memory from individuals that is deemed important to pass on. Oral histories also include stories by people that may be folklore (Schneider, 1995). Additionally, a story is a random string of events that are not necessarily ordered by time. Whereas, a narrative is an ordered sequence of events; a narrative can have a story, but a story may not necessarily be a narrative (Labov, 1972). My hope for this study is to articulate the strategies through the narrative stories from five cases; women who were successful in their journey through their STEM training and into their STEM career.

Research Questions

As stated in the introduction chapter, the overarching research question for this qualitative study is: What key factors from the lived experiences of Panamanian Afro-Caribbean women in STEM careers can be used to inform work with females of African phenotype in their pursuit of STEM education and STEM careers?

The sub-questions are:

1. What socio-cultural elements identified by these Afro-Caribbean women from Panama were most important in shaping their identity and resulted in their success in STEM?

2. What specific advantages, skills, attitudes, and strategies learned from their cultural identity enabled these Afro-Caribbean women from Panama to negotiate the barriers in STEM classrooms and workplaces (such as gender, socio-cultural differences, or African phenotype)?

3. What strategies and skills from the lived experiences of these Afro-Caribbean women from Panama might be used to inform educators in order to support all females of African phenotype in STEM education and careers?

Interview questions are located in Appendix 2.

Selection of Participants

Five Afro-Caribbean women from Panama who are of African phenotype and presently working or formerly worked in a STEM career in New York City were selected for inclusion for the current study. A purposive sample, (Bogdan & Biklen, 2007; Creswell, 2007; Lincoln & Guba, 1985) was determined to best meet the needs of this research because the women were from a specific immigrant population representing a specific community in the United States with information and strategies to forge an understanding of the research question that would lead to a grounded theory design analysis (Lincoln & Guba, 1985). Three selection criteria for the purposive sample were used.

The first criterion was that the women had to be currently or previously employed in a STEM career. The women selected had each worked in a STEM related field of practice. They also were able to describe the training processes that lead to their placement in a STEM career.

The second criterion for selection was the participants had to verify that their parents or grandparents had voluntarily immigrated to Panama from various Caribbean islands in order to work on the Panama Canal. The purpose for this criterion for selection for these women was to distinguish them from women of African phenotype who were brought involuntarily to Panama as a direct result of slavery. Women of African phenotype whose ancestors arrived in Panama due to slavery were not included in the study. Additionally,

women of African phenotype who are descendants of early pirates or ex-slaves who reside in

Panama were not included in the study.

The identified participants were also selected because they met the final criteria for

inclusion in this study; their families migrated to the United States between 1960 and 1975.

Many arrived as a result of the change in the Immigration and Naturalization laws of 1965

which allowed for the unification of families if a member was already in the United States.

For example, Afro-Caribbean women that migrated to the United States to fill a nursing

shortage were allowed to send for husbands and children to join them in the United States

(Clark & Riveire, 1989). All Participants entered the United States via New York City and

lived in New York City for more than ten years.

Selected participants were originally from either the Afro-Caribbean communities

located in Panama City, Panama or from the Afro-Caribbean community in the city of Colon,

Panama. Three of the women interviewed were retired, and although they still have homes in

New York City, they also have homes in Panama where they live part of the year. One

participant resides in North Carolina and is employed at one of the prestigious research

university hospitals. The final participant lived and worked in New York City for the Board

of Education at the time of this study.

All participants were English speakers, but this was often in the form of Creole

English. All but one had a very distinct Caribbean accent. However, even the participant with

the least accent used cultural phrases. Further, as Spanish is the primary language in Panama,

and all of the participants attended Spanish speaking primary schools at least through grade

six, they were all bilingual and fluent in both English and Spanish. This meant that during

their interviews they often code switched; they switched between English and Spanish as they tried to retell an event or share a particular concept.

I was able to identify my participants through contacts identified by family, friends, and their leads into the Panamanian Afro-Caribbean community. Many women who were recommended for this study were not included because they either did not work in a STEM career, did not live and work part of their lives in the United States or they did not immigrate to the United States during the designated time period. Therefore, all women who are in the study were carefully selected in the purposive sample. I included one participant who was a psychology instructor and social worker because I used the broader definition of STEM workers provided by the National Center for Educational Statistics (2009).

Participant Recruitment

The protocol for contacting participants, setting meeting times and places, and completing audio recordings were taken from Morrissey (2006). I contacted each participant by email and telephone to set up interviews, and arranged observations for my non-retired participants. Interviews lasted a total of six hours and observations averaged between three and six hours. The retired women, I met either at their homes or at a restaurant. These women showed me pictures; in addition I was able to secure artifacts from public web sites.

At the initial meeting the Institutional Review Board paperwork was completed and signed. Participants were also directed to select a pseudonym which ensured their anonymity but also used to designate who they are in the study. Interviews generally began with the written survey questions; however the meeting with one participant from North Carolina began with the observation of her class instruction. I used the interview questions found in

Appendix 3 but this was done in a semi-informal manner for all participants. Even though

the order of the questions was not adhered to strictly, all questions were eventually asked.

Rationale for Selection of Site

New York City is a major port of entry for all immigrants and specifically for people

from the Caribbean. In a report by Advincula (2007) it was identified that 37 % of all New

Yorkers are foreign born. A significant number of the foreign born were Afro- Caribbeans:

160,000 were Jamaican; 90,000 were Haitian; 86,300 were from Trinidad and Tobago;

25,000 were from Barbados; and 17,000 were from other parts of the West Indies. In regard

to Panamanian immigrants to the United States , census data identified that there were

13,076 Panamanian immigrants in 1960; 20,046 in 1970; 60,740 in 1980; 85,737 in 1990;

and 105,177 in 2000 (Gibson & Jung, 2006).

Procedure and Methods of Data Collection

Interview questions. In qualitative research, knowledge is produced through social

interactions (Kvale & Brinkmann, 2009). In this process, an interview is an "an interchange

of views between two persons conversing about a common theme" (Kvale, 1996, p. 44). As

the interviewer, I used the traveler approach in which I choose to take a thematic journey

with my participants. The purpose of the journey was to find out information that could lead

to change in support of female students of African phenotype (Kvale, 1996; Kvale &

Brinkmann, 2009). Specifically, I hoped to gain insight into how teachers might improve

their pedagogy in order to support female students of African phenotype via the information

presented by these five women.

Further, the epistemological approach for interviewing identifies seven features of

interview knowledge (Kvale & Brinkmann, 2009). These include: knowledge as production;

knowledge as conversational; knowledge as contextual; knowledge as relational; as well as knowledge as linguistic or as it uses language; knowledge as pragmatic; and knowledge as narrative (Kvale & Brinkmann, 2009).

Interview questions were developed for the overarching question and the sub-questions Glesne (2006). I used the first two steps from Kvale & Brinkmann (2009) i.e., thematizing and designing questions model in order to cluster the interview questions around my research questions. I was careful not to include leading or presupposition questions (Glesne, 2006). From time to time in the conversations I used informal questions in order to draw out information that would further address the research questions (Patton, 1980).

The question types that I drew upon included experience/behavior questions, opinion/values questions, and knowledge questions (Patton, 1980). In addressing the issue of clarity, I tried not to add multiple parts to one question, but kept them simple (Patton, 1980). This resulted in a longer script of interview questions or probing questions per research question (Schatzman & Strauss, 1973; LeCompte & Preissle, 1993).

I avoided 'why' questions since these indicate 'cause-effect' type relationships (Patton, 1980). However, I did use 'why' to ask about the neighborhoods that participants' families had chosen when they came to the United States. The purpose here was to help the interviewee to more deeply consider particular aspects of this decision which may have influenced their outcomes in STEM. All interviews were tape recorded. Again, all interview questions are located in Appendix 3.

Fieldnotes and observations. I used recommended protocol for data collection when developing fieldnotes which included jottings, headnotes and memos (Emerson, Fretz & Shaw, 1995; Schatzman & Strauss, 1973; Mason, 1996). I employed two forms of fieldnotes:

key word jottings and whole text jottings (LeCompte & Preissle, 1993). During interviews I

used jottings or drawings in order to clarify the information from the participant (Emerson,

Fretz & Shaw, 1995; Schatzman & Strauss, 1973). Jottings were not always in complete

sentences, but rather abbreviations or shorthand that I created. I used a composition book for

most notes and a small 4inch spiral notebook for field observations like the community

health fair I attended with one of the participants.

I wrote a daily journal about my interactions with each participant which included the

date, the participant pseudonym as per the Institutional Review Board, and a brief overview

of the interaction from my perspective as the researcher (Emerson, Fretz & Shaw, 1995;

Schatzman & Strauss, 1973). The journal was for information from the interviews but was

also used for catharsis in that I was able to write my reflection of the experience(Lincoln &

Guba, 1985). I also maintained contact information such as telephone numbers and email

address in this journal.

Surveys. The survey I developed (see Appendix 2) was emailed to those participants

who were not retired. Email contact with the three retired participants was not always an

option because in both cases the initial interview meeting was set by phone. Therefore, these

participants completed the survey when we met in person.

The protocol for writing this survey was taken from several sources. I drew upon

LeCompte & Preissle (1993) description of a confirmation survey which uses structured

questions to gather key information. The questions were closed and quantifiable (Marshall &

Rossman, 1989). The survey also included nominal questions about age, school attendance,

and college major and degree (LeCompte & Preissle, 1993). The structural framework for the

survey was borrowed from Bourque & Fielder (1995). Their approach provided guidance

regarding the development of heading sections, instructions for the participants and the structure for the spacing of the questions.

Methods of data analysis. I personally transcribed all recorded interviews verbatim and typed all memos and fieldnotes. I made three sets of participant transcripts. I printed each participant's transcript on a different color paper so that I could easily distinguish the participant based upon the color of their transcription.

Using the first set of transcripts, I began by open coding or categorizing the data from each participant based upon the research sub-questions (Strauss & Corbin, 1990). I began to formulate general categories that emerged in the sub-questions. This was done by reading through and identifying the common responses to each sub-question.

With the next set of transcriptions I cut apart all sub-question answers for each participant and created a filing system based upon the sub-question. Within these sub-questions, I examined each participant's answers and used more axial coding by putting the data back together for all participants based upon the categories and identifying the themes that began to emerge (Strauss & Corbin, 1990; Emerson, Fretz & Shaw, 1995). From these new themes and patterns I generated code notes, or memos, based upon the emergent information gleaned from each participant's responses to the sub-question, but also from all participants as a group (Strauss & Corbin, 1990).

I use the final color coded copy of all transcripts to highlight patterns based upon key words used and similar descriptions and key quotes that I wanted to include (Schatman & Strauss, 1973). I then collated the categories and sub-questions around core categories that emerged from the data of all participants. Using a selective coding process, I ensured that categories revolved around the central theme which reflected back to my research question

(Strauss & Corbin, 1990). In this way I looked for linkages and schema across all participants in order to answer my main research question and to also identify emergent theories (Schatzman & Strauss, 1973). Open coding, axial coding and selective coding are the three basic types of analysis for grounded theory research (Corbin & Strauss, 1990).

This study was based on a grounded theory approach and uses the procedures and protocol for such a design (Corbin & Strauss, 1990). In grounded theory knowledge is derived inductively, or going from the particular to the general, it is derived from the data analysis as it pertains to the cases (Strauss & Corbin, 1990). This is preferable because in research where the question encompasses multiple possible realities, no one theory can best explain the implications of the data (Lincoln & Guba, 1985). Procedures and protocols for grounded theory came from Strauss & Corbin (1990) which included the coding strategies of open coding, axial and selective coding. Data analysis began from the time of initial collection or interviews and categories were developed from constant comparisons derived from the theoretical memos written by the researcher. Constant comparisons included comparing incidents, stories and descriptions that were similar for all participants (Lincon & Guba, 1985).

During key points in the analysis, such as after the general description of the participants and at the end of the analysis of all the sub-questions, I contacted all participants for member checking in order to ensure that they were in agreement of my analyses. Additionally, when the results draft was completed I emailed all participants a copy and then followed up by telephone (Glesne, 2006; Lincoln & Guba, 1985).

My data was triangulated using Creswell's (2007) forms of data schemes. This was accomplished via open-ended interview questions, field notes from observations and the

survey. I also collected artifacts from each participant. These included pictures, brochures or other materials that provided insight regarding their personal backgrounds and/or professional accomplishments. Additional artifacts were collected from the World Wide Web and were public documents.

Position of the Researcher

As the primary researcher I am also an insider. I am a first generation Panamanian immigrant female and have family and social ties to the Panamanian community in New York City. I arrived in the United States at age six speaking Creole-English and primarily Spanish. Since I still understand and speak some Spanish the women were comfortable in code switching between languages. In my analysis I make every attempt to maintain their voice so that when they speak Spanish the words are transcribed in Spanish and are indicated in italics. In brackets I enter the translation or I provide a translation after a direct quote. Two participants used multiple Caribbean/Jamaican phrases. These phrases were also incorporated into the analyses and relevant explanations are provided.

Study Relevance

There is a distinct shortage of qualified people in STEM careers in general. Additionally, women of African phenotype continue to be significantly underrepresented in STEM related fields of employment. Teachers are primary gatekeepers for successful training and preparation for STEM. They are therefore potentially key supporters for students who will enter these career pathways. It is hoped that the information gleaned from the five women identified in this study can be used by teachers to change the trajectory of females of African phenotype who may be interested in STEM careers. Through the stories of these women, there is opportunity to increase the participation of females in all STEM fields and to

add to the diversity therein. Such an eventuality might enable the United States to be more competitive and fill these positions with those from within its borders rather than rely upon foreign workers to do so. Additionally, in supporting the persistence of females in STEM it is hoped that there would be an increase in science and math teachers from this underrepresented population. More information is needed about women who have been successful in overcoming the barriers that exist due to gender and African phenotype. The Afro-Caribbean women identified in this study may serve as important informants for assisting other females of African phenotype to persist in STEM education and to persist in their pursuit of STEM careers.

Chapter 4

Results

Introduction

This chapter provides a review of the results for the conducted study. To accomplish this task, analyses based on the employed grounded theory approach are discussed. The chapter begins with a summary description of data collected via the study survey for each of the five study participants. This demographic information is provided in table format to assist the reader to recall each participant within the context of the analyses that follow later in the chapter. I also include a description of each participant's housing information during childhood to provide enhanced insight about their economic backgrounds during their formative years. It was anticipated that such insight, based on the study participants' interview responses, would help the reader to better grasp the reasons why they or their parents would later chose the homes they did in the United States.

The second section of the chapter is an analysis regarding each of the research questions developed for the study. The subsections of this section address each of the respective sub-questions in order they were proposed (i.e., 1, 2 and then 3). Participants' interview responses are presented for each research question and sub-question.

The information for sub-question 1 provides descriptive narratives for each of the study participants in regard to their socio-cultural background. These narratives summarize information about their family of origin, how they chose their career and how they self-identify in regard to their ethnicity and phenotype. Review of responses to this question also includes a quote from each participant that is intended to thematically introduce them to the reader.

The section that reviews research sub-question 2 includes each participant's description of the strategies and advantages they believe best contributed to the successful participation in their particular STEM career. These strategies and advantages are presented in the section as a list and description of the values and beliefs acquired from their upbringing and which they each perceived to have most contributed to their success in STEM. The section also presents each participant's beliefs regarding the ways in which their socio-cultural backgrounds, gender and phenotype affected their education and training for participation in their STEM career. These descriptions are then related to how they employed their self- identified strategies and perceived advantages to help them navigate through the socio-cultural, gender-based and phenotype-based barriers encountered while pursuing their STEM careers.

Participants' responses to research sub-question 3 are presented in the final section of the chapter. This section provides the recommendations participants stated they would offer to teachers in order to help pre-service and career educators better support female students of African phenotype in STEM training and STEM career pathways. Their recommendations for addressing the barriers, strategies for encouraging more females of African phenotype, and specific recommendations for increasing the number of females of African phenotype in STEM, are discussed.

Spanish words and phrases are italicized throughout the body of the Chapter. For this reason the reader will find that many school names and cities are also italicized. Brackets are used within direct quotes to denote my comments that are inserted for the purpose of clarification. Additionally, as stated in the introductory chapter, the term 'Black' will refer to

all subgroups of people exhibiting African phenotype but specifically African Americans and Afro-Caribbean.

Research Questions and Sub-questions

As a reminder to the reader the overarching research question for this dissertation is: What key factors from the lived experiences of Panamanian Afro-Caribbean women in STEM careers can be used to inform work with females of African phenotype in their pursuit of STEM education and STEM careers?

The sub-questions are:

1. What socio-cultural elements identified by these Afro-Caribbean women from Panama were most important in shaping their identity and resulted in their success in STEM?

2. What specific advantages, skills, attitudes, and strategies learned from their cultural identity enabled these Afro-Caribbean women from Panama to negotiate the barriers in STEM classrooms and workplaces (such as gender, socio-cultural differences, or African phenotype)?

3. What strategies and skills from the lived experiences of these Afro-Caribbean women from Panama might be used to inform educators in order to support all females of African phenotype in STEM education and careers?

I begin with the results that address the overarching question.

Overarching Research Question: What key factors from the lived experiences of Panamanian Afro-Caribbean women in STEM careers can be used to inform work with females of African phenotype in their pursuit of STEM education and STEM careers?

General Description of Participants

Five participants were identified, selected for inclusion, and interviewed for this

research study. Their fictitious names are Andrea, Afia, Fusia, Dorcas and Nubia (see Table

1). These pseudonyms were each identified and selected by the participants as their own

designation.

Table 1: *Participant Demographic Information*

Participant's Names	Afia	Andrea	Fusia	Nubia	Dorcas
Degrees	BA: Psychology MS: Psychology/ Social Work	Nursing school in Panama - 3 yr. program BA: Health Education MA: Public Administration / Quality Control Training Certificate	BA: Natural Science MD: Podiatry	BA: Nursing MA: Adult Clinical Specialty	BS: Premed/ Biology/ Chemistry MA: Education
Employment Status	Retired	Retired	Employed	Employed	Retired
Professional Titles	School Program Coordinator	Nurse	Podiatrist	Professor/ Nurse	Mid/ High School Teacher
Professional Titles	Professor	Nurse Coordinator -Quality Control specialist	Health Specialist/ Public Schools -Grants Manager	Professor - School of Nursing	
Age at time of Migration	21	26	15	12	23
Educational Training Location	K-12 in Panama 1yr College in Panama	K-12 & Nursing Training in Panama	K-9 in Panama	K-6 in Panama	K-12 & College in Panama

Of the five participants, Nubia immigrated to the United States at the youngest age, whereas Andrea was the oldest at the time that she came to the United States. Nubia and Fusia both attended high school and college in the United States. Afia came to the United States to attend college. Dorcas and Andrea had completed their college education in Panama. Both went on to earn Master's degrees in the United States. All the women were trailblazers with regards to their STEM employment. For example, Andrea, Nubia, and Dorcas in particular were the first women of African phenotype in the positions they held.

Interviews with the five participants were completed in several different places. My interviews with participants Dorcas and Afia were conducted at their homes. I met Fusia and Nubia at their offices but interviewed them when we either went to lunch or for tea. The interview with Andrea was completed at a local restaurant near her home.

All of the participants described their childhood families as either low income or lower-middle class. Two of the women, Afia and Andrea, offered that today they would use the word 'poor' to describe their family-of-origin. However, at the time they did not realize this because growing up they felt that their basic needs were always met. Andrea further explained her perception of this experience, "We were poor but we never saw ourselves as poor. We ate every day. Nobody ever came and cut off our lights. Nobody ever came and removed a piece of our furniture because it wasn't paid for" (Andrea transcript lines 171-174). Since participants' parents or grandparents appeared to have somewhat steady but meager incomes they did not have the capital to support all of their children's or grandchildren's aspirations. Thus, all of the participants reported that they worked and contributed financially to their own college education.

All of the participants stated that, at the time of their interviews, they maintained a primary residence within the United States. Two of the five participants, Andrea and Dorcas, stated that they have second homes in Panama City, Panama. Dorcas, Andrea, Afia and Andrea were residing in New York City at the time of their interviews. Nubia was living in Raleigh-Durham, North Carolina when she was interviewed.

Each of the five participants reported that they either lived in Panama City, Panama or the city of *Colon*, Panama during their upbringing. As previously mentioned in the Review of Literature section, Panama City is the capital of Panama and is located on the Pacific Ocean. I have previously identified that *Colon*, located on the Caribbean Sea, is historically the primary point of entry for the many Caribbean immigrants who came to Panama to help build the Panama Canal and later work on the Canal Zone.

Three of the study participants described the two communities in Panama City in which they had lived as children. Fusia described her experiences in *San Miguel*. Dorcas and Afia described their homes in *Calidonia*. *San Miguel* and *Calidonia* are both located south of the downtown area of Panama City. They described that these two communities were primarily comprised of West Indians. As a result they spoke English in and around home, but Spanish mostly at school. These communities are reputed to still be primarily populated by lower income or "poor" families.

Afia had a somewhat different residential experience. Initially, her family lived in *La Boca* which is located within the Canal Zone. This was a middle class neighborhood for silver workers who were Caribbean workers whose earnings were paid in Central American wages. Explanation of this pay scheme is provided in Chapter 2. Prior to the 1950's, this community set aside exclusively for West Indians and was all Black. The community boasted

homes that were built by Americans. These homes were therefore similar to homes that

would be found in the United States; they were larger than the average Panamanian home.

La Boca experienced the forced removal of the silver workers so that the

neighborhood could become a Whites only neighborhood. Afia suspects this was because *La*

Boca is located on prime beachfront. This report from Afia affirms assertions from the

literature that the United States attempted to establish Jim Crow like- restrictions based upon

phenotype. These restrictions were representative of the United States' policies at the time.

Unfortunately, after Afia's grandfather retired, the family moved to *Calidonia* in

Panama City where they lived in a tenement building. She referred to this move as a "lower

standard of living" for them.

The final two participants, Andrea and Nubia, described their upbringing in *Colon*.

They shared that their experiences did not include restrictions due to phenotype. Most of the

homes and businesses were occupied by those of Caribbean descent. Andrea and Nubia also

reported that their families lived in apartments when they were children. The apartments

consisted of one bedroom, a living room, kitchen and a bathroom.

Dorcas and Fusia, and later Afia reported that they lived in tenement buildings in

Panama City. Tenement buildings provide apartments for multiple families who share a

common bathroom and shower. The private quarters for the families generally included one

large room and kitchen area. The ceilings in these buildings were often high. Many families

therefore added a *tabanko,* a loft that created a separate sleeping space.

As a note of interest and in regard to socio-cultural identifications and inclusion, three

of the five participants had *a mola* displayed in their home or office. A *mola* is a piece of

handmade cloth artwork sewn by the Kuna Indians, one of the many indigenous people of

Panama. The *mola* has been adopted as a symbol of cultural pride for all Panamanians. It is traditionally sewn with a red background and has colored stitching that usually depicts a bird or other animal indigenous to the rainforest of Panama. My participants appeared to be displaying their pride regarding their integrated cultural heritage as Afro-Caribbeans but also as Panamanian citizens. This emphasis of their pride in their heritage is captured in the analyses of their responses to the research questions that are reviewed in the next sections.

Research Sub-Question 1: Family, identity and transition to United States.
What socio-cultural elements identified by these Afro-Caribbean women from Panama were most important in shaping their identity and resulted in their success in STEM?

Nubia the University Professor and Practicing Nurse. *"A teacher and a practicing nurse...they said I was a natural teacher" (Nubia fieldnotes.071712.)*

Nubia's family lived in *Colon* near the fire station. Her maternal grandparents came to Panama from Barbados and her father's parents were from Jamaica and Martinique. Both her parents worked. After the building of the Canal, many jobs were created for the maintenance of the community and the Canal structure. Her father was a meter reader for the *Colon* "Light Company" (the local electric utility company). Her mother worked for an import/export company in *Colon*. Her grandfather was a retired welder who had worked in the building of the Canal.

Nubia's grandparents lived in the same home with her parents, her two brothers, and her two sisters. She attended *Republica de Paraguay* Elementary/Mid school. [Fusia later explained to me that schools in Panama were named after embassies that were located in Panama. In return students who attended a particular country's school learned about the culture and history of that country. Countries from various continents were represented.]

Nubia's mother had initially visited 'the States' (this is the term used by my participants to refer to the United States) to attend her oldest sister's wedding. She was able to extend her visa because she found a sponsoring family for whom she worked as a domestic. Her mother worked for two years while her husband was in Panama with the children and worked at his job at the Light Company.

On February 17, 1965 (her mother's birthday) the family was finally reunited, in the United States, at their new home in the Bushwick section of Brooklyn. Her mother had sent them all coats to aid in the transition from the tropical 70 degree temperatures of Panama to the frigid single digits that greeted them when they arrived in New York City. According to Nubia, her mother had secured a three bedroom apartment and had everything ready for them: furnishings and winter clothing. Her preparations for the children also included enrolling them at their new school which they started the following week. The family would later purchase a home in this neighborhood. This home is still owned by her family.

Nubia attended middle and high school in the States and then went on to Hunter College where she earned her Bachelors of Science in Nursing. After graduation she was employed as a nurse for New York Cornell Hospital. She was the only Black nurse hired for the day shift. She stayed there two years and then resigned. She later returned to school to work on a Master's degree in Adult Clinical Specialty. She then worked at various hospitals in the New York area, as well as at an insurance company. In 1998, she accepted a position at the University of North Carolina Research Hospital as an emergency room nurse, where she was employed at the time of her interview.

After a few years at the hospital in North Carolina she also became a professor in the School of Nursing at North Carolina Central University, one of the Historically Black

Colleges. At the time of her interview, she was dividing her time between teaching on Mondays and Wednesdays at the University and clinical practice at the Hospital on Thursdays, Fridays and Saturdays.

She explained that her emergency room experiences served to enhance her teaching by keeping her current regarding up-to-date practice in patient care. Additionally, Nubia identified that she teaches a Pediatric Advanced Life Support and Adult Advance Life Support certification course four times a year. She also stated that she teaches other certification courses sponsored by the American Heart Association which are required for the hospital medical, nursing, and emergency room staff.

Describing Nubia. Our initial meeting was at the Adult Advance Life Support class which she teaches at a satellite campus site for the Research Hospital and University. The staff spoke highly of her as a professional. I sat in for two classes that were each over an hour in length. The attendees were nurses or physicians who worked at the hospital. The mostly White students studied a manual prior to attendance; Nubia's job was to create emergency room scenarios around the bedside of a mock patient, for which they would find solutions as a team. She was actively engaged during the class and hardly ever sat during these two classes. She guided the class with open-ended questions or shared stories of her own emergency room encounters.

Nubia is married and has two adult sons. The youngest was pursuing a second degree in biology, at the time of this interview. Although her grandmother was half white, Nubia has very smooth dark brown skin and an aquiline nose that is noticeably pointy. She has brown eyes. Her hair was a mix of gray and black which she wore very short with neat shaven

edges. It looked very wavy and soft and was all natural. I later asked her about her hair. She shared that after college she decided to stop using perms to straighten her hair.

She was about five feet three inches tall and wore about a size 10 dress size. She looked quite fit. When we met, she was dressed in black sandals, a long dark green skirt and a long sleeve white blouse. On the left side of her white shirt were two butterfly pins. She told me later that these pins were her mother's. She also shared that she often wears something that belonged to her mother or her deceased sister to honor their memory. She wore several thin gold bracelets on her right hand and a large silver bracelet. She had a ring on her wedding finger and one on the opposite hand. She also wore small studded silver earrings. Her stylish glasses were turquoise, blue and black. A silver necklace with a large pendant was around her neck. She also wore a silver anklet. She admitted later that she likes to wear jewelry. However, she says that she wears no jewelry at the hospital except for the bracelets.

Of the five participants, Nubia has the least detectable Caribbean accent. I can only identify her Caribbean background by her speech because of the way she pronounces some words and the phrases she uses. Perhaps this was because she was the participant who arrived to the States at the earliest age. Perhaps she had more time to practice the language.

Andrea: the Nurse and Hospital Quality Assurance Specialist. *"Again you know Colon only had 16 streets…everybody knew each other…also in Colon there was nowhere that basically as Blacks you couldn't walk. In Panama [City], there are places, like where we live now in El Cangrejo ,you would be asked what are doing here"…(Andrea transcript lines 390-395).*

Andrea lived in *Colon* on one of its 16 streets. Like Nubia, her family also lived in a two room apartment. Andrea is the middle child of three girls. She describes her upbringing as being very strict. Her father was an upholsterer of car seats and furniture. He marketed his services to Americans who had money. Andrea said he believed in doing work that was 'perfect'.

Locating and recruiting Andrea as a study participant was easy because her mother was the teacher at a well-known house 'school', in *Colon*. Various people, who had suggested contacts for my study participants, as well as members of my family, attended. Her mother was originally a seamstress who graduated from Panama's public school system.

Andrea was uncertain regarding how this school began. She did remember that during the summer her sister had gathered kids for extra lesson at their home. As it turned out, when the summer break was over the children wanted to continue with this arrangement. Andrea's mother responded by taking over the teaching of these students. She also helped them with their homework. She charged the local families one dollar a week for this instruction in English or Spanish. Students attended after school or when school was not in session. Her success rate with the students who attended was such that the home 'school' grew and her mother had to turn children away.

For her formal education Andrea attended *San Vicente de Paul* Catholic School in *Colon*. At the time, the elementary schools were crowded. In contrast, the Catholic Church not only had space but also allowed students to attend tuition free as long as their families were Catholic and attended mass. She next attended *Abel Bravo* High School. Andrea shared that she always wanted to be a nurse so she later entered *Santo Tomas* nursing school in Panama City [This nursing school is connected to the hospital where I, the researcher, was

born]. The distance from *Colon* to Panama City is 56 miles. She could not commute daily so she moved to Panama City to attend school. This was the first time she lived away from her home and her family.

After graduation Andrea married and had two children. She worked as a nurse in Panama earning the annual salary of $1900. Two nursing friends who had immigrated to the United States wrote and told of her of the nursing shortages in the United States at that time. She responded by sending her paperwork and qualifications to Columbia Presbyterian Hospital in New York City. When offered a position she decided to accept the $5000 per year salary the hospital in New York offered. In 1967 she left for the United States to work as a nurse. The hospital sponsored her and expedited her immigration and permanent visa [green card] paperwork. Her husband and children remained in Panama.

Andrea's contract stated that she had to work in the U.S. for one year. She stayed for two years and within that time she also completed the requirements for a Bachelor's degree in Health Education. Fortunately, due to the Family Unification Act, she was able to send for her husband in six months. The two of them then worked and in time they were able to send for her sons, who had remained in *Colon* with her parents.

In 1969, Andrea left Columbia hospital to work at the Brooklyn Hospital so that she would spend less time on a shorter commute to work when her sons arrived that year. At about the same time she entered New York University to work on her Master's in Public Administration. She remained at the Brooklyn Hospital for13 years first as a nurse, later as the nursing care coordinator and finally as the Quality Assurance Director for the entire hospital.

Andrea then moved from the Brooklyn Hospital to work for the New York City Health and Hospital Corporation as their Senior Assistant Vice President. In this capacity she was responsible for monitoring all the patient care services delivered by doctors, nurses, nursing assistants, and housekeepers for 11 acute care hospitals, five long term care facilities and nine clinics. After more than 35 years of service in the United States, Andrea retired.

Describing Andrea. I met and interviewed Andrea at a diner in the Canarsie section of Brooklyn near her home. We arrived about the same time so we met at the door. Andrea is about five feet five inches tall. She had medium build. Her hair was brown and was pulled back. She stated she had not had a perm to straighten her hair for over 30 years. She has dark brown eyes and freckles on her caramel brown face. She was wearing some makeup. She was also wearing small pearl earrings, two gold chains around her neck and three bracelets. In addition to a wedding band set on her left hand she wore a silver ring on her right. Her nails were painted with purple polish. She arrived dressed in a lime green short sleeve top and slacks.

Andrea and her husband now live part of the year in their Brooklyn home and the other part in Panama City, Panama. At the time of the interview, she had been a member of various organizations including the Caribbean American Nursing Association and the Panama Nurses Association, as well as President for the past four years of the New York State Association for Health Care Quality. Andrea also sponsors an adopted child in Panama through a local organization. So, although retired, she was quite active in two countries and in both of the communities in which she lived.

Dorcas: the Middle and High School Science Teacher. *"I went to the school to see the principal, and when I saw that at the clock[where teachers sign in], only Whites were*

teaching, all the teachers were White and the kids were Black or Spanish, mostly Black. – I said something is drastically wrong with this. They need teachers, our kids have to see more of us teaching, this can't be" (Dorcas transcript lines 97-101).

Dorcas grew up in Panama City. She is the youngest of eight children. Both of her parents were from Jamaica. Her father was also educated in Jamaica. During the interview, she made a point of saying that her father immigrated to Panama for the "ten cents an hour canal pay" as a laborer on the Canal. She also remembered the American work system in Panama as one that imposed the same racial system used in the United States. Her father witnessed an interaction with a White worker in which an Afro-Caribbean man lost his life in an explosion because the White officer had kicked him. Being an educated man, he did not feel obligated to endure such dehumanizing treatment that could also lead to death. Because he had other talents and skills for which to draw, he chose to open his own "clean and press" business which is for cleaning and pressing clothes. Her mother also worked washing clothes and cleaning the homes of Americans who lived in the Canal Zone.

Dorcas and her family lived in the Sojourner Truth tenement building in the *Calidonia* section of Panama City. This is significant because this building was started by West Indians to provide housing for their own people. The family had two rooms that included a large living room with a kitchen area and one bedroom. They shared the two available bathrooms and two showers with five other families.

Dorcas attended *Pedro Jota Sosa* elementary school in *Calidonia*, and then went on to *Instituto Nacional* High School. She had planned to become a doctor. She therefore enrolled at the University of Panama and received a Bachelor's of Science in Pre-Med/Biology and Chemistry. After college, she met and married her husband in Panama.

Dorcas came to the United States because her husband had been sent to the U.S. by his aunt to attend school. The U.S. Family Unification Act, as it had for other participants, made it easier for her to immigrate with him. They moved to the Crown Heights section of Brooklyn. At the time this neighborhood was mostly comprised of African Americans and foreign born Blacks. This area shared borders with a segregated Jewish neighborhood. At the time of this writing, Crown Heights is now predominantly Caribbean and still borders on the Jewish community.

Dorcas was interested in working in the economically challenged neighborhood of Bushwick. One day she decided to visit the principal at the school in that neighborhood and was surprised to find that all the teachers she saw clocking in at the main office were White. This was despite the fact that most of the students at that particular school were Black. She decided that day to apply to her local Board of Education and became a teacher because she believed Black children needed to see teachers that looked like themselves. She taught Middle and High School science for the next 30 years until her retirement.

Describing Dorcas. Dorcas arrived to our meeting and interview dressed in black dress slacks, a white dress shirt and dress shoes. Though we met at her home in the East Flatbush section of Brooklyn, she had just come back from her exercise class. She had nevertheless changed her clothes and was dressed professionally befitting a teacher. She said she could not meet me wearing 'pumps', a West Indian term for gym shoes.

Dorcas is brown skinned and wears glasses. She is a petite shaped woman who is about five foot four inches tall. She was also very soft spoken but greeted me warmly at the door of her home. Her braided hair was pulled back. She was not wearing any earrings even

though her ears were pierced. She stated that she was a widow but had two daughters and three grandsons.

We sat in the dining room of her home for the interview. The table where we sat was covered with a lace table cloth that I recognized as one that was representative of those I had seen in Panama. On one wall was a large *mola*. She stated that she had lived 35 years in the house where we were meeting. Originally the neighborhood had been predominantly White. The area had many Black immigrants.

At the time of the interview, Dorcas and her daughter were working on a business venture to market the pepper sauce which is a traditional West Indian hot sauce that was made from her mother-in-law's recipe. As a result, she was often travelling between Panama and New York City. Her business employs growers and workers in Panama who bottled the sauce. She stated that it was a small operation for two reasons. First, she wanted to maintain the integrity of the product. She also wanted to be able to employ women and pay them better wages than they would normally earn for this kind of work.

Fusia: the Podiatrist. *"At age 9, I remember…. starting to tell my teachers, I was like maybe 4th grade,5thgrade…that I wanted to become a doctor, I didn't know what kind then".(Fusia transcript lines 24-25)*

Fusia is the only child of a single-parent mother. During her childhood, she lived with her grandparents in the *San Miguel* section of Panama City. Her mother, grandparents and aunt lived in a one bedroom tenement building with a *tabanko*, a shared bath, and shower. There were two beds in the upstairs area. Downstairs was the dining room area furnished with the table, chairs, stove, refrigerator, and television.

Fusia's grandfather was a carpenter and had his own business building kitchen cabinets. Her grandmother did not work. Her mother graduated from high school as a seamstress and did sewing for the community [many high schools offered vocational tracks as an alternative to the academic track so that graduates and females in particular could earn a living]. Her mother later immigrated to the States and left Fusia to be raised by her grandparents until she sent for her at age fifteen.

Fusia described her family as being lower middle class. Unfortunately, as an entrepreneur the income from her grandfather was not predictable. They did, however, have a steady bi-monthly salary from her aunt who worked for the Canal.

Fusia decided at age nine that she wanted to be a doctor. She recalls going to the hospital at four in the morning with her grandmother who had suffered stomach pains. By one o'clock in the afternoon, her grandmother was still waiting to be seen by a doctor. It was too hard to watch her grandmother in pain so she got up and stopped one of the nurses walking by to ask why no one had attended to her grandmother. The nurse replied that there were not enough doctors to attend to all the sick people. Fusia remembered, "That's what sparked my interest in desiring to help fulfill what I would consider a need and a void" (Fusia transcript lines 27-29).

Fusia attended *Republica de Brazil* elementary school in the *Calidonia* section of Panama for first through fifth grades . She then attended *Liceo de Senoritas*, which was an all-girls schools located in the *Paitilla* section of Panama City. The *Paitilla* neighborhood, at that time was predominantly middle and upper class. Her family sent her to this school because they were determined to help her fulfill her desire to become a doctor. The *Liceo de Senoritas* school was known for the kind of academic rigor that would most usefully prepare

her for her career choice. She remained at *Liceo de Senoritas* through grade nine at which time her family immigrated to the United States.

When Fusia arrived in the States, she lived in the Bedford Stuyvesant section of Brooklyn. This neighborhood primarily consisted of African American residents. However, Fusia recalled that there were several other Panamanian families in the building where her family lived.

Fusia's mother was encouraged by a friend to send her to a high school outside of her neighborhood where the population was predominantly White and Jewish. There were few African Americans, Caribbean and other Latin immigrants at this school. She started grade 10 at this high school becoming involved in the ASPIRA organization that supported academic achievement for students of Hispanic descent. ASPIRA, or "Aspires" in English, is a New York City based program that originally served the Puerto Rican and Latin community. With the support of ASPIRA, Fusia graduated and then attended Fordham University.

Fusia's mother could not support the traditional college experience such as living in the dorms. Fusia therefore lived at home, worked a part time job, and commuted to the Bronx for college. She completed a degree in Natural Science and then entered the College of Podiatric Medicine in Harlem, New York. She continued to live at home during podiatry school until she had to leave New York City during her last year for her residency program.

After graduating, Fusia accepted a position in a Philadelphia clinic for one year, where she received additional training in podiatric surgery. She then returned to New York City where she established a private practice treating over 3000 patients between 1981 and 2005. At the same time, she worked at various clinics in the New York City area, was an

attending physician at both Fisk Hospital and Baptist Medical Center, as well as worked at a nursing home, New York Methodist Church Home.

After closing her private practice in 2005, Fusia decided to work in public service for the New York City Department of Education. At the time of our first meeting, in 2009, she was working as the Health Director for three public school districts. In this capacity she oversaw the immunizations and general health care for children in order to minimize childhood diseases and limit time lost from school due to illness. She also conducted health fairs and health education training for parents.

At the time of interview for this study, Fusia was working as a Grants Manager for the New York City Department of Education. In this administrative role, she was tasked with securing funding for schools to begin programs such as male mentoring, as well as for ancillary programs before, during, and after school. She was expected to do so by partnering with local community-based organizations.

In addition to her full time work, Fusia participated in various medical missionary trips throughout the Caribbean and Central America. She reported that she traveled annually providing podiatric services to the needy populations throughout these regions.

She also continued to volunteer at health fairs for local organizations. I attended a Saturday health fair in Brooklyn, during which she gave free foot exams for local residents. She examined feet, distributed foot products and medications, and referred some patients to podiatric services. Fusia said she would like to retire in a few years.

Describing Fusia. I met Fusia near her Brooklyn office; she wore a black skirt, silver belt and silver/black top with silver shoes. Her black hair was naturally wavy, not permed, and was pulled back with a thin tie band away from her face. She wore small silver earrings

that did not stand out from her face. She wore no makeup. She had strikingly brown eyes that could be seen through her glasses. She wore a silver band on her wedding ring finger. Her nails were painted red and she wore a watch on the left wrist and thin silver bracelet on the right. . She also wore a small silver necklace around her neck. Like all participants, Fusia is physically fit and wears about a size eight or ten.

Fusia spoke with a heavy West Indian accent. She seemed to carefully select and enunciate her words as she gave me information. She also frequently code-switched between speaking English and Spanish during our conversation and as we were greeted by co-workers. Fusia is married with one adult daughter.

Afia: School Programs and Social Worker/ Psychology Instructor. *"My job was to coordinate it, convince, do the politics of getting the principals and administrators to see the value ...because if this is happening in the family then the kids are going to do better academically"*(Afia transcript lines 36-38).

Afia is also the only child of a single-parent mother. She has a half- sister, on her father's side, who also lives in New York City, whom she sees often. She began her life in the middle class community of *La Boca* located on the Canal that, as I described earlier, had been set aside for "silver" workers. This family home included its own kitchen, bathroom, bedroom, living room and dining room. It also had a small front yard.

Afia described this community as beautiful. The family also had commissary [military store] privileges that did not extend to other non- Canal Zone workers. However, living on the Canal was similar to the United States; there were restrictions of access for those of African phenotype that were evidenced by facilities that were identified with signs such as "Whites only".

After her grandparents passed away, Afia lived with her grandmother's cousin and her husband. During our interview, she referred to both of these people as her grandparents (I also do so throughout this dissertation). This grandfather also worked on the Canal Zone. After retirement, he received only $25 a month in retirement and had to relinquish his Canal subsidized housing. The family, therefore, moved to *Calidonia* and into a tenement building. Her grandmother had her own business raising chickens and selling eggs, as well as making starch and pepper sauce.

Afia's father was originally from Jamaica arriving there from Costa Rica. His family immigrated to Panama in order to work for the banana and fruit companies, and the railroad. Her mother's family also came from Jamaica but they did not come to Panama as manual laborers. They were educated people and came to Panama to be teachers or skilled laborers. This distinguished them from the many 'diggers' and 'ten cents an hour' laborers.

Afia went to *Pedro Jota Sosa* elementary school and later *Jose Delores Moscato* Middle/ High school. However, she also attended an English school taught by a West Indian 'lady' from Martinique. At the time her family had determined that she would be a doctor because she excelled in math and physics. However, she did some research and discovered that the study of psychology interested her more.

After high school, Afia received a scholarship from the University of Panama. This university did not have a psychology program at the time so she began researching schools in the United States. She settled on a program at Brooklyn College.

Afia immigrated to the U.S. and lived with an aunt in the Bedford Stuyvesant section of Brooklyn. After graduation she worked at various community agencies and schools where she started programs and presented workshops on diverse topics including sexuality, AIDS

prevention, domestic violence and child development. She also worked with a foster care program that was designed to re-unify children with their birth parents by training and supporting the parents in acquiring useful parenting skills, and by having the parents work with the foster parents.

Afia later returned to school and earned a Master's in Social Work and Psychology. She taught college courses in clinical psychology, child abuse and human sexuality. At the time of the interview, she was retired. She is divorced and has two adopted adult children. At the time of the interview she owned her own home in the Bedford Stuyvesant section of Brooklyn. This house was only a few blocks from where she first lived with her aunt.

Describing Afia. Afia graciously invited me to her home for our interview. I arrived to find her sister unloading a car load of food in preparation for our meeting, a behavior typical of West Indian hospitality. I will say more about this later when I address research sub-question 2.

Afia had brown skin and was about five feet six or so. She wore her hair gray in dread locks which hung past her shoulders. When asked, she commented that she goes to the hairdresser every two months to have her braids tightened so they look neat. She also stated that other women often compliment her about her braids but men will compliment her when it is loose and "edgy" like it is now, especially the younger ones.

She had two thin silver rings on her fingers and an Egyptian bracelet on her right hand which she had received from a lady in Ghana. She mentioned that she doesn't wear a lot of jewelry like other Panamanians. The other participants had worn quite a few pieces. She had on a blouse with a V-neck scoop with a white shell underneath and casual pants.

Afia stated that due to her middle class values and her family's educational background she had been afforded time to be a "thinker". She was also fairly sure that one of her family members was the descendant as an "outside child" (born out of wedlock to a man who was already married) of one of the great Black leaders from Jamaica. She asked me not to include the name because the family does not have any proof such as DNA to support their belief. Nevertheless, her family seemed to have been well educated as well as to have held some power and influence in Jamaica. Unlike the other participants, she was not the first generation in her family to obtain higher education.

Participants and their self-identity. One of the survey questions asked how participants' chose to self-identify. During the interview I asked them to explain the selections that they made. All participants except Nubia selected 'Black'. Those who chose this designation appeared to use it as a generic term intended to identify persons of African phenotype without being specific about their actual ethnic or cultural background. Nubia chose to identify herself as African American. I asked her about her selection. She explained:

> I feel that I have lived in this country a long time, and even though I was born in
> Panama my descent is African. It's not strictly Panamanian because the people of
> color in Panama are basically from the slaves that were dispersed across the
> Caribbean and the different West Indian islands. We are of African descent. (Nubia
> transcript lines 421-425)

In further discussion, she agreed that she uses the term "African American" broadly to denote Africans in the Americas and not simply the descendants of the Africans who were brought to the United States during slavery. In this way, according to Nubia, all people from the

Americas of African descent should be considered African Americans. She was not the only

participant with this viewpoint.

Fusia, Dorcas and Andrea all selected 'Black', but also selected additional choices.

Afia only selected 'Black' as a category and goes on to explain that what you see is race first.

She says, "I think it's Garvey; it's the first thing people see is this" [pointing to her arm

indicating her skin color] (Afia transcript line 431-432). Afia went on to explain that people

tend to see "race first" or African phenotype. By way of clarification, Marcus Garvey was the

Jamaican leader of the Pan-African movement during the 1920's. This movement was

designed to unite all people of African phenotype in the African Diaspora but specifically

African Americans, Afro-Caribbeans, as well as Central and South Americans. His goal was

to form a separate country and government (Crawford, 2004).

Fusia additionally identified as Hispanic. She explained, "…because Black has to do

with the color of my skin and my ethnicity. But my culture will be one of some influence

with the Spanish culture, heritage and beliefs" (Fusia transcript lines 392-394). Fusia agreed

with Afia that when people actually see her, they assume that she is African American. She

stated that although she has lived most of her life in the United States, "the Panamanian,

Afro-Caribbean, Hispanic culture that I was raised in is still a big part of my life today"

(Fusia transcript lines 388-389). She chose to identify by phenotype and culture.

Andrea seemed very proud to also identify as Panamanian. When asked why she

selected Black Panamanian, she stated, "Because I'm Black and I was born in Panama and I

am very proud of being who I am" (Andrea transcript lines 486-487). She chose to identify

herself by phenotype and her country of origin. She elaborated further, "The White people

say they are White…we break ourselves up in so many [groups]…to me where I was born is

my nationality that's Panamanian; the color of my skin is Black, to me that's enough"

(Andrea transcript lines 496-499.

Dorcas quoted Stokely Carmichael's Black Power Movement chant stating, "Black is

Black no matter what" (Dorcas line 239-240). She stated that she believed in alliances with

all people of African phenotype. However, in terms of her own identify she explained, "I am

Black, Panamanian and Jamaican…my roots. I can't deny my father and mother's existence"

(Dorcas transcript 424-425). So, Dorcas chose to identify herself by phenotype, culture and

family-of-origin.

Research Sub-question 2: Family values and beliefs.

What specific advantages and strategies learned from their cultural identity has

enabled these Afro-Caribbean women from Panama to negotiate the classroom and

workplace barriers related to STEM that they have encountered due to gender, socio-

cultural differences, and/or African phenotype*?*

In this section I consider three major themes in order to answer research sub-question

2. First, I explore further the ways in which the women addressed issues regarding their

African phenotype. Second, I consider how their gender affected their experience of

workplace inclusion. Last, I present the values they believed they had acquired from their

culture-of-origin. They also discussed their perceptions of how these values had enabled

them to overcome the gender and phenotype barriers they had experienced during their

STEM training and employment.

Views about African phenotype. I expanded on the question of identity and

phenotype in order to better understand how these women managed to navigate the social

challenges of working in White male dominated workplaces. These places were likely to

have few women who looked like them. It is sometimes the case that non-Whites experience the challenge of being a different phenotype and different culture in a mostly White setting as very negative and isolating. Each of the women shared their stories of being excluded or being identified as different. Those who lived in Panama through adulthood also included stories about living in Panama and being marginalized because of their phenotype.

Dorcas explained a term used to describe Black Caribbeans in Panama. In the United States the 'N' word is used derogatorily to refer to people of African phenotype. In Panama the '*Chombo*' which translates to 'foreigner or one who speaks English' is often used by those of Spanish descent to describe Afro-Caribbeans. Given these circumstances, I nevertheless noticed that the pepper sauce bottle Dorcas was marketing used the term. I therefore asked if the 'N' word could become a term of endearment since both terms were intended as insults to people of African phenotype. Dorcas responded:

> No, what does 'N' mean, by definition it means you are lazy, but *chomba* means you are a foreigner who speaks English. Sometime if the person says, '*oye venga chombita'* [you come here foreign female]…the word is not the same term. It's like the Blacks from Honduras, we call them *garafunas*…meaning Blacks that speak English…they call me *chomba* because I am West Indian. So that's alright. It gives a clear definition…it means I speak English and I am from the West Indies. (Dorcas transcript lines 724-730)

Dorcas drew this distinction by stating the difference in the definition of '*chomba*' versus the 'N' word. On the one hand, '*chomba*' defines the person by language and describes their position as a foreigner in Panama. The 'N' word, however, attempts to derogatorily describe

the character of a person of African phenotype and then imposes this character on the entire group.

Dorcas shared other stories of the negative effect of the use of the 'N' word to define her character as she transitioned to the United States to seek employment. When she decided to become a science teacher she went to the Board of Education to submit her paperwork. There she learned that many African Americans are not able to pass the oral board exam. She remembered how she responded to a statement made by a White proctor for the oral exam who complained about the Southern accent of some African Americans:

> When they [African Americans] went to do their oral expression they [the White proctors] said they [African Americans] spoke with an accent…I said all of you [White proctors] have an accent. I speak with an accent! Well they [the White proctors] tell me I'm different…they [the White proctors] would ask us if we went to finishing school…I said, what do you mean by finishing school? 'Well, you sit properly. You use your knife and fork properly.'…I said that is coming from our parents" (Dorcas transcript lines 229-237).

In this narrative Dorcas explains how she fought to be recognized as Black and identify with African Americans. She made this effort despite the fact that distancing herself from African Americans may have offered some advantages in regard to being accepted by the White proctors of the oral exam. She made it clear that she rejected the opportunity.

She also made it clear that later she fought to help fellow African American school employees pass the exam to become teachers so that they could move from being teacher's aides to becoming teachers. She explained, "A lot of Black people even here in America were afraid… I didn't grow up that way…you have to struggle. I did that" (Dorcas transcript lines

243-245). She thus seemed to explain a vital part of her personality. She was willing to fight for those who were less fortunate than she, even though she apparently had privileges they did not. She took on the fight of fellow Blacks who shared the same phenotype, rather than seeing herself as better than them because of her ability to pass the test. She seemed to realize that the difference was not in her ability but rather in the perceptions of difference held by Whites who behaved as gatekeepers.

At the first school where she taught, she was the only Black teacher in the Science Department. She described how the Jewish teachers in an attempt to defend their perceptions responded in this way:

They would tell me, "You are different"…I would say, "What are you talking about?"… "Different from American Blacks"…I said, "No, Black is Black no matter what"….They would say, "You have an accent"…I said, "You do too…why do you criticize the ones that came from the South with their accent? Their accent is like the children's [African American students'] accent"(Dorcas transcript lines 213-219).

Dorcas shared this dialogue with the White teachers at the school. In this exchange she reminded them that they are the true outsiders in this predominantly African American school rather than the Black Southern teachers who were representative of the student body.

She explained that she also later corrected her Hispanic students when they tried to tell her that she was not Black, meaning she was not African American because she spoke Spanish. She remembered, "They would say, '*pero maestra*, you are not Black'. I tell them, 'No, you are Black too'" (Dorcas transcript lines 506-507). This belief that the term 'Black' is reserved only for African Americans would also be a part of Afia's experience.

Afia described being in a meeting in which she was making a presentation in Spanish and English. A meeting participant continually identified her as Indian. She finally answered her by saying, *"'Yo soy negra'…*[the participant responded] *'Senora don't insult yourself, tu eres India'…*'Not only am I not *India, pero tambien Africana* [but also African]'… *'Ayi, no diga eso. No se insulte[don't say that, don't insult yourself]'"*(Afia transcript lines 625-627 and member check 02182013). This dialogue that Afia recounts concluded with her being forced to defend her African heritage in order to not be limited by the woman's perceptions of what it means to be Black or *negra.* The woman told her not to 'insult" herself by calling herself Black but to hold to being Indian. Again, the term 'Black' is limited to African Americans. Afia, like Dorcas continues to claim her African heritage.

Nubia also recognized her African heritage and self- identified as African American. She shared how she came to recognize that the difference of being a Black American was not limited to phenotype only. She explained:

> I wasn't raised in the United States; I wasn't raised under a Jim Crow experience. I don't have those images in my head. That's not part of my makeup. That's not part of my psyche. I think I was telling him [referring to her husband], I was recounting an issue that I had with a policeman in Brooklyn, New York. I was going down the subway steps on Chauncey Street and this officer was coming up the steps. I was in high school…everybody came down one side of the steps and people came up the other side. Well he was coming up the steps on the side that people come down and I refused to move. And he told me that I had to move, and I told him no, I was not moving…and there were quite a lot of people around me….and I told him that he needed to move because he was on the wrong side of the steps…He said, "I'm a

police officer". I said, "I don't care, I am not moving"… and he took his baton and he started hitting the side of the baton against the steps. And I said, "I'm not moving"…My husband said, "No other Black person in America would have done that"…He said, "You just don't do that, you don't buck the system"…I did not see him [the police officer] as White versus Black, I saw him as violating a basic rule, courtesy (Nubia transcript lines 339-358).

With the crowds gathering, the police officer eventually abandoned the battle with this Caribbean teen. He probably did not understand why a woman of African phenotype was not intimidated by his phenotype, his gender or his authority as an officer. He did not seem to understand that there could be people of African phenotype in the community who did not have the internalized psychological abuse that resulted in a fear of Whites. Nubia did not follow the dictate that as a White officer he was above any rules in the society that may be imposed on the masses of people of African phenotype; rules that could not be altered because of his position as an officer, but also his phenotype.

In contrast, Afia shared the experiences with the police of her African American male neighbor, a lawyer, who had been subjected to being stopped by the police on numerous occasions. Unlike Nubia's battle, this African American man seemed to endure each interrogation as part of his lot associated with his African phenotype. Afia reported:

I see 'African American' in the broader sense…when the cop stops you he's not identifying your accent, but your race. I think the business of saying, "Those people from America" is a divide and conquer strategy because ultimately you are Black (Afia transcript lines 438-450).

This profound explanation from Afia invokes the Garvey Pan-African philosophy by her redefinition of the term 'African American'. She uses the term in the same global sense that Nubia did. After years of living in the United States, Afia had come to realize that police response to Blacks is different than their response to Whites and that phenotype matters in regard to the treatment that is extended. Therefore, the Black male lawyer is targeted as Black first regardless of his level of education and position in the New York City community. For Afia your phenotype is more of a determinant than your culture.

Fusia recognized this difference in treatment based upon phenotype in college. She shared a story in which her ability was questioned during her undergraduate study at Fordham University. "In college one of the professors told me I don't want to be a doctor, I want to be a nurse. He was in a sense trying to steer me a direction I didn't want to go. But with determination and support again from the ASPIRA group, I pursued that goal" (Fusia transcript lines 337-340). Had it not been for the ASPIRA group who encouraged her to continue with her life- long plans of being a doctor that she had maintained since age nine, the advice of one professor may have altered her career pathway.

Fusia, nevertheless, did listen to the professor and applied accordingly for nursing school; she also applied to medical school. However, she shared rather proudly that she was accepted into medical school and not nursing school. She further explained, "In America, I think they look at the color of your skin more so than your abilities and capabilities. I had the intelligence to pursue and the capability to overcome the rigorous academic challenges, as well as the work that was required to achieve the academic goal" (Fusia transcript lines 325-326). She believed that she was able to pursue her goal in spite of the seemingly preconceived negative beliefs about her ability. With these concerns in mind, I asked the

participants about their comfort level with Whites who are the perceived gatekeepers to many STEM trainings and career pathways.

Comfort with Whites. All of my participants indicated a high level of comfort with working with and interacting with Whites. This was important to know given that in STEM fields White males and females hold 74% of science and engineering positions (NAS, 2011). Fusia stated, " No problem interacting with Whites because I am confident of whatever topic they may want to talk, and I'm always proud of where I came from, and who I am now"(Fusia transcript lines 548-550). Her comfort level seemed to come from her strong sense of self and her cultural history.

Andrea drew on her sense of self stating, "I think I look at myself and I never look at me as being less than anyone" (Andrea transcript lines 399-400). She went on to share a story about her sister stating that others make her feel a certain way about herself. Apparently, Andrea challenged that belief saying, "You [her sister] come away with, 'They make'… and I come away with what I KNOW and I BELIEVE and if I believe what 'they' say. It's not, 'they made me'. It's because I believed it" (Andrea transcript lines 406-408). Andrea presents a powerful statement about self-identity and self-affirmation. She challenged her sister about accepting what 'others' say about her stating instead that their words only become true if you choose to believe them. Her sister's position seemed to be part of the psychological damage that Nubia alluded to earlier in regard to the police officer.

Nubia also supported Fusia's and Andrea's statements. However, she addressed biased ideologies regarding White versus Black intelligence. She stated, "I think over the years, I've realized that they are not any different from anybody else, their skin just happens to be pale. Inherently they are not smarter than me and inherently not more stupid than me…I

don't view them as a superior being" (Nubia transcript lines 951-9540). Afia who also held many positions where she supervised White staff members seemed to agree stating, "One of the things I know is that I don't feel less than them" (Afia transcript lines 591-593). All of participants shared statements or similar sentiments that reflected that they were comfortable with Whites because they didn't feel they were interacting with people who were superior due to their phenotype.

Gender and African phenotype. The women in this study not only had to overcome the barriers of race or phenotype. They also had to overcome the negative stereotypes associated with being females and specifically Black females. I asked the participants to explain whether they were more comfortable with White women versus White men. This question was designed to determine if there was more support from females in STEM who might embrace them because of their common gender. Oddly, they all reported that their comfort level was greater with White men.

Most participants seemed to feel that White men in the STEM careers where they worked were, as Afia stated, "Clearer and more to the point" than White women (Afia transcript lines 603-604). Conversely four of the five identified substantive differences in their working relationships with White women. They shared specific examples. Fusia, as a podiatrist, shared about this difference, " I would say it could be jealousy, they are just narrow minded, that they didn't think there could be a Black woman that could have achieved even more that they did" (Fusia transcript lines 560-62). Fusia's experience seemed to illustrate how limited expectations exist based on phenotype and the stereotype threats regarding intelligence and achievement of women of African phenotype.

Referring to White women in her STEM workplace, Nubia added, "They don't expect me, initially without knowing me, to have the level of knowledge that I possess and when I start to talk they are like, 'Oh she knows what she is talking about'". (Nubia transcript lines 962-963). Nubia further recalled a negative interaction with her White female supervisor. At her first place of employment she was the first female of African phenotype to work as a nurse on the day shift. The nursing staff did not accept her as an equal and she remembered incidences of feeling sabotaged in regard to the management of patient medications. She explained that because she was so meticulous, she never gave medication to her patients without thoroughly reading the labels. These negative interactions came to a head one day when the supervisor asked to meet with her in a utility closet rather than her office. Nubia remembered that she finally had her say with the supervisor:

I said, "So I am the invisible nurse…I was not raised to think that you define me, you don't define me…My father and mother raised me to know who I am and what I am capable of and it doesn't start with you" (Nubia transcript lines543-548).

In this narrative Nubia educated the nurse by challenging her myths about women of African phenotype and their beliefs about self. She explained to the head nurse that she was not defined by her opinion but by her parents' opinion of her. She shared that her beliefs about herself were not influenced or tied to what her White supervisor or colleagues thought about her. She also debunked the myth about intelligence by stating that her standards regarding her capabilities were not tied to her supervisor or to the other White nurses with whom she worked. She knew she was competent and like Andrea, this knowledge was not tied to the beliefs of others.

In the next section I share the cultural values that seem to support the beliefs about self-identity that were shared by all or most participants. These values seemed to be woven throughout the narratives shared by the group, giving them a common voice in several areas. It seemed that these core values were defining the participants, causing them to be recognized as different.

Values identified by participants. The five participants were asked to identify the key values with which they were raised. Each participant identified several values. Eight values were identified when the responses of the participants were considered cumulatively.

Value 1: Education. Education was the first value identified by each of the participants. In her response, Dorcas reflected the various sentiments and emphases of all the respondents, "Education is not an option, it is a must" (Dorcas transcript, line 342). Education was not just a goal but a means to an end. Fusia further summarized this position stating:

> I believe that my mom and her parents and grandparents and those who came through
> the Caribbean, they had a sense of the importance of education because they knew
> that having an education was always, um, signifies that you will succeed and do better
> in life and live a better quality of life. (Fusia transcript lines 302-305)

Fusia, as well was most of the participants, was given a heavy dose of the need for and importance of education. Nubia provided further insight, "My parents made it very clear that the only way to success, in this country, is through education" (Nubia transcript line 322). Afia's grandfather was educated as a teacher but was not practicing his profession in Panama; he chose to work for the Canal. The same was true for Dorcas' father who was a teacher in

Jamaica but immigrated to Panama for the 'ten cents an hour pay". He later left that job to start his own business after a fellow Caribbean worker died on the job.

Reading and the value of literacy was modeled as an important part of the education process. The participants each reported that they witnessed the men in their homes reading. Afia, Fusia and Nubia each saw their grandfathers reading newspapers or books. Andrea and Dorcas saw their fathers reading and they both reported that their fathers brought books home for them in order to guide their reading. Andrea explained, "We had to read books but we could not read true romance [novels] or comic books. Those you could not read" (Andrea transcript lines 565-566).

All of the women stated that they were able to access books from school or the library. Dorcas, because she was the youngest in her home, Dorcas arranged to write the book reports for her classmates if they provided the reading book; then she would write her own from the same offered, "You know how difficult it was to write two papers on the same thing, and they didn't jive, coming from the same person" (Dorcas, lines 447-448). Dorcas' comments demonstrated the extent to which these women would push themselves to have access to reading material and literature. Dorcas' parents also bought books for the family; she said they had a "bookshelf" in the home.

Dorcas, Nubia, and Andrea also reported that the women in their homes were often observed reading either the bible or whatever books were available. Afia describes her grandmother as illiterate even though her husband was a teacher. She states that her grandmother explained this by saying: "'you have to marry up you know'" (Afia transcript line 414). Her grandmother seemed to be saying that although she was not educated, she was smart enough to marry someone who was.

Value 2: Using free time for informal education and skill building. Informal education and developing other skills was a second value the participants identified. They reported that their school day began at either 7:30 a.m. or 9:00 a.m. and ended at either 3:30 p.m. or 4:00 p.m. They would go home at about 11:30 a.m. or so for lunch and *siesta* [rest] and then return for the afternoon's instruction.

The participants were each involved in after school programs at the end the regular school day. They explained that it was an expectation in high school that each female student had to learn a practical skill such as sewing or cosmetology. This was designed to ensure that all students would have a skill from which they could earn a living. Andrea reported that she was enrolled in the cosmetology program in addition to her academic program. She was able to make extra money in college by doing the hair of fellow students. Afia, Fusia and Dorcas all learned how to crochet in their after school programs. Afia stated that she also learned how to sew.

The women were also involved in various music lessons, sports and other extracurricular activities. Afia stated that she learned to play the piano. Dorcas shared that she had learned to play the French horn and the piano. Nubia disclosed that she had participated in gymnastics. Afia and Andrea's activity was swimming. Fusia reported that she took fencing lessons in Panama and after coming to the United States was able to join the fencing team at her high school in Brooklyn. Fusia's reported that her mother also signed her up to learn a "second language" [actually her third]; she studied French. Additionally, Fusia, Dorcas and Nubia mentioned their involvement in activities at church which included the reciting of poems or participating in church plays. Dorcas stated that she played the French horn at church.

Three of the women participated in cultural events that were technically beyond the economic ability of their family. Afia's mother took her to plays and the ballet. Afia stated regarding this that, "Some of the family members used to laugh when she took me to the ballet" (Afia transcript lines 334-336; member check 021813). Fusia expanded on this phenomenon:

> Well another value that I got was pomp and circumstances. That's something that they taught us, teas and the pageantry of things and how you are supposed to carry yourself whether you are male or female…'You never get a second chance to make a first impression'. They didn't tell us that but they emulated it. We watched it (Fusia transcript lines 373-377).

The Caribbean immigrants to Panama seemed to value culture through dance, plays and music in ways that did not often reflect their economic ability. This somewhat extravagance could be why Afia's mother was ridiculed by the family.

The participants also reported that they were involved in activities within the Caribbean community such as dances and what Fusia referred to as the pageants, specifically affairs that required formal dress. Dorcas explained:

> On Sojourners [the building she lived in]…there is a theatre, and upstairs there is room for gatherings, a meeting place for organization and up there they had the quadrille dances. Quadrille is a dance, and different kinds of activities…people dress in nice evening gowns and girls wore evening gowns. (Dorcas transcript lines 329-335)

To clarify, the Quadrille is a traditional dance from Jamaica that was adapted from a formal British dance. For these events, the Caribbean community dressed in formal attire; the

valuation of formal attire for these events was a defining part of the socialization the women received.

Value 3: Spiritual foundation. Fusia, Afia, and Dorcas all mentioned church as an important part of their upbringing. Nubia and Andrea did not specifically mention church involvement. However, they did give evidence that they attended church, as well as evidence regarding the importance of their faith in their lives. Afia and Fusia went to church with neighbors. Afia explained that her family did not go to church in Panama because the Episcopal Church in Jamaica excommunicated the entire family when her grandmother, who was unmarried, became pregnant. Although they held to their faith, they no longer attended church.

Value 4: Caring for others and giving back in kind or through service. Fusia and Afia both stated that caring for others was a value they acquired from their family. Fusia explained:

> Another value was a real sense of giving back and helping those that are less fortunate than we were because even in the community where we lived there were people who were not as fortunate as we were (Fusia transcript lines 359-363).

This is noteworthy given that Fusia earlier described her family as lower or lower middle class. These families clearly had so little but nevertheless taught the value of looking out for others who may be in greater need. In high school, Fusia received tutoring in English to improve her grammar and writing. However she stated that while she was there, "I used to kind of be in the Spanish office helping kids who did not do well in Spanish. So while I was there being tutored, I was able to give back, that was important" (Fusia transcript lines 228-230).

Andrea further supported this perspective in her description of living in the city of Colon:

They [people in *Colon*] were a lot friendlier…You could go to *Colon* to anyone's house and get a nice hot meal. People in *Colon* were very um, what's the word, it's not accommodating, but they welcomed you and you could be sure you could get a nice plate of food. You could be sure they would bring a big thing of sorrel [Jamaican hibiscus plant that was boiled and then chilled to make a drink] nice and cool...again, I think it's because it [the community of *Colon*] is so small. (Andrea transcript lines 385-388)

Andrea offered further evidence of the kindness of people in their generosity regarding help in providing basic necessities such as food and shelter. Their emigration to Panama meant that many Caribbeans were without family and loved ones in their new homes. They therefore built new family networks and pseudo-kin relationships with immigrants from the various other islands.

Value 5: Entrepreneurial spirit. Another value that was highlighted by two of the five women was the significance of developing an entrepreneurial spirit. Fusia whose grandfather had his own carpentry business stated, "Another value that they taught me was a sense of being our own boss, the entrepreneurial spirit which that kind of carried me as I went into private practice as a podiatrist" (Fusia transcript lines 357-359).

Afia expanded on this but specifically emphasized the lesson learned regarding women. She offered:

…A sense of women being responsible for themselves [was important]. I mean that wasn't said, but women worked and even if they had a mate, women worked. Tetel

[her grandmother] was an entrepreneur. She made her starch, had her eggs and stuff….but she wasn't anti-male; meaning if you're working together its fine, but for you to postpone our life for a man…You have a responsibility to yourself and your children and your relationship to be supportive but not to postpone your life (Afia transcript lines 199-218)

Afia communicated two things. First, that women and specifically her grandmother demonstrated their entrepreneurial spirit. Second, according to Afia, women do not have to be anti-male and stand alone, but can be married and fulfill their own purpose and dreams in life. The strength of these women is exemplified in Andrea's story about her mother. Even though she only graduated from sewing school, she later became a successful teacher managing a school in her home.

Additionally, the need to be financially wise and not buy on credit was part of entrepreneurship. Andrea used a phrase she learned as a child from her father to explain: "You don't put your hat where you can't reach it", meaning, "Financially, if you can't reach your hat or something you want to purchase, then you shouldn't buy it". Andrea further adds: "If you don't have the money to pay for something, do not try to purchase that" (Andrea transcript lines 131-132). Andrea went on to describe that she and her husband were able to buy all of their own furnishings for their home in Panama. This value of saving included opening a savings account in Panama so that there could be money saved from their joint earnings.

Value 6: A strong sense of self. All of the women related, in their narratives, a strong sense of self and a pride in themselves, as people of African phenotype. Fusia described that she was expected to look and behave appropriately, stating that this training served to "build

my self-esteem, that gave me a sense of if you look right on the outside, you are doing well in general (Fusia transcript lines 381-383). Andrea explains that her strong belief in herself comes from her father. She says, "my father was a very strong believer in himself"(Andrea transcript lines 322).

The women's parents and grandparents seemed to build their self-esteem by communicating their faith in their daughters' or granddaughters' abilities and by expecting their successes. Nubia was asked to explain what she meant by "believe in yourself" for her list of values. She explained:

> I think my mother and father never discouraged me from accomplishing what I wanted to accomplish and I think that they were a support…and by them being a support that in itself sends a message that you are capable of achieving what you want to achieve….and she [her mother] always talked about being proud and never raised us to deny who we were as a people, as a people of color and so I was raised very proud and strong. (Nubia transcript lines 340-343 and 353-355)

Nubia not only identified this value, she also gave examples of how she saw her mother demonstrate a strong sense of self for her and her siblings.

Dorcas cited challenging her teachers regarding the *"folklorico tipico"* as evidence of her strong sense of self. These were folklore dances that were scheduled to perform for the high school students to foster an appreciation of different cultures including the indigenous people of Panama, as well as others around the world. However the Caribbean students were seldom invited. Dorcas explained this incident in which they were invited for a conference that included African dances:

I stood up to one of my professors and when we went to the Conference of Blacks in

America [Conference on Blacks in the Americas] he invited a whole bunch of

Africans from different regions. We had ["Spanish"] dances…and I tell him, "Listen,

it's time that we stop this and start opening up and let people realize that it's [the

"Spanish" dances] really African"(Dorcas transcript lines 372-377).

During the dances Dorcas realized that many of the "traditional" dances from Panama have

their roots in African style and movement. Additionally, she was able to see in the local dress,

indicative of Panamanian culture, derivatives of African wear. Her point was that she was not

afraid to challenge authority, thus demonstrating her strong sense of self.

Value 7: Hard work. I asked the women what they would say was the reason for their

success in STEM and three of the five women agreed that their hard work and perseverance

was the reason for their success. Dorcas, Nubia and Andrea concurred. Dorcas reported that,

"Hard work and in America you learn that if you work hard, study hard, you can be whatever

you want to be" (Dorcas transcript lines 764-765). Dorcas' answer evoked the puritan work

ethic inculcated in the 'American Dream': hard work should be the path to success.

Andrea drew upon a previous answer to restate that belief in self is important. Andrea

imparted, "Believe in yourself, set your goals and make sure everything that you do is

something that's going towards accomplishing that goal" (Andrea transcript lines 946-947).

Andrea, as an administrator, began with the self and then referenced personal organization

and planning as pathways to success.

Nubia shared that part of her success was maintaining her skills in patient care. Even

as she moved into administration and teaching she acknowledged, "The nurse at the bedside

can never be outsourced. So my attitude was I need to know how to manage but I need to

know what's happening at the bedside" (Nubia transcript lines 933-934). She further

explained that although management of staff is important, understanding the evolution of

care for patients is always a priority.

All of the women pursued degrees or certification beyond their college bachelor's

degree. This value of hard work prepared them for future opportunities in their career. Hard

work is a value that is important. As Andrea described her busy schedule as wife, mother and

STEM career woman in management, she states, "it almost killed me physically"(Andrea

transcript line 669). Therefore, hard work includes effort and sacrifice.

Value 8: Honesty and loyalty. These last two values were mentioned by Andrea and

Nubia. They identified honesty as a key value with which they were raised. Andrea went on

to explain that this was a value that she has carried throughout her personal life because it

was the foundation for her credibility. She explained:

> I tell my kids and I told my staff, when I was at work, "There is nothing worse that
>
> can happen…there is nothing that bad or worse than if you tell me a lie. – Tell me the
>
> truth. I don't care how bad it is. I need the truth. Then I can sit with you and figure
>
> out how we can handle it. Do not tell me a lie and let me go out there and get mud on
>
> my face…don't lie on me" (Andrea transcript lines 458-463).

Andrea stated that this conception of honesty came from her father.

Research Sub-Question 1-Probing Question a: What advantages are there for you as a

woman of Caribbean heritage?

After learning of their values, from probing questions developed for each sub-

question, I asked the participants if there were advantages for them as immigrants of

Caribbean heritage. All of the women shared that their being bilingual or multicultural was a

strategic advantage. Fusia explained that she felt comfortable being in an environment with people from other countries and being a part of such economic and cultural diversity. Afia explained that there were specific advantages to being able to speak Spanish, as well as being of African phenotype. She shared:

> The advantage was being totally multicultural…if you are looking for someone who you could check off Black, woman, Spanish, a whole bunch of things…The jobs I walked into that I got is because I spoke Spanish…they knew I could deal with this culture and that culture…Panamanians …they can eat Spanish, I mean the West Indians, they can do the Spanish thing, they can do salsa, they can do English, Reggae, they could do all those things.(Afia lines 712-730)

This explanation highlights that Afia recognized a distinct advantage not only in being able to speak another language, but also in being able to feel comfortable and adapt to other cultures. This cultural adaptation and insight was based in her knowledge of language, food, dress, and the worldviews held by others (Afia's member checking conversation 02182013).

> This idea about cultural advantage was shared by Andrea as well who stated:
>
> One, being bilingual and two, I think we have a lot of richness in our culture…I'm in a reading group…a lot of the books we read are predominantly Black…a lot of them is kind of real and it relates to the South and some of those folks also had um, some real rich culture of their own…some time you think that you have it bad some place until when you read and see some of the experiences and it has made me understand the reaction of some people (Andrea transcript lines 661-670).

We can glean from Andrea's insights that being of a different culture may lead you to appreciate and respect the culture of others. She shared that by reading about the culture and experiences of Black Americans, she had come to a deeper understanding of their lives.

Dorcas shared some final insights about advantages and how her cultural perspective and multiculturalism had helped her in her teaching of students who were from Central and Latin America. She explained that teachers at the schools where she worked were primarily Jewish. They took students on a field trip to Central Park one day. Dorcas explained regarding the incident:

> I took them for a walk in Central Park…when I look two of the boys were missing and when I look they saw the water and they jumped in. They thought they were home [meaning back in their home countries]…They took their clothes off. These were Latino children…so they weren't being malicious they just did what they were used to doing. (Dorcas transcript lines 788-795)

Dorcas's insight into the culture of the students allowed her to correct and discipline the students without demeaning them. She understood that they were simply drawn to the water, not knowing that such a large body of fresh water existed within the island of Manhattan.

Research Sub-Question 3: Recommended strategies for teachers.

What strategies from the lived experiences of these Afro-Caribbean women from Panama who are successful in their STEM careers can be used to inform educators in order to support all women of African phenotype in STEM?

This final section begins with the thoughts of my participants regarding the lack of females of African phenotype in STEM, the strategies that females of African phenotype would need to have to be successful, and finally their recommendation to educators to

support females of African phenotype in persisting in STEM education and participating in a STEM career. To answer research sub-question 3, I include three of the probing questions which I have labeled sub-question 3-probing questions a, b, and c.

Research Sub-Question 3-Probing Question a: Why do you think there are so few women of African phenotype in STEM?

The participants' answers to this question were as varied as the women themselves. There were few similar points. Nevertheless, all of the responses were critical in explaining the problems that persist for Black females trying to access STEM careers.

One problem that Dorcas identified was that often her female high school students were concerned about finding "a profession that paid them right away, quick rewards and [that] not with too much effort" (Dorcas transcript lines 591-592).

Andrea shared a similar concern from the point of view a professional in the field. She was a wife and mother of two when she immigrated to the United States. She therefore had to juggle family in addition to her higher education. She shared:

> I think the barriers has to do with women and having families…It's a lot to go to school and take care of kids, and the work, but I did it all full time…I might be wrong, those machos that think they are machos, the men that they think your job is to cook and clean the house and take care of the children, anything else they want to do, that's your problem because [they are saying] "I'm not going to help with anything". That's a barrier (Andrea transcript lines 662-668).

Andrea, who was responsible for the patient care at several medical facilities, was attempting to explain the overwhelming task of maintaining a family and having a high powered career.

She was able to do both. She elaborated later that it was difficult and "it almost killed me physically" (Andrea transcript lines 669).

Fusia's answer to this question was that there is a lack of cultural and intellectual exposure experienced by women of African phenotype. She shared, "We did not have some of the beginnings that some of our Caucasian counterparts had in terms of some of their exposure at an earlier age going to the museums and the Bronx zoo"(Fusia transcript lines 414-415). She felt that this lack of access to community academic resources and alternative learning contributed to the lack of preparedness for blacks in low socio-economic populations.

Afia's contribution was that lack of high expectations on the part of teachers and members of the society is a most significant problem. She explained her concern:

I think the studies have shown that people don't expect us to be smart and those are subjects that are considered to be smart subjects, [such as] math. I remember a Chinese Asian kid and she was having a hard time and a teacher said to me…and they were packing the Black kids in Special Education…and she said, 'Oh he can't be learning disabled he's Chinese'. This was a so called teacher, and she was saying this about this kid because he was of a particular group. So the assumption is that you know expectations that you can't do it and you get that message. (Afia transcript lines 390-396)

This was a striking illustration of the teacher communication. First, the teacher shared her stereotype threat that because Asians are more intelligent if they struggle the problem is not with their innate ability. In contrast, Black students were expected to need Special Education because their struggles were linked to their innate inability.

Nubia's insights also addressed the concern that Black students hear and receive the message that they are less capable. When asked about her students and why she thought the ones that needed the help did not seek help she offered:

> [Her students say] "I don't want you to think I'm stupid". I say, "Nobody knows everything. You are here to learn. Nobody is going to think you are stupid". I get this over and over again. I have an open door policy. [She says to them] "If you don't want to see me, you can email me, I'll explain it by email, but you don't even seek the help I give you". (Nubia transcript lines 699-703)

Nubia's primarily African American students were not able to simply seek out the help they needed based on the merits of the teacher -student relationship. This may have been the case because internally they had to fight against the messages conveyed to them by previous teachers.

It is interesting to note that both Nubia and Fusia shared extensively about the problems incurred while seeking help during their college years. Nubia told about confronting her nursing professor who at first did not want to give her help. However, she refused to leave the professor's office until all her questions were answered. Fusia sought out help in high school and college. She explained that she requested tutoring in English and writing from the ASPIRA group. She added that she did not always get A's and B's in college but she knew she was a hard worker and was determined to complete her goal of becoming a doctor.

Research Sub-Question 3-Probing Question b: What strategies could you share to encourage females of African phenotype in STEM?

When asked what could be done to help females to persist in STEM, three of the five women said that females needed self-confidence. Andrea stated, "The first skill is to have personal/self-confidence, 'Believe in yourself and when challenges come by, because they will….don't ever turn it down because that might be the challenge that you will be successful at'" (Andrea transcript lines 884-887). Nubia presented her insights in this way:

> I think it starts at a very early age where you have to instill a sense of confidence and self-love…We have to not only demonstrate it, but live it…It comes down to the choices that you make in toys, in book selections to the images that you allow them to see on television and the images that you allow them to think that they can portray. BET [Black Entertainment Television], I cannot stand that station. That station to me had a golden opportunity to truly elevate the image of people of color in this country and what they did, they took the easy way out and they reduced it to nothing but media, sports, music. That is not who we are. We are scientists. We are artists. We are creators… (Nubia transcript lines 719-730).

Nubia explained how this self-confidence needed to be instilled and nurtured in children from an early age. She was also very adamant about her views regarding BET and the formerly owned Black network because she felt that the images portrayed in the media negatively affect the self-confidence and self-love of African Americans. She also emphasized the need for parents to be mindful not to degrade their children as this damages self-confidence.

Afia further expounded upon this ideal, sharing that self-confidence is developed over time. She offered, "We as specifically Black, and we as specifically families, really need to believe that we have the capacity to do it" (Afia transcript lines 761-764). Afia further stated that this self-confidence is built when you know the history of your family origin and people.

Dorcas and Fusia added that in order for females to be successful they must be exposed to all types of cultural and social opportunities like visiting museums or experiencing field trips like Dorcas' trip with students to Central Park. Dorcas, as a former science teacher, also understood, the importance of participation in science fair competition as a means of increasing student self-confidence and affirmed:

> I think the need to do science fair…I think the competition. Look what just happened on Mars…When it [the Mars Rover] landed the joy. Those men jumped in the air. That's what we are talking about, accomplishment. I think some of that is missing…Kids were highly competitive. Put them to go into the books, read some more, see things and how it's done, grow things in a box…(Dorcas transcript lines 599-606).

As a school teacher, Dorcas recognized that competition could lead to a sense of accomplishment for students and serve to build their self-confidence. She suggested several ways in which teachers can harness a healthy sense of competition through programs like science fair in order to reach this goal. The Mars mission was used as an example of this sense of group accomplishment.

Research Sub-Question 3-Probing Question c: What would you tell educators in order to see more females of African phenotype in STEM?

I next asked the participants what can be shared with teachers to specifically support females of African phenotype in STEM. They identified seven recommendations. Some of these recommendations challenged teachers to help girls realize self-confidence rather than contribute to its destruction.

Recommendation 1: Teachers should believe in their students' ability. Set high expectation for students.

Dorcas believed that her students possessed the ability to be successful. Dorcas worked at the inner-city middle school at which she described the students as "fresh and rude" [meaning they spoke disrespectfully to teachers and exhibited poor behavior]. She explained that in most of the teaching environments in which she worked, the schools primarily had students of color but the teachers were primarily White. When asked, "What was the difference between the response of White and Black teachers towards the students?" She elaborated:

> I think it's a class [thing] and they see the kids are poor…from poverty and also many of the White teachers especially they feel that those children will never fill their shoes…In my mind, I've never felt that way…I've always felt that one day one some one of these children will fill my shoes and fill it better than I…A lot of teachers don't have that*". (Dorcas transcript lines 550-554).*

This powerful statement from Dorcas demonstrated her belief in her students and reinforced her expectation that they would do better than she. She seemed to suggest that when teachers don't believe in the ability of their students, they are serving to directly limit their students'

potential. She further added, "Don't just look at the kids and give up…because in those brains they have a lot to offer for themselves" (Dorcas transcript lines 498-499).

Afia believed that a major problem with teachers of Black children was their lack of belief in their students' ability and intelligence. She stated, "Most of us…don't believe that our kids have the capacity to do stuff. We still believe that our kids need correction, so we think that school is about uniforms and discipline…and not about creativity and exploring" (Afia transcript lines 464-467). Afia explained that schools for Black children are centered too much on structure and order and this limits the creativity of these children. She further illustrated this point by stating belief about what President Obama's grandmother's response to his ability might have been:

> I think Obama's grandmother saw him in this little college wherever, and said you know, that's not going to do it. You're going to get up and go to Columbia or some other place…so if he had stayed in Hawaii it [his presidency] wouldn't have happened. (Afia transcript lines 900-906)

Afia shared two important points. The first was that adults, not just teachers, need to see the potential that students have and support that potential. Second, she believed in putting students in private schools or in more competitive schools where there is greater access to educational opportunities.

Although Dorcas had immutably high expectations for her students, her teaching style was often light-hearted and students were actively engaged. She remembered that they would say about her, "You are going to Noriega's class [the dictator]". She was known for discipline and control. In further regard to this she stated:

Because I told them, once, you cross into my class, hats off, and when I close my

door… "Oh, oh there she goes…don't make her angry because the accent is gone, she

becomes Jamaican. Boy you betta[better] behave yourself". (Dorcas transcript lines

505-508)

Dorcas was firm with her students and used her culture and Creole English to communicate

her expectations. White teachers often commented on her practice of allowing the high

school students to kiss her when they greeted her, or the fact that "big strong looking men"

would cry when the semester was over and they had to leave her class. Dorcas seemed to

relax her boundaries as a teacher and instead engaged her students on a more personal level.

Fusia's insights were more conventional. Her sole recommendation was that teachers

support and encourage students. In regard to this she stated:

The teacher should be a cheerleader who will mentor them and who will be a good

source that will serve as a resource for them to get what they need to get to take them

to the level to achieve that STEM profession. (Fusia transcript lines 587- 590)

Fusia's recommendation was simple and straight forward. She directly linked student success

with teacher support and empowerment.

In the prior section, I explained that Nubia offered individual office help, email

assistance and individual tutoring. Here, I refer to her life experience to explain why she used

these strategies. Her teachers had helped her and, reflective of her deep-seated values, she

was compelled to give back.

When Nubia came from Panama she entered the seventh grade. She reflected on the

fact that although she could speak the language and had great math skills she had struggles

with the academic English. She explained how her English teacher remedied this:

And then my English teacher was a young, White guy, and he said, "Tell me something about yourself?" I said, "I'm new to this country and my dominant language is Spanish" [all of her education to this point was in Spanish]…He developed a different approach in terms of teaching me. I would meet with him every day after school for 30 minutes and I would work on English comprehension and he said to me all you need to do is just read…When classes ended in June he gave me a list of books that he wanted me to read over the summer…He said, "Because when you read them when you come back in September you will be ready" (Nubia transcript lines 290-301).

This teacher had believed in her and communicated an expectation that she would do well. She followed his strategies and went on to be successful. As a reminder, Nubia arrived in the U.S. in February and entered 7th grade. With the help of this instructor, she was ready to move on to 8th grade after just five months of instruction. She continued to be a successful student thereafter.

It is not so surprising then, that Nubia also had high expectations for her students. In regard to her students' struggles, she stated, "They need to read". She explained further:

I let them know that they have to read; students come to class and they think they don't have to read the chapter. I ask them how you think you are going to learn this stuff. I say I read the chapter that I'm assigning you to read…The attitude is they are going to read for the exam and what I tell them is you cannot read to pass an exam for my course. If you are reading to pass an exam you are not reading to learn content and you have to read ahead to know the content…You cannot get out of this course if you don't know the content. (Nubia transcript lines 900-906)

Nubia had come to embody the lesson learned from her seventh grade teacher. Because her course was a senior-level course that students had to pass in order to graduate, she taught them skills beyond mere test taking. She passed on strategies for learning.

Recommendation 2: Teachers should begin teaching from the point of student interest.

Dorcas shared a conversation with a pregnant student in which she asked, "Where is your baby developing?" The student unknowingly said her baby was developing in her stomach. From this response, Dorcas was able to introduce a conversation about the reproductive system. She stated: "I taught regular biology…and we were supposed to start with the protozoans, the amoeba. I said, 'No. Let's talk about sex, because they like that'" (Dorcas transcript lines 489, 493-494). Dorcas believed that it is important to begin with the students' interest in order to teach the curriculum and get them actively engaged. Her strategy was Socratic and she often began instruction with questions that would stimulate interest and encourage involvement. She explained, "'Ask a lot of questions', that's my style" (Dorcas transcript line 485).

Similar to Dorcas, Andrea believed that students should be allowed to ask questions. She shared how her experiences challenging teachers and asking them questions influenced her approach to teaching. After school she would discuss the teacher's information with her father. If the answers differed from her parents', she returned to school for more dialogue with the teacher.

Andrea firmly believed that students should be able to disagree with their teachers' answers and that this should be acceptable. She shared:

Asking a question…maybe not agreeing or saying, "Look I didn't understand that to

be that way, could we go over that again"…Ok and once they put out their point of

view, their point of view may not be correct, but allowing them to express it. And

then being able to show them…I learn that, and I tried to teach that to my staff and

my department…Sometimes you may know something is not going to work…but you

have to tell the person, "Alright you go ahead and try it" (Andrea transcript lines 795-

802).

Andrea felt that students should have the opportunity to share their opinions because this is

how they practice; these opinions may not reflect what they really believe whole-heartedly.

Nevertheless, they were given the opportunity to voice opinions and entertain them as

options to the curriculum. It is also important to see that she applied this in her work

environment. For Andrea these solutions or answers didn't need to be correct because the

skill for the learner was to master the process of critical thinking and develop solutions to the

question or problem.

Andrea specifically focused on strategies for Black teachers who she felt often stifle

Black children by interpreting their questions as being defiant. She submitted:

I see that some teachers, Black teachers, and especially when you have some kids that

are I don't call them defiant, but they will challenge. [The students are saying,] "I

have a brain". It's like they will try to do everything to shut you down…there are

those that would look at someone as stupid, and they would tell you, "Maybe you

want to come and teach the class?" because don't question. (Andrea transcript lines

780-788)

Andrea seemed to be imploring teachers to realize the importance of student voice and asking

questions during learning. Her point was that questions or the challenging comments students

may share do not need to be interpreted as an attack and grounds to silence them. In

explaining this she reinforced the importance of teachers learning from children. She

revealed that she learned about a computer game from her grandson when he was five years

old.

Recommendation 3: There is a need for more Black teachers for Black students.

Andrea raised specific concerns about some Black teachers. In contrast, Dorcas

argued in their support. She explained that in the Panama school system, in which she was

educated, most of her teachers were Spanish and not White. She reported, "When I came up

here to America is when I saw mostly White teachers" (Dorcas transcript lines 565-566). She

further explained that although she had worked with very caring White teachers, she still felt

that there was a difference. She added, "I understand the White teachers if they don't feel a

nearness with our Black children because I think we need more of our Black teachers that

feel that some of these children will one day be a part [of the middle class]"(Dorcas transcript

lines 560-562). Dorcas felt that Black teachers can sponsor students into the middle class so

that they too can be professionals.

Andrea spoke about White teachers regarding their labeling Black students as having

behavioral challenges. She also talked about how this label can become a self-fulfilling

prophecy. She explained:

I think one of the things in school with the White teachers; anything goes wrong it's

the Black kids. And for some Black kids they become extremely intimidated or they

become bad behaving because they feel if I'm going to be blamed anyway…I find

that they give more attention to the Whites…I experienced that with my own kids and I went to the school and told the teacher pretty much what I thought.(Andrea transcript lines 828-834)

Andrea shared as a parent how her two sons were received in schools. Her sons were good students but faced the challenges of being accepted as smart males of African phenotype.

Andrea complained about the educational process that slowed down her son in order to let the other children catch up so that all students could be at the same place academically. She stated, "If they are that advanced, then move him up, but don't have him when things come up and you hold up your hands and you never get called" (Andrea transcript lines 841-842). As a bright student having to wait for further instruction until his class members learned the material seemed to create restlessness. She further added, speaking for her son, "'Mom, they never call on me to give the answer, I will put my hands to give the answer…and they never call on me'" (Andrea transcript lines 853-855). This invisibility for intelligent students of African phenotype is formed when they follow the rules by raising their hands but then are ignored.

This invisibility can also be found in the parent-teacher conference process. Rather than the teacher addressing the academic needs of the student, the focus moves to the physical characteristics of the student. Andrea complained in regard to this issue:

When I go and hear about my kid in school, tell me about his grades and his academic performance. I don't want to hear how handsome and what a delight, I had to stop that…I know how handsome or not he is, let's talk about his grades. (Andrea transcript lines 636-639)

Teachers need to be mindful that parents are concerned with the educational progress of their students and this should remain the focus.

Andrea further emphasized this point by sharing how one of her son's teachers wanted to combine a behavioral grade with the academic grade in order to affect the overall student grade. In this way, all future teachers would be alerted that the student was a behavioral challenge. Also, her son would get a lower academic grade that did not truly reflect his ability.

Recommendation 4: Teachers need to support and respect the role of parents.

Nubia felt it was important that teachers not attempt to supplant the parental role. She explained, "Your role is to be a supplement educator period….teachers don't know your child better than you do…we have to empower our parents to the level of being respectful and being supportive" (Nubia transcript lines 877-882). Although this suggestion seems similar to Afia's, Nubia seems to be taking this further by saying that teachers need to be mindful that parents are the first teachers of their children. Additionally, she mentions the value of being respectful to parents and their rights. These are strong statements given that she herself was a teacher.

Recommendation 5: Teachers should live in the same community with students.

When Dorcas first began teaching, she lived in the same community as her students. This sense of communal families was another value acquired from Panama. In Panama, teachers could not afford to live in other communities so many lived in the same community with their students. Dorcas and Afia both shared stories of interacting with their teachers in the communities in which they grew up.

Therefore, when Dorcas began teaching she implemented this value in the United States. She shared how she had disciplined a student while she was at the Laundromat doing her laundry stating, "That's why I teach in the neighborhood. I recommend it. Some people want to shy away, but you should teach in your neighborhood. They need to see, they need to see you…" (Dorcas transcript lines 494-497). This recommendation from Dorcas reveals that teaching is not something that is simply done in the classroom setting with the curriculum. It also can occur in the community where students actually live and interact.

Recommendation 6: Teachers need to adapt and use Gardner's multiple intelligence models for all students.

Afia mentioned the importance of Gardner's multiple intelligence so that teachers can be reminded that there is no "one size fits all" in the educational process. She further explained:

> You look at Gardner's multiple intelligences and you see some of those kids head on in the sciences. But we label them and they get bored and they are like, "Please, can you just stop talking and do something, let's do something, build some bridges". But they talk, talk, talk. (967-973)

Afia was again making the plea to teachers that Black children need hands-on learning. She challenged teachers to take a fresh look at Gardner's multiple intelligences and consider the needs of the individual children in front of them.

Afia used the experience of her grandson and his participation in a science program, at his school, as an example of her point. Her grandson attended a science program that was open to all fourth grade students in a large regional area that had many students of color. However, because of parent work schedules, Afia asked, "Who was in the thing?...*Casi todos*

Blankitos [almost only all Whites] and they put him because *yo puedo llevarlo* [I was able to take him]. But parents who are working…" (Afia transcript lines 916-919). Afia seemed to suggest that White children are able to access such programs because their parents are able to accommodate the schedules of these activities.

It clearly is not the case that all White students enjoy the advantages of a middle class life. Nevertheless, some White students may have the resources of more flexible parent schedules, nannies or babysitters who can accommodate their schedules. As a retired grandmother, Afia was able to step in to help her son by picking up her grandson. She explained further about the program that they learn, "how things work,what does that bridge do…So then they learn how they could translate math into other kinds of things" (Afia transcript lines 919-923). Afia was making a plea for more hands-on learning rather than lecture. She went on to share that students who are often referred to as attention deficit are actually "the best and the brightest" and teachers need to find ways to encourage them.

Similar to Afia, Andrea believed that teachers need to remember that children do not all learn in the same way. She restated:

> Teachers need to know every pupil doesn't learn the same way. I learn by being present, hearing and interacting, asking questions. Some people they don't need to go, they can take the book, read it and they will do very well. That's how they learn. Other people have to have the interaction and that's how they learn. So you need to know. (Andrea transcript lines 927-932).

In this narrative Andrea emphasized that teachers need to get to know the learning styles of students in order to help them to be successful. She added:

So teachers need to know sometimes the kid is not stupid, they have to spend time to learn how that kid learns best. And you will be surprised if given the opportunity to learn the way their brain will accept the information they will excel. But if it's a one shoe fits all it's not going to work because everybody can't fit into the same. (Andrea transcript lines 935-938).

Andrea rather boldly addressed the belief of teachers that children are "stupid" when they do not learn [according to a prescribed norm or grade level]. In contrast, she spoke from her expertise in the field of medicine that lack of achievement could be due to ineffective instruction or instruction that is contrary to a child's cognitive learning style.

Recommendation 7: Black students need exposure to a wide variety of professions.

Afia also suggested the need for career fairs that expose students to more than civil servant positions. She explained, "I have nothing against police and these people, but we need to bring people that we know the kids will say, ''oh I can be that and it [the speakers] doesn't have to be Black" (Afia transcript lines860-863). Afia seemed to be suggesting that students need to have a wider exposure to available career opportunities. She also offered that these professionals do not need to look like them in order for students to see themselves participating in these careers. Afia further shared an account of a law program, in the City of New York, in which students are paired with law firms in order to gain exposure into the "real world" experience of those in the field. She emphasized, "It has to be real and hands-on stuff" (Afia transcript line 877).

These seven recommendations directly address student learning. Dorcas, Afia and Nubia addressed the recommendations from the teachers' point of view. Nubia, along with

Fusia and Andrea also shared either from their personal school experiences or from the experiences of their children.

Chapter Summary

The data and information presented from my five participants can be used to inform those who interact with females of African phenotype that are interested in pursuing STEM education (teachers and schools). From their socio-cultural experiences emerged a strong sense of self that influenced how these five participants chose to self-identify and how they chose to present themselves physically as women of African phenotype. All participants chose to wear their hair in 'natural' Black styles that excluded perming and straightening of their hair. Two of the women, Nubia and Afia, chose to self-identify using a more global definition of the term African American. Fusia chose to self–identify by phenotype and culture, whereas Dorcas and Andrea self-identified by phenotype, culture and country of origin.

Their experiences regarding the ways in which others responded to their phenotype is best summarized by Andrea who shared that although others may have negative beliefs about her, she does not have to accept these beliefs. This stance was echoed by Nubia who stated, "My parents define me". This internalized self -perception produced differences in the psyche that were in contrast with the perceptions of those who were nurtured under a system of segregation or social inequities based upon phenotype. They found it advantageous to be bilingual and that being multicultural attested to their ability to understand others. They were thus able to circumvent the limits set by others because of their phenotype. They realized that assumptions about phenotype were not an adequate depiction of their abilities or skills.

Finally, the significance of this study was addressed in the recommendations that they offered to teachers. They all echoed the sentiment that teachers can educate and benefit females of African phenotype or conversely, that their perceptions and beliefs about student ability, i.e., students are stupid, can be detrimental to females of African phenotype. All recommendations to teachers centered on ways in which teachers can communicate and foster self-confidence in their students.

Chapter 5

Discussion, Recommendations, Study Limitations, Implication for

Practice and Future Research

There is currently a need for qualified workers in STEM in the United States. This is the case because of the shortage of STEM workers and STEM teachers for K-12 educational institutions. There also are not enough students selecting STEM pathways in higher education to fill projected STEM positions. However, despite the need, barriers exist in the U.S. that perpetuate the exclusion of people of African phenotype in STEM education and career pathways. Therefore, people of African phenotype continue to be underrepresented in STEM careers comprising only 4% of all STEM workers in the United States (NSF, 2011).

Caribbean immigrant women have a comparatively long history of being in STEM careers in the United States (Clarke & Riviere, 1989). Afro-Caribbean women, and specifically women from Panama, seem to be able to overcome obstacles associated with their gender and phenotype. From five of these female immigrants this dissertation sought to obtain insights that would help K-16 females of African phenotype persist in STEM education and provide their teachers with appropriate strategies to support equity and excellence in the instruction of these females.

This grounded theory case study was conducted through interviews with five Afro-Caribbean women from Panama who were either working or had previously worked in a STEM career. These participants were selected for this purposive sample because their parents or grandparents had immigrated to Panama and had also worked in the building of or maintenance of the Panama Canal. All of the participants had immigrated to the U.S. and had then worked in a STEM career. All of the participants were bilingual speaking both English

and Spanish. Data for this qualitative study was triangulated by the use of open-ended

interview questions, field notes from observations, as well as a pen and paper survey

(Creswell 2007). Data analysis was conducted using the grounded theory design and protocol

(Corbin & Strauss, 1990).

Interpretation of the Data

In this chapter, I present two proposed models that were induced from the grounded

theory approach. The STEM Attainment Model (SAM) is the first model for discussion. It

follows a pyramid structure similar to that of Maslow's self-actualization model. The SAM

model illustrates the hierarchy of influence and strategies that allowed these women to gain

access to their STEM career. The second model is the Ecological Model of Self-Confidence

and Bi-Directional Effects shown in Figure 5.2. This model highlights the role of self-

confidence as an important criterion for persistence in STEM education and STEM careers. It

further identifies how self-confidence is nurtured or negated by the socio-cultural influences

in the lives of females of African phenotype.

The evaluation of the emergent outcomes produced the structure for the STEM

attainment that is presented in SAM in Figure 5.1. Ultimately, the purpose of the Model is to

explain how the results of the study addressed this dissertation's overarching question: What

key factors from the lived experiences of Panamanian Afro-Caribbean women in STEM

careers can be used to inform work with females of African phenotype in their pursuit of

STEM education and STEM careers? The order of the discussion is based upon the

hierarchical levels of importance starting from the base and progressing upwards.

Figure 5.1 STEM Attainment Model (SAM)
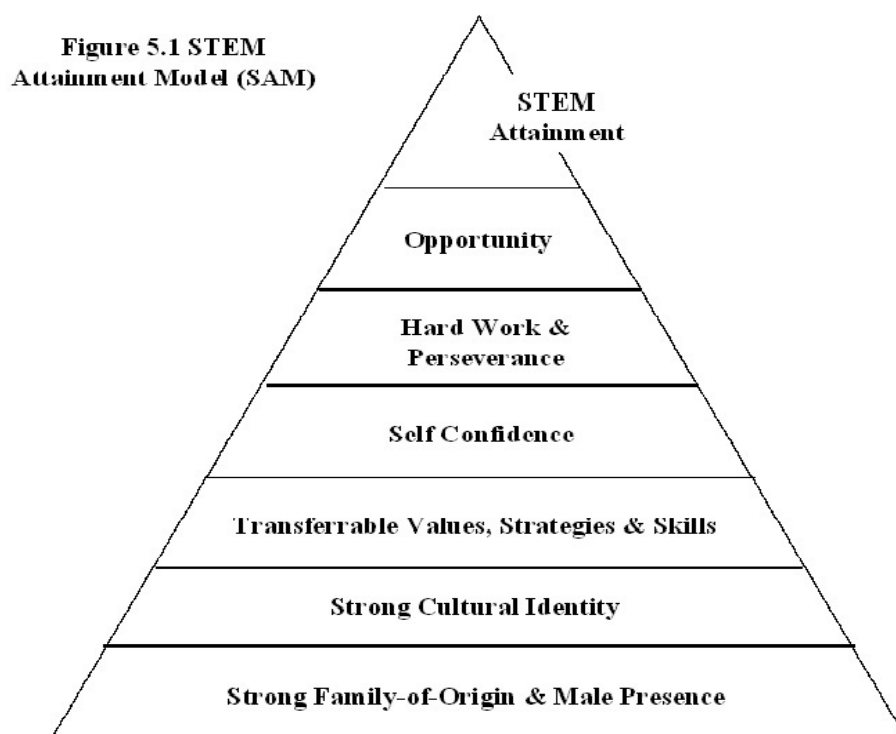
Figure 5.1 **STEM Attainment Model (SAM)**

Strong Family-of-Origin & Male Presence

The first factor for STEM attainment was the presence of strong family ties and the presence of consistent male influence, specifically fathers and father figures in these females' social network. Strong male presence is important for academic encouragement and support for daughters (Goossen, 2009). Vandamme (1985) found that when comparing low income boys and girls living in a home with their fathers or father figure with low income boys and girls living with mothers only, the group that lived with their father or father figures scored higher on standardized tests.

In concert with these findings, the women included in this study identified strong male presence and influence as a foundational building block. They referred to them throughout their narratives. For example, Andrea in speaking about her self-confidence,

credits her father by saying: "my father was a very strong believer in himself" (Andrea transcript lines 322). The males in the household interacted with their daughters and transferred values and principles to them. Dorcas states: "We always had a book shelf…my father always brought books home" (Dorcas transcription lines 545-546). Andrea shares that her father did not allow his daughters to read romance novels or comics but strong literature from reputable writers. By guiding the printed reading material that the women were exposed to, these fathers influenced the learning outcomes of their daughters.

These fathers also helped with the educational process. Nubia shares that at noon when her father arrived home, each child would have to share their lessons from school. Nubia adds, "If we were having a problem we told him…he said, ok, if I don't have an answer by tonight, I will bring somebody that has the answer."(Nubia transcript lines 314-316). Nubia's father expected his children to learn the assignments. If he could not tutor them, he found someone in the community of *Colon* that could.

Again, all participants lived with a male in the home whether he was their father or grandfather or both. In cases where they were from single-parent mothers, these mothers lived in their parents' home with their child. Their child was therefore also reared by the grandparents and the grandfather, in particular.

Strong Cultural Identity

Strength of cultural identity was a second factor that emerged from the participants' interview responses. All of the participants identified that either their parents or their grandparents had immigrated to Panama from their Caribbean island homes. They stated that their relatives made the trip to work on the digging of the Canal or to provide a cultural support structure for the thousands of newly immigrated workers. Since these immigrants

could speak English they were better received as workers by the Americans than the Spanish speaking Panamanians.

Further, since Panama became a nation only because of the Canal project, these immigrants to Panama were key participants in the building of a new nation; they helped build the infrastructure that became the foundation for the Panamanian economy. The Canal museum recognizes their efforts through displays which depict the hardships of digging a canal that connected two oceans.

Strong cultural identity as a key factor was identified via the study participants' responses to Research Question 1. In answering this question, all the women described that they primarily identified themselves by referring to their African phenotype. Some also chose to add their ethnicity and country of origin as additional descriptions. All of the women stated that because of their cultural identity they experienced high levels of comfort when interacting with Whites. This is significant since STEM careers are dominated by 74% White men and women.

The women in the study also referred to the influence of Marcus Garvey and the Pan-African movement (Crawford, 2004), as well as Stokely Carmichael's Black Power Movement (Carmichael, 1971). Afia explains about her family of origin, "But those people were all Garveyites…those people who were conscious; Garvey made a tremendous impact on the community and the Afro world community (Afia transcription lines 298-299). Dorcas in response to the Jewish teachers attempting to create a wedge between her and the African American teachers, chants Carmichael and says, "Black is Black no matter what" (Dorcas transcript lines 222). In doing so, they described how their identity was shaped by Garvey and Carmichael, two Afro-Caribbeans who promoted a positive Black identity and image.

The communities in Panama in which they were nurtured also fostered this positive Black identity.

The collective identity of these Afro-Caribbean women also seemed to be grounded in their cultural roots and was described as distinct from or in resistance to the influence of Whites. Ogbu (2008) asserts that the collective identity of African Americans is related to their interactions with White culture. He argues that this identity is influenced by the fact that Whites in America were of the dominant or property class. However, Afro-Caribbean's' resultant identity stemmed from their determined refusal to accept a low-caste status in their islands' social hierarchy resulting in a division based upon economics and not phenotype.

Banks (2004) explains this by stating that interaction with Whites in the American society has resulted in an African American community that may be psychologically damaged. Individuals may be in psychological captivity. Conversely, the experiences described by the five Afro-Caribbean women were an important reminder that this negative psychological internalization of self-hatred and group hatred can be overcome.

Their apparent inoculation against psychological damage could be attributed to the fact that Afro-Caribbeans are historically from societies in which they were the majority. There was therefore, a conspicuous absence of the negative images and the institutionalized effects of racism that permeate American society. Nubia, for example, recognized that there was a psychological difference between herself and her African American counterparts who had survived a social system that included "images of lynchings" and other Jim Crow effects that she realized she did not share. The absence of this negative mental image allowed her to question the White officer as a man who happened to be violating the rules of the subway or public place. She challenged him not because he was White but because he was discourteous.

Nubia had moved beyond the psychological captivity stage of Banks' typology. She therefore did not possess the self-hatred that would have compelled her to move out of the way of the officer allowing him to maintain his privileged position without challenge.

The fourth stage of Banks' (2004) typology is the development of a multiculturalism and global perspective in which a person comes to accept herself and can therefore accept and participate with others around the world. Four of my five participants identified that being bilingual or multicultural was an advantage to them in the United States. In Panama, their parents benefited from being able to speak English which made them more employable than the local Spanish only speakers. Further they were more aware of the needs of others around the world. This is evidenced in Fusia's participation in medical missions that served poor communities in regions of Central and South America. These five participants recognized that their position as immigrants from Central America afforded them advantages in language and culture but also generated a global perspective that enabled them to embrace the culture of others. In so doing they typify Banks' fifth stage which is multiculturalism.

Afia's descriptions provide a useful example of this point. She mentioned the advantage of being familiar with the ways in which people dress, the foods they eat and the music to which they listen. Further, Afia and Dorcas mentioned that the music to which they listened was not limited to Caribbean artists but also included Spanish and American music. They reported that from their experiences they developed a wider range of appreciation and exposure to different people and different cultural expressions.

Transferrable Values, Strategies & Skills

Transferable values and strategies was the next level of STEM Attainment that was identified from the data. By the term 'transferable values' I mean values that were acquired in

other contexts that later were used to succeed in STEM. They are values that function like transferrable skills.

The first value the women each identified was commitment to education. All of the women's responses were in agreement with Dorcas' statement that her father said, "education was a must". The women shared stories of conversations with parents or grandparents in which their elders espoused their position that exceptional academic performance was expected. Andrea and Nubia mentioned that they routinely discussed their daily lessons with their parents. Their parents were actively involved in the learning process. Dorcas recounts that as a child she would attempt to listen to her father and the *eruditos*, or educated men. She recalls, "They were talking about the war, Dubois, and different Black Americans who were struggling (Dorcas transcript lines 363-366). Her father and the men gathered around the newspaper to discuss world affairs and specifically those that affected people of African phenotype. Waters (1999) appeared to agree with these occurrences finding that Afro-Caribbean parents tend to stress the importance of education and strong work ethic with their children.

Second, each of the participants had parents or grandparents who were determinants in their academic success; they worked to establish continuity between home and school culturally, linguistically, and socioeconomically. For example, Fusia's grandparents sent her to a school that had the reputation for training females who would attend college. Nubia's mother and father both attended parent meetings regarding her academic progress. Afia would eventually be allowed to travel to the United States in order to earn a degree in psychology because there was no program available in Panama. All parents or guardians exhibited a high involvement in and focus regarding the education of these women.

In regard to parental support, Clark (1983) found that African American children were successful academically when parents set high expectations for them regarding homework and resultant grades, as well as engaging in conversations and activities at home that supported the educational process. Additionally, these parents went to the school at times other than the required parent conferences and 'sat in' on classes. He also found that parental involvement is specifically important for the academic success of females.

Literacy was a third important value. All of the participants' male caretakers demonstrated the importance of literacy by either reading to these women or procuring books for them to read. Apparently, these books included substantive literature, as Andrea reported. All of the women shared that they saw the men and some of the women in their homes reading so that literacy was overtly communicated as a value. Nubia's grandparents were instrumental in her reading in the home. She explains: " I learned English from my grandparents….they taught us to read and write English at home…you had to read the Bible"(Nubia transcript lines 240-245).

The fourth important value was using free time for informal education and skill building. All of the women engaged in extra activities that included crocheting, sewing, playing an instrument and swimming. Afia indicated that her mother took her to the ballet although she did not have the extra income for such luxuries. Afia recalls, "Some of the family members used to laugh when she took me to the ballet" (Afia transcript lines 334-336). These educational enrichment opportunities extended beyond sports to skills that could be used to support themselves, as with Andrea who used her cosmetology skills to earn extra money to pay for college.

The examples of values and strategies from these families of origin typified those of a middle class membership. Middle-class families are more likely to have their children engage in dance, and music lessons or sports (Lareau, 2011; Rothstein, 2004). Lareau (2011) found that middle-class parents were concerned with giving their children opportunities and exposures that would provide them an advantage. Parents or grandparents used their meager resources to ensure their children's success.

In concert with this, the families of my participants demonstrated that although their parents did not have the discretionary income to fully participate and provide all that middle class children may receive, they nevertheless, attempted to provide their daughters with middle-class opportunities when they could. They taught them middle class cultural habits through their exposure to ballet programs, formal cultural events, and dances. They taught them the dress and behaviors expected for these events. Through this informal education, they taught them how to be comfortable in these divergent settings and home instruction was supportive of their academic training from school.

These middle class values and awareness of interactions in a world that is influenced by the dominant White society meant that these women learned the rules of behavior for Caribbean culture but they also learned dominant culture rules and values. These appeared to influence their behaviors and dress regarding how they represented themselves in public. For example, Dorcas' belief that it was inappropriate to wear "pumps" for our meeting at her home. These standards regarding their physical dress and overall appearance seemed to be the reason why all of the women were well dressed at the time of their interview. This was the case whether we met at their home or work. Further, this included how they cared for their hair, nails, and the jewelry worn.

Self-Confidence

Self-confidence is the next higher level of SAM. All of the participants noted the importance of believing in self as key to their reaching STEM membership. Parental support and encouragement are important aspects of fostering self-confidence which is key to the success of females in STEM (Rayman & Brett, 1995; Scott & Mallinckrodt, 2005). Fusia explains this by stating that the nurturing received from her family served to "build my self-esteem…"(Fusia transcript lines 381). Nubia also added, "I think that my mother and father never discouraged me from accomplishing what I wanted to accomplish…" (Nubia transcript lines 340). How this self-confidence is fostered so that it produces participation of females of African phenotype in STEM is the resultant conclusion of this dissertation.

Self-confidence was cultivated for these women in part because they were not constantly compared to Whites or any other dominant group. Their parents or grandparents were from nations where they were the majority. Their self-image was therefore not limited to a low-caste, mentality due to their phenotype. These women were able to enact significant self-determination. They did not live in a system where their measure of success was measured by others in their society. Instead, their personal success was measured by their perceptions about how they were doing in the U.S. as compared to the opportunities for advancement they would have experienced in their families' country-of-origin (Bryce-LaPorte, 1972).

Thus, they managed to avoid a major hindrance for people of African phenotype and females in the United States; accepting the belief that they were less intelligent and less able to succeed in math and science or STEM (Wortham, 2006). Fusia demonstrated this general strength of character in her response to the counselor who was trying to encourage her to

become a nurse instead of a doctor. She explained that she felt White America tends to categorize all people of African phenotype as being African American. She also communicated that by doing so, White America imposes the same flawed belief system about ability and intelligence on all of African phenotype inclusive of foreign born Blacks. As a result, rather than being challenged to achieve and excel, Blacks are often limited by the negative expectations of teachers and professors who hold such negative beliefs (Steele & Aronson, 1996; Tettegah, 1996).

In the United States females of African phenotype, in addition to stereotype threats regarding phenotype, also encounter limits based upon gender. These threats rooted in gender bias send messages that females are less intelligent in math and science subjects than males (Johnson, 2006). Fortunately for Afro-Caribbeans these messages do not have the same effect because they have received positive input from parents, teachers, and their cultural community that has helped dispel these myths. In fact, from an early age it appears all selected a STEM career (e.g., Andrea wanting to be a nurse; Dorcas, Fusia and Afia all having interest in becoming doctors). Their parents and community supported their STEM pathways.

The social structure in which they were reared lacked the systemic preconception of stereotype threats regarding intelligence, instead it fostered and supported their desires to excel in arenas that in the United States are often designated for Whites only. Sadly, in the United States not only do Whites believe that people of African phenotype are less intelligent, this preconceived bias has caused some people of African phenotype to adopt this belief and thus impose self- limitations (Smith, 1990).

It is not the case that all the women were exceptional students and had no struggles. Fusia reported that she "did not get all A's and B's" in college. However, when she needed help she sought it out. While attending college Nubia sought help from her chemistry instructor. Therefore, these women seemed to accept that the fact that intelligence is not fixed, or a gift but rather based on growth (Dweck, 2006). When intelligence is seen as a gift, the individual believes ability is innate and fixed; in the growth-oriented mindset intelligence can be facilitated with effort and hard work. The confidence in their ability is associated with a growth-oriented intelligence mindset and belief (Dweck, 2006; Corbett & Rose, 2011).

Hard Work & Perseverance Leads to Opportunity

The next two levels of SAM are valuation of hard work and opportunity. Three of the five women interviewed stated that hard work and perseverance were the reasons for their success in STEM. Dorcas echoed the American work ethic by stating that hard work is a path to becoming "whatever you want to be" (Dorcas transcript line 764). Andrea seemed to agree with this but added that persistence is also important. Andrea reports," Believe in yourself, set your goal and make sure everything that you do is something that is going to accomplish that goal (Andrea transcript lines 946-947). This value is particular important for Afro-Caribbeans for whom being West Indian and working hard are almost synonymous.

These women came from households where all of the males except one were entrepreneurs who had started their own businesses in Panama. They saw their parents or grandparents work. All the women caregivers in their households worked and contributed to the income of the family. Afia stated that this was an African value where women are expected to contribute to the economic wellness of the family. She recalled that this was also

evidenced in Caribbean societies where men worked in the fields, but Caribbean women went to the marketplaces to sell the produce (Klein, 1986). Women's work is important and distinct from the work of men. This example provided by their families and caretakers regarding hard work would later influence their beliefs regarding hard work. Even retired, they continue today to be involved through entrepreneurship endeavors or serving on committees both in the United State and in Panama. This supports Manski's (1995) theory of endogenous effects regarding the individual in a community (neighborhood) in that members tend to reproduce what they witness from other members in the system. So as the women saw hard work modeled, and women's work valued, they too imitated this behavior. Andrea, in her work as wife, mother and Senior Vice President of New York City Health and Hospital Corporation explains ," …it almost killed me physically"(Andrea transcript lines 669).

Waters (1999) found that West Indians, in her study in New York City, wanted to distance themselves from African Americans over this issue of work. They felt that African Americans did not want to take advantage of available work. In contrast, Afro-Caribbeans often will take menial positions because they do not perceive these jobs as defining their sense of self. Instead, such jobs are seen as stepping stones to a better position. West Indians are stereotyped as working several jobs and taking the ethic of hard work to an extreme. This stereotype is echoed in Waters' (1999) study. When African Americans were interviewed about the work ethic of Afro-Caribbeans some agreed that they were more hard-working and ambitious. Others questioned why they would work so hard for wages that were so paltry. Afro-Caribbeans saw the hard work as a value that would ultimately lead to economic wealth (Waters, 1999).

Kasinitz (1992) identified, "In the case of West Indians hard work certainly does play a role, as does a reluctance to take public assistance" (p. 97). These studies support the supposition that there is a difference in work ethic and beliefs about work for Afro-Caribbeans. One reason is minorities immigrate to a country to improve their economic position and gain access to better education for their children (Mortimer & Bryce-Laporte, 1981). They can create opportunities by their transnational mentality of going to where jobs are available (e.g., other countries). A second reason is that Afro-Caribbeans have been able to realize tangible benefits from their hard work. These ideological differences seem to distinguish them from African Americans. They have seen a payoff for their hard work and perseverance; this is not always the case for all Americans of African phenotype. African Americans have not always experienced the compensation for their work or educational attainment (Rothstein, 2004).

Wilson (1996) found that, in a Chicago, community employers felt that African Americans were less desirable to hire because of their poor work ethic. This included poor attendance, tardiness and wearing clothing that did not fit the work environment. African Americans also reported they felt that they were perceived as less desirable. One applicant was informed that all applications from Blacks were immediately put in the trash without perusal. Wilson concluded that the cycle of joblessness in the African American community had resulted in hopelessness that enacted itself through alcohol and drug abuse, intermittent work cycles, and economic destruction of the communities in which African Americans live. The stereotype that African Americans are not hard workers seems to limit their opportunities economically.

Ultimately, working hard was a value for the Afro-Caribbean women interviewed, but this hard work led to tangible opportunities based upon their educational attainment. They all worked towards securing higher educational degrees even though they were already employed and somewhat secure financially. Andrea became the first Quality Control Specialist for the hospital systems in New York City because she chose to pursue a certification program beyond her Master's degree. Such opportunities were clearly important to these women's STEM success.

STEM Attainment

STEM attainment is the highest level of SAM. The five participants clearly exemplified all the requisites necessary to reach this final stage because they were employed in or retired from STEM careers. Each participant reported that they had received encouragement from parents, grandparents and the community which instilled the self-confidence needed to pursue their STEM career. This is reflected in SAM in that the foundation was their family of origin which provided the skills and strategies needed to build self-confidence so that they could persist in STEM training which is evident by their hard work and perseverance.

All of my participants had the distinction of being the first person of African phenotype to hold certain positions. This meant that they had the strength to daily face the challenges presented by Whites who fundamentally did not believe that they were able or capable. In the struggle Nubia encounters with her supervisor in her first position as a nurse she draws upon her self-confidence built over the years by her parents and responds, "You do not define me, my parents define me" (Nubia transcript line 425). To further support this, Andrea's statement that it is not what others believe about you, but what you choose to

believe about yourself that matters. Dorcas and Afia also proved that they had the self-confidence to embrace their Black identity when others presumed that they were not Black.

Females in the United States are sent the message that math and science are male fields of study. Girls may internalize the belief that boys are better at math than they (Beilock, 2010). Further, females of African phenotype in the United States, constantly receive the message that math and science are not attainable because they do not possess the intelligence for these fields (Steele & Aronson, 1995).

This was not at all the case for the five women involved in this study. I now introduce the second model which combines the transferrable values and strategies identified by the women in the study through SAM, to specifically discuss how self- confidence can be built in order to counteract phenotype and gender barriers to STEM acquisition.

Building Self-Confidence in Females of African Phenotype

In this final section, I apply results of the data analyses to the interpretation of Research Sub-Question 3. The recommendations that the study participants offered are developed into the proposed Self-Confidence and Bi-directional Effects Model (see Figure 5.2) throughout the sections. I use the Model to discuss the barriers and challenges to SAM. The Model also addresses the ways in which these barriers may be mediated by those who influence STEM education for females of African phenotype. The offered recommendations arose from the data via the grounded theory approach.
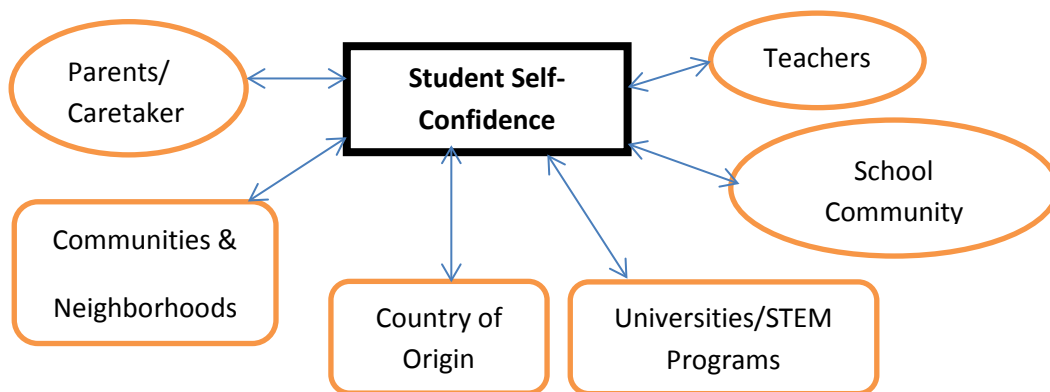
Figure 5.2 **Ecological Model: Self-Confidence and Bi-Directional Effects**

The Ecological Model of Self-Confidence and Bi-directional Effects shows that self-confidence for females of African phenotype is a central factor to STEM success for women of African phenotype. The placement of self-confidence in the hierarchy of STEM attainment was demonstrated in the previous section from SAM. The proposed current Model asserts that self-confidence is influenced by several factors. These are: women's country-of-origin; the cities where they lived in their formative years; their relationships with their parents or caretakers; their interactions and support at the schools they attended; and their relationships with their teachers. All of these interactions serve to develop or negate the self-confidence needed for STEM attainment.

This Ecological model also suggests that these identified relationships have a bi-directional effect on self-confidence. Thus, it is expected that the self-confidence of females of African phenotype is affected by these external factors and that these external factors are also affected by the self-confidence of these females.

The model also implies that these relationships may produce the very barriers regarding phenotype or race and gender that impede the persistence of females of African

phenotype in STEM. Alternatively, they may provide the positive building blocks for self-confidence needed by females of African phenotype. One relationship in the Ecological Model of Self-Confidence and Bi-directional Effects may be positive while another simultaneously is producing a negative effect or threat. This does not mean that the net result will be a female who is unable to persist. As participants encountered negative threats from teachers they found that the positive support of parents and members from their country of origin offsets these threats. The result is as the African saying states: "it takes a village to raise a child". No one relationship can solely provide the self-confidence needs of a child; it takes all the relationship members to produce a positive net result. Conversely, no one relationship can negate the positive influence of the other relationships. However one such threat may be detrimental and diminish the positive effects.

Females of African phenotype are potentially an important resource. In the case of my five participants, the U.S. ultimately reaped the benefits of these women's STEM education and occupational attainments because they were nurtured in social systems that had positive impact on their self-confidence. In the section that follows, I offer recommendations following elements from the Ecological model to those that are in positions to reduce the negative stereotype threats and offer positive support to build self-confidence for females of African phenotype. I speak specifically to those who work with females from the African American community because they are the majority population of those of African phenotype in the United States and are from the underrepresented membership of STEM. These recommendations evolved from the literature, the participant voices, the STEM Attainment Model (SAM), and the Ecological Model of Self-Confidence and Bi-directional Effects. From SAM, the first recommendation is to parents or caretakers since they are the basic

foundation of self-confidence and they provide the values and strategies for the persistence of females in STEM.

Recommendations to Families: Parents & Caretakers

1. Parents are encouraged to actively participate in the educational process of their children.

Nubia's recommendation to parents was that they should not relinquish their parental rights to personnel from their children's schools. Nubia's reminder that parents know their children best is echoed here. Schools may be perceived as intimidating and parents often do not feel welcome, even though it is the right of the parent to participate in the educational process (Lareau, 2011).

It is important that parents positively communicate that education is important through their involvement in assignments, checking of homework and ensuring that students have the necessary school supplies such as rulers, paper, and crayons for classroom instruction. Parents are encouraged to promote literacy by promoting a print-rich environment that includes having reading books at home, making reading time a priority in the home and taking their children to the library.

Secondly, parents are asked to have their children participate in enrichment programs and activities that can foster a love of learning. Through music education, sewing and other skill building activities, females can be gain the self-confidence in their ability that can be transferred to persistence in STEM training.

Finally, parents are also encouraged to take their children to museums, zoos and other educational and community outreach centers. In this way they extend the academic content

knowledge of their children. It is important that parents, as children's first teachers, continue to execute authority in this role and not relinquish it to schools and teachers.

Recommendations to Community Leaders and Neighborhoods Programs

1. **Communities that serve African American females can offer programs that support and promote STEM membership access and increase representation.**

Banks' (2004) typology again is a reminder that in order for African Americans to move to the third stage, of cultural identity clarification where the individual develops positive attitudes towards their own culture, there is a need to see members that look like themselves and are positively portrayed. Toward that end, community leaders and neighborhoods are asked to participate in the educational process by providing STEM role models for school events and career days. Further, mentors are needed for after-school, weekend, and other programs that specifically promote STEM education and career pathways. Females need to see STEM members in order to have an aspiration for these careers. Through these encounters the self-confidence in their ability can be enhanced.

Community institutions such as libraries are asked to be intentional in the display books in order to include those that reduce stereotype threats and positively portray people of African phenotype. Books that are made available to students need to promote images of Black scientists and Black doctors like Mae Jemison and Ben Carson, as prominently as they promote images of sports figure like Michael Jordan and LeBron James. Additionally, these should be displayed throughout the year rather than confined to the month of February as part of the Black History focus. This will serve to increase the self-confidence of females of African phenotype.

2. **Funding is needed for the expansion of successful programs such as ASPIRA that are proven to work with Hispanic students and those of African Phenotype.**

The ASPIRA program provided Fusia with counseling and academic guidance so that she was successful in the academic track that prepared her for college and later STEM success. It was also an ASPIRA counselor who advised her to pursue her desire to become a doctor, despite the recommendation from her teacher that she consider becoming a nurse. These programs that offer tutoring and counseling services to students guide the academic process by supporting parents and students who may not understand how the educational system is designed in contrast to their home countries. These programs can help close the achievement gap which will further build self-confidence in females of African phenotype.

3. **Provide opportunities for females of African phenotype to work in STEM careers of practice.**

Community groups are asked to partner with STEM businesses in order to provide mentorship and internship programs in order for females of African phenotype to have exposure in being in these communities of practice.

4. **Funding of programs that allow females of African phenotype to attend museums, zoos and other local educational programs**

Many schools do not have funding for field trips to museums and zoos. Funding is needed to allow for students to attend these local educational services. Funds can be provided by organizations that work with schools or as a voucher to parents. For example, students who are on the honor roll in elementary school may receive a free family pass to the local

museum. This will serve as an incentive to students in low income communities who demonstrate academic excellence.

5. **Programs are needed that support parenting skills that encourage the education and participation of fathers.**

Low income parents often feel uncomfortable participating in the educational process of their children (Lareau, 2011). Therefore, communities need to provide programs and opportunities for fathers to be included in the educational process. This can be achieved through father-daughter events and family science nights.

Recommendations to Schools

1. **African American parents, regardless of socio-economics and class, need to be embraced in the schools that serve their children.**

Schools that seek to improve student achievement can adopt parent-teacher empowerment models that foster the support of parents in the educational process. Schools that are implementing these models are seeing improvement in student achievement. Such gains are especially important for schools that are predominantly African American or need improvement in yearly academic progress (Christianakis, 2011). Schools need to intentionally design programs to include fathers in the activities of the school.

2. **Programs are needed that train parents and fathers in order to support their inclusion into the educational process of their children.**

Afia's position in the school was designed to support the parents in order to improve student achievement. Schools need to provide computer training, workshops on parenting strategies, and topics of interest to parents; in this way parents can be equipped to actively engage in the academic process of their children. As parents and schools unite with one

voice, it reduces the dissonance that may occur within the students when parents and schools are not aligned, this will increase the self-confidence of the students.

Next, an emergent theme in this study was the active participation of fathers or father figures in the lives of the women for this study. Programs that specifically include fathers by inviting them for father-daughter interactions can create opportunities for inclusion for male caretakers. The male presence positively affects the academic progress of females (Vandamme, 1985).

3. **Training is needed for all school personnel for the implementation of culturally responsive pedagogy.**

Harris & Marsh (2010) found that African Americans that have a strong identity and acceptance of their culture perform better academically. Because they are successful academically, Whites and Asians are not asked to deny their ethnicity or family-of-origin. It is unfair to expect African Americans, Hispanics and Native Americans to deny their culture and embrace academic achievement based upon White culture. Ogbu (2008) argues that this 'acting White' will only serve to produce cognitive dissonance and force some members to choose to remain loyal to their culture even if this results in poor academic performance.

Culturally responsive pedagogy has been repeatedly promoted in the literature (Harris & March, 2010; Lynn, Bacon, Totten, Bridges & Jennings, 2010; Ladson-Billings, 1995). It is the culturally responsive teaching that creates a classroom climate that includes the experiences from the culture of the students into the teaching in order to better effect learning (Gay, 2000). In-service trainings is needed for all school personnel from the ancillary staff to classroom teachers in order to increase cultural competence of the school and foster respect for students and their families of origin. Dorcas provided an example of this by her

philosophy of starting her lessons in biology based upon the interest and needs of her students.

4. **Schools can foster programs that challenge students through competition and higher order thinking.**

Parents want to feel that their institutions of learning believe in the ability of their child (Cholewa, Amatea, West-Olatunji, Wright, 2012; Lynn et al., 2010; Tucker, Dixon, Griddine, 2010; Wiggan, 2007). Students need to be offered a full curriculum that embraces common core standards. These standards include content knowledge and performance assessments.

Schools and teachers can communicate conviction in student ability and set high standards for students by participation in competitions such as science fair and exposing them to curriculum that includes hands on learning. Dorcas stated that this sense of 'competition' allows students to challenge themselves. She gave the example of the Mars mission in which scientists cheered when they accomplished their task as an example of what is lacking in our public schools. Afia added the importance for students to 'build and make things', or engage in hands on learning. Similarly, Fusia recalled her education in Panama, remembering that she had to make a model of the light bulb. Students need a rich curricular experience that includes hands on learning, participation in competitions and engaging verbal interactions.

5. **Schools need to provide classes that educate mothers and second language parents.**

With the changing demographics and increased percentage of immigrant students, schools need to provide classes for parents who have limited educational attainment or who

are second language learners. Programs that include English classes, computer training, and basic information of the educational system of the United States would be important to immigrant families.

6. **Changes are needed in the way the national educational achievement gap is communicated.**

Information about academic achievement for people of African phenotype is most often communicated as a comparison to Whites. Asians, African Americans or Blacks, Hispanics and Native Americans are compared to Whites. However, the academic performance of White Americans is no longer the global standard for excellence (Wiggan, 2007).

Wiggan (2007) asserts that the communication of the achievement gap serves to maintain constant negative comparison, as well as the black-white binary. This contributes to the adverse effects of self-confidence for those of African phenotype. It continues to communicate that Whites are the benchmark for success for which all other groups must be compared. This approach emphasizes to the media that Blacks continue to perform poorly without reporting the variance that exist by social class and ethnicity of those of African phenotype (Gay, 2000). It diverts attention from the real issue: that the United States is far behind most developed countries in the performance of math and science for all members of its society including Whites.

7. **Schools need to address the ways in which the system of tracking students based upon ability and phenotype perpetuates the underrepresentation of females of African phenotype.**

Honor programs do not offer the same level of rigor at all schools (Lopez, 2003). Low income students often enter college and are less prepared because of the schools that they attend (Kozol, 1991; Stewart & Stewart, 2007). The system of tracking that attempts to determine the academic outcome of students based upon their initial academic successes or failures is proving to maintain a structure that limits the participation of females of African phenotype. This system negates a growth model of intelligence for females of African phenotype.

Recommendation to Teachers

1. **Females of African phenotype, in general and African American females in particular need to receive the message that they possess the ability to succeed in STEM.**

Stereotype threats are transmitted daily by the media via networks that often cater to audiences of African phenotype (e.g. BET), and schools by teachers (Quinn & Spencer, 2001). These threats communicate that females of African phenotype are not smart enough for STEM membership (Beilock, 2010). These negative influences dramatically affect the self-confidence of students and reduce the likelihood that they will participate in STEM. It is important that teachers send messages that encourage and communicate that they are capable. Teachers are also cautioned to remember that intelligence is growth oriented and not fixed, therefore, females who struggle in math are not incapable, but need more practice and instruction.

2. **Teachers are advised against blaming students and their families for their lack of performance.**

This important recommendation has already been highlighted by Lynn et al (2010). It is the schools responsibility to serve all of its students and determine how best to educate them in order to realize academic yearly progress. Schools and teachers that do not believe that their students have the ability to succeed academically are transferring this belief to the students and contributing to a system of failure.

3. **Treat each student as individuals and not as a number in a 'one size fits all' model for learning.**

Differentiated instruction should not be solely used for Special Education, but for all students. By using these strategies teachers may be challenged to relinquish negative beliefs regarding intelligence and phenotype which limit their academic progress. As life-long learners, teachers need to be the models for change for the educational system. Class values that continue to perpetuate the beliefs that based on phenotype, some members of society are less intelligent and incapable of STEM participation can be changed by the educational system (Aronson, 2008).

Finally, teachers are challenged to include in their curriculum African American scientists such as George Washington Carver and his work with peanuts and sweet potatoes and Louis Latimer who published work on the light bulb filament. By including such scientists students of African phenotype can learn about the impact of people that share their phenotype. Teachers are encouraged to introduce these people in context with the curriculum and not isolated to the month of February.

4. **Teachers are reminded that reflection is important and specifically reflection on their own beliefs regarding race, class and gender.**

Gay (2000) states that 78% of all teachers who enter the workforce are White and represent the middle class. These middle class values and beliefs often include perceptions regarding intelligence based upon gender and race. Tettegah (1996) finds this to be true in her study with pre-service teachers. As a result of the history of racism and hegemony in the United States many would prefer to overlook the lingering effects. However, it is imperative that teachers re-evaluate their beliefs and actions and the ways in which they render students 'invisible' in their classrooms. Finally, all teachers and counselors are challenged to encourage females to participate in advance placement science and math courses. Through these courses females can be exposed to academic rigor that may be lacking in general education courses.

Recommendations to Higher Education and Teacher Preparation Programs

1. **Multicultural training that will produce a culturally responsive pedagogy for students that include differentiation of instruction.**

Research has found that teachers often feel that their students of African phenotype are inferior in intelligence (Smith, 1990; Tettegah, 1996). Additionally, the fact that students do not believe in their own ability is no longer a matter of misperception of their teachers' beliefs. Rather, students of African phenotype are likely to have accurately perceived their teachers' negative beliefs.

This is important because the United States continues to be a nation of immigrants and the majorities, or White people, are now the minorities in many cities throughout the country (Dougherty, 2010). U.S. classrooms will therefore continue to include students of varying phenotypes and cultures (Taylor & Sobel, 2011). Therefore, it is important that teachers engage in culturally responsive teaching that recognizes the family of origin and

culture of their students rather than showing contempt for it (Gay, 2000). Through culturally responsive pedagogy teachers can be challenged to identify the learning styles of students and differentiate instruction for all students.

Afia mentioned that Gardner's Multiple Intelligences can be adapted to differentiate teaching approaches. Gay (2000) argues that some teachers are resistant to this approach because they do not want to appear to be 'racist' or to be treating children differently. However successful teachers of children, Black children in particular, acknowledge that there is not a 'one size fits all' approach to teaching children.

2. **Teacher training programs need to include the work of Ogbu, Banks, Aronson and Dweck.**

In order to support effective teacher pedagogy, the work of Ogbu and Banks are important for teachers to gain knowledge regarding the identity of students and specifically those of African phenotype. Aronson's work on stereotype threats is needed to help teachers to reflect upon their classroom practice and the ways in which they impose threats and impede the educational process for their students of African phenotype. Finally, the work of Dweck is a valuable reminder that learning is growth oriented; the educational system tends to treat females and specifically those of African phenotype adversely when they struggle, imposing a gift model response to their academic struggles.

3. **Grant funding is needed to support females of African phenotype so that they can participate in STEM internship programs.**

Again, it is important for females of African phenotype to be exposed to STEM communities of practice. This should not be limited to STEM practice placements, but also STEM teachers at universities and middle and high school science teachers.

4. **Preparation of Science Methods Students.**

The first recommendation to Science Methods instructors is that they build confidence of reluctant science learners. Many females are afraid of science classes inclusive of methods for science because of negative past experiences with this subject matter. There is a need for science teachers in 48 of 50 States (Westerlund et al., 2011). Science methods teachers are asked to encourage all pre-service teachers to fill these shortages. Most science classes are taught by teachers who are considered out-of-field; they do not have the qualifications to teach science or math (NAS, 2007).

Further, the shortage of science and math teachers is not limited to the US; in Europe, Australia and Sub-Saharan Africa there is a demand for science and math instructors (Westerlund et al., 2011). Next, pre-service teachers need to address their fears regarding math and science so that they do not transfer this to their future students; this begins by building self-confidence in the subject matter. Strengthening the self-confidence of teachers will positively affect the self-confidence of female students of African phenotype regarding these subjects.

Methods teachers are challenged to expose students to science teaching pedagogy that reminds them that science instruction and what is considered 'knowledge' or epistemology is a Western male construction which often excludes the epistemological constructs of other cultural groups. Although, generating science knowledge is an activity that includes humans, the voices that are often included in the making of this is limited to males (Espinoza, 2012). Western ideology often includes conquering nature and explaining it, whereas in the case of Native Americans, knowledge is constructed so that humans and nature cooperate and coexist (Cajete, 2000). Science methods teachers are encouraged to include instruction that

educate teachers to be culturally responsible in the teaching of science so that the culture of

the community for their students will be represented. Females of African phenotype need to

see themselves respectfully represented in instruction. Syllabus readings should include

seminal writers such as Ogbu, Banks, Aronson, Cajete, Ladson-Billings and Gay, to broaden

the cultural knowledge of teachers so that they can be better informed to work with students.

Recommendations to Educational Outreach Programs and STEM Initiatives

1. **After- school and enrichment offerings by Universities and other
   organizations should consider the challenges faced by working-class parents
   who may not have flexibility in their schedules to attend school-related
   functions.**

Many parents in lower socio-economic communities may work odd shifts and a late

program pick up may be difficult (Lareau, 2011). Of note is the fact that Fusia helped fund

school-based afterschool programs that served students. In this way, she helped make schools

a safe haven for students and a one-shop-stop so that parents are not struggling with the

transportation of their children to other locations. It may therefore be wise to ask parents

what time may be best for these extra programs. Through Fusia's 21st Century grant program

she works with schools to determine whether before, during, or afterschool programs work

best for the needs of the students at the schools. In this way STEM programs need to be

mindful to ensure that underrepresented students are served by the programs offered and that

this is reflected in the enrolment of these programs.

Through these recommendations it is expected that the self-confidence of females of

African phenotype will improve and this will result in their greater participation in STEM.

Ultimately, and unfortunately, as the Ecological Model of Confidence and Bi-directional

Effects shows the poor self-confidence of students of African phenotype and especially African American students produces students with poor self-image and the results are poor academic performance and lack of preparedness for STEM membership.

Study Limitations

The findings of this grounded theory case study are limited in that it is a purposive sample rather than random. The participants of the study only represent a snapshot of Caribbean culture and history, namely those members who went to Panama to work on the Canal Zone. The reader should therefore be careful in making generalizations based on their experiences. Additionally, participants were not representative of the entire range of STEM careers.

A second limitation is that the study focused exclusively on the experiences of Afro-Caribbean females. Afro-Caribbean men in STEM were not considered. The women in this study are unique in that although their families came from different islands in the Caribbean, all family members came from islands that were colonized by the British. Therefore, the education of the parents or grandparents and their respective cultures were influenced by the British. This probably influenced the similarities that were presented in their values and cultural experiences. The culture of women from non-British islands was not considered in this study, therefore experiences of women from French or Spanish islands were not explored.

Additionally, the study only considered the experiences of Afro-Caribbean women who were employed in STEM. The study did not explore the experiences of Afro-Caribbean women who worked in service-oriented jobs. The experiences of the women identified in this study may therefore not be representative.

Finally, as a female Panamanian of African phenotype, who is also employed in a STEM career, I was well received by participants. My participants were very open and forthcoming in regard to their experiences and explanations. I was invited into their homes and had easy access to them if I had additional questions. Member checking was more of an informal conversation. They were constantly encouraging me. Thus, this process as an insider afforded me more access than what may have been afforded to an outsider, or to someone who was not Afro-Caribbean. This may have resulted in the rich narratives that I received.

Implications for Practice

It is not possible that a single case study could conclusively affect changes in practices and attitudes of families, communities, schools, and teachers. Nevertheless, this dissertation presents evidence that supports the research that self-confidence is a primary factor in the persistence of females of African phenotype through STEM education training and into STEM careers. Additionally, this study identified that the self-confidence of females is impacted by their parents, their country of origin, their communities, the schools they attended and their teachers. I identified that all of the persons who influence students on these multiple levels need to consider the various ways in which they affect the self-confidence of females of African phenotype through implementation of both their formal and informal policies, programs and practices.

More specifically, the U.S. educational system – inclusive of schools and classroom teachers of which it consists – is challenged to consider how the historical treatment and beliefs about intelligence still negatively affect the collective identity of African American students. This includes constant comparisons to White students as the standard for academic

ability, economic success, and preferred status (Ogbu, 2008). These comparisons and expectations seem to perpetuate diminished self-confidence for African American students and negatively affect their academic performance (Steele & Aronson, 1995).

Parents and families can help females of African phenotype overcome these barriers by providing values and strategies needed to build self-confidence. Additionally, families in which a father or father figure is involved is proven to promote the success of these females. Families can instill values that support education and literacy in the home by providing reading materials and model reading in the home. The emphasis that families place on education should also be seen by the way the financial resources of the family is allocated; parents need to invest in alternative educational opportunities such as music, dance and sports that build aptitude, strengthen skills and talents, and ultimately secure self-confidence. Finally, it is important that parents model the value of hard work and pursuit of opportunity so that females of African phenotype can feel empowered to persist through to their STEM career.

Banks (2004) believes that there is still a need for African Americans to move from cultural psychological captivity to biculturalism and multiculturalism. This can be accomplished if the recommendations of this dissertation, as well as the recommendations of similar research are followed. This dissertation adds support to the assertion that teacher expectation can positively influence how students perform. However, teachers' negative expectations and disbelief in student ability are expected to result in the poor performance of students of African phenotype. If teachers are not able to believe in the ability of their students then effective teaching cannot take place and the opportunity for learning is lost.

Data from all participants revealed that the reasons they were able to overcome barriers related to phenotype and gender was because of the transferrable values and strategies learned from their families, their community and culture. This cultural experience included cultural pride, as well as a distinct absence of negative internalizations regarding intelligence. The women in the study were able to resist negative messages received from professors and co-workers. All of the study participants agreed that the negative messages that are routinely presented about Black intelligence, especially by the media are internalized by students who have to work against these messages in order to be successful. If these issues are not addressed then we will continue to see the under-representation of females of African phenotype in STEM.

Future Research

Future research is needed in order to further support the findings of this study. Self-confidence appears to be a primary factor that needs to be developed in order for females of African phenotype to persist in STEM training and participate in STEM careers. Additionally, development of this self-confidence may be best affected by members of society who are involved in the training of these females. It is the researcher's expectation that community organizations, schools and administrators, teachers and STEM programs can use SAM and the Ecological Model of Self-Confidence and Bi-directional Effects models as a litmus test for the success of their programs. In so doing all entities share responsibility for the support of the female of African phenotype and no entity is exempt from offering positive input. Exploration of resilience theory might provide additional insight.

Second, these proposed models would benefit from further examination using disaggregated data based upon ethnicity in order to better reveal the origins of women in

STEM who are of African phenotype. Presently, all women of African phenotype are routinely grouped together. Other ethnic groups, who may be persisting in STEM and are of African phenotype, may be able to offer additional strategies to females of African phenotype.

Third, this research offers insight to communities throughout the world that seek to empower females of African phenotype in order to encourage their persistence into careers that offer economic stability as STEM careers. I speak specifically to Panama and other Caribbean nations who produced these women; I encourage those systems to continue to intentionally build the self-confidence of their females of African phenotype so that their nations will benefit from the results. I also offer these proposed models to communities in South Africa where in a post-Apartheid system females of African phenotype are being educated to participate in a work force that previously was not open to them. As the self-confidence of South African females of African phenotype begins to emerge, this will serve to positively affect the community and the nation by producing a more educated parent with the skills needed to educate the next generation of students.

In conclusion, it was not the intent of the researcher to speak for the African American community simply because we share a common phenotype. Further research of the literature is needed to improve my ability to understand the issues regarding phenotype for Black people and particularly for African Americans. Research in critical race theory (CRT) would need to be addressed in order to have a more critical lens.

It is my hope that the experiences of these women of Afro-Caribbean culture and the strategies they presented can be used to inform work with all females of African phenotype

and promote their self-confidence so that they persist through the barriers in phenotype and gender that are related to STEM.

Hopefully, the United States will continue to reconsider strategies for filling the shortage of workers in STEM careers. Ideally, this would include a reevaluation of the ways in which schools are supporting females for the STEM workforce. It behooves the nation to look deeply at their female students who are of African phenotype. Females of African phenotype, much like my participants, represent a multitude of untapped potential. In the voice of one of these women, ultimately, "we are scientists, we are artists, we are creators" (Nubia transcript lines 729-730).

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Appendices

Appendix 1

Participant Survey Questionnaire

Your Name:_____

Research Study:
The experiences of Panamanian Afro-Caribbean women in STEM: Voices to inform work with Black Females in STEM Education.

Researcher: Beverly A King Miller

This questionnaire is designed to enable me to find out some personal information about you.

All information you provide will be kept confidential.

Thank you for your participation in this project.

If you have any questions regarding this questionnaire, you may contact me at: Beverly Miller. You can also contact my Advisor, Dr. Quincy Spurlin, The University of New Mexico.

Background Information

1. Place of birth: _____

2. Date of Birth:_____

3. How do you self- identify yourself: Please check all that apply:

    _____Black _____African American _____American _____Afro Caribbean

    _____Panamanian _____Jamaican _____Other

4. Year of arrival in the United States : _____

5. How old were you when you came?_____

6. High School/Secondary School you attended_____

7. College attended: _____

8. College degree (s): _____

9. How many years did it take you to complete college? _____If more than 4 years, please

    explain:_____

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10. What professional organizations are you a member?_____

11. What language/s do you speak? _____

12. How did you learn English?

_____

13. How often do you return to Panama?_____

14. What Panamanian Afro-Caribbean organizations are you a member of in the United

States?_____

15. What Panamanian Afro-Caribbean organizations are you a member of in

Panama?_____

16. What kind of financial or other support do you send to Panama or the

Caribbean?_____

17. What organizations specifically for Black people in the United States are you a member ?

_____

Appendix 2

Research Questions for Participant Interview

Overarching Question for Research Study:
The overarching research question for this qualitative study is: What key factors from the

lived experiences of Panamanian Afro-Caribbean women in STEM careers can be used to

inform work with females of African phenotype in their pursuit of STEM education and

STEM careers? **Introduction Questions: The first series of questions are about how**

you came to work in your career field.....

1. Tell me about your work and what you do? What is your title? Do/did you supervise

   other people?

2. What led you to choose the career field that you presently work in?

3. If you attended school in Panama, where was this?

4. Tell me about your school experience? Primary, High School, College?

5. How were the schools you attended selected? Why were these chosen?

6. What were your biggest challenges as a student?

7. Were there specific challenges in school that you think you faced in being female and

   of African phenotype? (African phenotype refers to being of African descent and dark

   skin.)

8. How did you overcome these challenges?

9. When things were hard as a student in STEM where did you get your support to

continue?

Research Sub-Question 1: What socio-cultural elements identified by these Afro-Caribbean women from Panama were most important in shaping their identity and resulted in their success in STEM?

Family/ Culture

Ok, so let's talk a bit about your family and Afro-Caribbean culture.

1. Tell me about your family life in Panama?

Probes:

a. Where did your family live?

b. What kind of housing?

Now that you moved to the United States....

1. What was the neighborhood and community like that you lived in when you moved to the U.S.?

2. Why was that neighborhood or location chosen?

3. What was the socio-economic status of your family? How did you know this?

4. Tell me about some of the values that you were raised to have as a child that has most shaped you as an adult?

Probes:

a. Values around education? Values about hard work? Values about honesty? Integrity?

5. How did these values support your success in STEM?

6. How did the Afro-Caribbean community **(in Panama)** contribute to and support these values?

I now want to talk about identity.....

1. How do you identify yourself?

Probes:
a. Do you consider yourself African American, Afro Caribbean etc... why?
b. What experiences shaped this identity?

2. Have you felt pressure to identify as African American in the United States? Describe what this was like?

3. How did the community you lived and interacted with in Panama contribute to your Afro-Caribbean identity?

4. How was your identity different from other people groups/cultural groups in the country of Panama?

5. How was your identity different from other people groups/cultural groups in the United States?

6. In what ways did this identity shape who you are today?

7. In what ways did this identity affect your choice to work in STEM?

Research Sub-Question 2. What specific advantages, skills, attitudes, and strategies learned from their cultural identity enabled these Afro-Caribbean women from Panama to negotiate the barriers in STEM classrooms and workplaces (such as gender, socio-cultural differences, or African phenotype)?

I would like to talk to you a bit more about the socio-cultural aspects of your culture. For instance family values, routines and beliefs.

1. How was literacy shown to be a value in your house growing up?

2. Which family members did you see reading? What kind of reading did they do? Other than going to school for the required instructional times, what other educational activities did you engage in? Can you describe these for me?

3. What kind of 'free time' activities did you have as a child? What kinds of activities did you do during these times?

4. How was graduations or promotions celebrated? How did the celebrations communicate that these events were important?

5. What kinds of cultural, sports or other activities were you taken to as a child? With which family members did you attend these events? Cultural activities like plays, musicals, museum visits, art galleries.

6. What kinds of family vacations or outings as a family were taken? Again, who attended?

7. How often did you interact with your extended family such as grandparents, aunts, cousins? What were these activities like? Did you enjoy the time with them?

8. On a typical day in your house, what kinds of foods did you eat? Fruits, vegetables, mostly grain, mostly meats....

9. Finally, regarding your physical health, what was the frequency in which you were taken to the doctor for a general exam, to the dentist, eye doctor?

10. What middle class values were transmitted by your care takers that you hold to now?

11. Where do you think your care takers (parents) came to learn these middle class values?

I now I want to discuss questions regarding identity, gender, and African phenotype....

1. What are the advantages in being Afro-Caribbean in the United States educational system?

2. What are some disadvantages to being Afro Caribbean in the United States educational system?

3. What assumptions do you think teachers in the classroom make because of your skin color or African phenotype?

4. Have you experienced negative stereotypes in the classroom due to your skin color**?**

Probes:

5. Please explain what happened. How did you respond in these situations?

6. How might it be easier as an Afro Caribbean woman to take classes in STEM here in the US?

7. What are some barriers that you think women face in going to school for STEM training?

8. What advantages might there be in being an African American woman in STEM classes here in the US?

9. What disadvantages might there be in being an African American woman taking STEM classes?

10. What are some of the assumptions that you think teachers have regarding African Americans in STEM education or education in general?

Probe:

10a. Can you give examples as to how you arrived at this conclusion?

Let's talk now about being in a STEM career in the workplace....

1. What are the advantages in being Afro-Caribbean in the US workforce?

2. What are some disadvantages to being Afro Caribbean in the United States workforce?

3. What assumptions do you think employers and empoyees make about you as a result of your African phenotype?

4. Why do you think there are so few Blacks or people of African phenotype in STEM?

5. What are some barriers you think women of African phenotype face that is unique to them in the workplace in STEM careers?

   I now want to discuss how Afro Caribbean identity may help in your persisting in your STEM education and participating in a STEM career

1. What components of Caribbean culture have helped you with this isolation and to persist in STEM education?

2. What components of Caribbean culture have helped you with the racial isolation in many STEM careers that enable you to continue in your job?

3. How comfortable are you interacting with Whites? Please explain.

a. If you are comfortable with Whites, why do you think that is?

b. In what ways are you uncomfortable with Whites? Why do you think that is?

4. In what ways have you changed to fit in to the culture of the United States?

Probes: What cultural behaviors, foods, music or other things do you do differently that is more "American".

5. What customs do you hold on to although they may not fit here in the United States?

6. In what ways do you feel like you have to balance two cultures as you live here in the United States?

Research Sub-Question 3. What strategies and skills from the lived experiences of these Afro-Caribbean women from Panama might be used to inform educators in order to support all females of African phenotype in STEM education and careers?

1. Why do you think so few women of African phenotype complete STEM training and enter STEM careers?

2. What skills do you think women of African phenotype need to have in order to be successful in a STEM career given all the challenges of race and gender?

3. When you face challenges due to your African phenotype what are some strategies that you use in order to 'stick' with it?

4. What would you like to tell educators in order to improve the numbers of women in STEM careers?

5. In regards to the educational system, what kind of help did you get that would be beneficial to support other women of African phenotype in STEM?

6. And my final question is: What do you think has been the key to your success in STEM?