INCREASING RETENTION RATES OF BLACK WOMEN IN GATEWAY STEM COURSES: AN INTERVENTION AT NCCU

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Table of Contents

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

Abstract

The purpose of this disquisition is to improve the persistence of African American women in science, technology, engineering, and mathematics (STEM) gateway courses at North Carolina Central University (NCCU) through the implementation of a series of interventions. In this disquisition, I give a brief overview of the multiple barriers that have hindered many African American women from persisting in STEM fields. I explore the roots of student apathy, the roles of supplemental instruction leaders and tutors and the impact each has on student success. I also examine the intervention of incorporating early alert warning systems at an historically Black college and university (HBCU). My intervention includes (1) re-structured training of supplemental instruction leaders and tutors, (2) the consistent and accurate use of Grades First at NCCU, and (3) follow-up communication with supplemental instruction leaders and tutors to increase the pass rates of African American women in STEM gateway courses and increase their persistence in STEM programs at the institution.

The Disquisition

A disquisition, unlike a dissertation, is not traditional doctoral research. Both are partial fulfillments of a doctoral program; however, the disquisition is an action-based thesis (ABT) and a dissertation is a research-based thesis (RBT).

A disquisition focuses on a problem of practice in a particular setting. The disquisition relies on data to provide claims as to why the problem exists. The intervention or solution is applied to the problem and reviewed every 30 days, where modifications are made if necessary. The dissertation requires a thesis and typically five or six chapters: introduction, abstract, thesis, data/methodology, results, and conclusion. The disquisition does not consist of the traditional five or six chapters as the dissertation. Similarities are present; however, the disquisition should include the following: abstract, introduction, solution(s) to the problems, problem of practice in the local context, theory of improvement, methodology, participants, survey instruments, summary, process of intervention, findings, implications and recommendations, impact for leadership, and recommendations for others.

Introduction

There has been a longstanding history of disinvestment directed toward women of color, specifically[1] African American women, in science, technology, engineering, and mathematics (STEM) fields. Traditionally viewed as White, male-dominated fields, the STEM fields and associated institutionalized, structural, and internal barriers have barred many Black women from successfully pursuing lucrative STEM careers. Issues that pertain to access, diversity, inclusion, and acceptance for African American women have been, and currently are, obstacles that hinder Black women from assuming their rightful place in STEM fields.

The *golden age of science in America* (1940-1972) was a very dark period for women, especially African American women interested in pursuing scientific professions. Women who were fortunate enough to attend colleges and universities were met with isolation, ageism, sexism, and sometimes homophobia (Rossiter, 1995). In addition to all of these challenges, Black women were also subjected to racism. Since these practices defined the norm, little was done in White America to challenge the status quo.

During the late 1940s, organizations that supported women in their academic and professional pursuits, restricted membership to Whites only (Aspray, 2016). For instance, The American Association of University Women (AAUW) rallied against the underrepresentation of White women in leadership roles in academia but refused to accept Black women as members. It was not until the 1950s that the AAUW addressed its discriminatory practices, and in 1963 its members voted these practices out of existence (Aspray, 2016; Rossiter, 1995).

[1] African American women and Black women are used interchangeably.

African American women have steadily trailed behind their peers in STEM fields. It was not until the latter portion of the 20th century that STEM fields began to experience a flicker in college enrollment by African American women. Between 1995 and 2007, the proportion of science and engineering bachelor's degrees awarded to Black women increased from 7% to 8% (Hill, Corbett, & St. Rose, 2010). Still in 2010, African American women only held approximately 2% of science and engineering jobs (NSF, 2015).

The disproportionately low participation of African American women in STEM fields is attributable to a myriad of factors, including barriers that are internal, structural, and institutional.

Barriers

Internal Barriers

Internal barriers are psychological obstructions that prevent an individual from reaching their full potential based on perceived thoughts about his or herself (Bandura, 1986; Reis, 2002; Tinto, 2004). According to Covington's self-worth theory of achievements, individuals are thought to be only as worthy as their achievements (Covington, 1984). Students who already possess feelings and thoughts of insecurity may connect their abilities to succeed with their self-worth, creating a negative cycle of self-doubt and self-inflicted failure or thoughts of inadequacy (Farinde & Lewis, 2012). Internal barriers manifest themselves in challenges to a person's identity and self-efficacy, especially—for the purpose of this intervention—academic self-efficacy.

Identity plays a strong role in predicting women's persistence in STEM fields because societal norms have dictated that those who work in STEM fields should be reflective of the

dominant culture, i.e., White and male. How a woman identifies herself is crucial in negotiating the STEM workplace. Many African American women who choose to enter STEM fields may feel the need to alter their physical appearance as a means of fitting in. Something as simple as a hairstyle becomes a major issue when it comes to being a Black woman in a career dominated by White men. Should she opt to embrace a natural style (e.g., an afro or cornrows) or should she accommodate the expectations to have straightened hair? Although natural styles are artistic and political expressions that celebrate African heritage, to some Whites, Black women who choose to wear them may be perceived as unapproachable, aggressive, or even militant in academic and workplace settings (Chang, 2015). Without knowing, Black women may find they are compromising their identity to become a part of an unwelcoming culture with a traditionally masculine image. This compromise and these challenges, however, do not start in the workplace. By the time African American women enter the STEM workforce, they have endured countless other challenges to their personal and academic identities. In fact, Williams (2015) asserts that Black women begin to question their own intellect and their right to be in STEM after having had to prove themselves over and over again to their peers. Having to consistently prove and demonstrate her capacity undermines a woman's confidence. It follows, then, that the *loss* of self-confidence is an important factor in a woman's decision to retreat from a STEM major.

Self-efficacy is defined as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, pp. 71-81). Baber, Pefer, Colbeck, and Furman (2010) suggest that having a strong self-efficacy results in people being able to conquer the challenges that they encounter. Having a weak sense

of self-efficacy may result in people underestimating their skills and not having the capacity to deal with challenges they encounter.

Self-efficacy influences a person's plans to pursue a particular academic, career, or personal choice (Chang, 2002). Scholars found that students with high self-efficacy achieved higher grades and remained enrolled longer as compared to students with low levels of self-efficacy (Williams & George-Jackson, 2014).

Self-efficacy beliefs assist people in determining their perceived range of career options as well as their tenacity and attainment of desired results in pursuing such options (Lent, Brown, & Larkin, 1986). Having a strong sense of self-efficacy is necessary for students, especially African American female students to be successful in STEM majors. More often than not, African American women find themselves and their academic competencies called into question; this ultimately affects their feelings of self-worth, undermines their competencies, and adds to the obstacles in their way of pursuing a STEM major and career (Carpi et al., 2017; Farinde & Lewis, 2012).

Structural Barriers

Structural barriers are historic laws and regulations created to prevent individuals or groups from entering colleges and places of employment. These barriers can be traced back to the White House administration over 70 years ago. Contrary to the belief that the STEM crisis is a relatively recent problem, the lack of diversity and inclusion in STEM fields has been a quandary for the United States—since the 1940s when the United States found itself falling behind its foreign competitors (National Science Foundation [NSF], 2001) because of its failure to put research dollars into specific communities—namely Black communities. During the

height of Jim Crow (1876-1965) segregation was visible and legal (Haynes, 2014), and elementary, middle, secondary, and post-secondary institutions in Black communities did not receive their fair share of government aid that could have provided the necessary support to improve teaching (NSF, 2016). The U.S. government was not aware – or ignored the knowledge—that excluding women and minority populations would prove to be problematic for the economic health of the country.

During this era, scientific research focused more on wartime problems. Initially established as the National Research Foundation (NRF) in 1945 by President Harry S. Truman, the NRF would later be renamed the NSF (NSF) on May 10, 1950 after President Truman signed Public Law 81-507. Under this Act, the President appointed a National Science Board comprised of 24 part-time members, a director, and a chief executive officer, to expand scientific research so that the United States could once again compete on the international scene. (NSF, 2001). Specifically, more opportunities for undergraduate research were made available for faculty in predominantly White colleges and universities; there was no mention of research that would aid in attracting minority students or supporting educators of color in the classroom. It was not until 1970, under the Nixon Administration, that director William McElroy announced NSF's commitment to improve the quality of science education and to strengthen the research capability at historically Black colleges and universities (HBCUs) (NSF, 2016).

A decade later in 1981, President Jimmy Carter challenged societal norms as he brought awareness to girls and minorities not being afforded equal opportunities in middle school science and math courses; the "3-2-1 Contact" program was created, targeting underserved populations in middle schools (NSF, 2016). The Carter Administration also established a program for

expanding the capacity of HBCUs. Efforts were made to stimulate interest in and awareness of underrepresented minority populations and women in science and math courses. President Carter also appointed John B. Slaughter as the first African American director of NSF from 1980 to 1982. Slaughter, a staunch advocate of science, technology, engineering, and mathematics, created numerous mentoring programs at the national and university levels to improve the representation of students of color in the sciences (NSF, 2016).

President Ronald Reagan's view toward African Americans was completely opposite to that of his predecessor. Reagan used his political power to dismantle affirmative action, civil rights, and social programs that were created to support people of color. Once referring to African American women as "welfare queens," his misogynistic and racist views, reduction of programs, and termination of U.S. Commission on Civil Rights members who were against his policies on affirmative action and civil rights (Davidson, 2004), served to strengthen the barriers that African Americans faced.

Within his first year in office, President Obama created The American Recovery and Reinvestment Act of 2009. This legislation provided teacher training and research to improve the quality of math and science instruction (U.S. Department of Education, 2009). Addressing the needs to support educators and attract girls, women, and persons from underrepresented populations in STEM fields, President Obama's tenure resulted in multiple STEM initiatives to broaden the participation of women and girls in STEM fields, and to address barriers that pose a threat to women and girls and members of other underrepresented groups (Executive Office of the President, 2013).

Institutional Barriers

Institutional barriers are those that are practiced within an organizational setting; they can be subtle or blatant **(**Wilson et al., 2015**)**. The most prominent barriers that limit attainment of African American women in STEM fields are institutional characteristics, policies, and practices that pose significant difficulties for African American women in STEM fields (Farinde & Lewis, 2012; Perna et al., 2009), even though the enactment of the Title IX Education Amendment Act (1972) banned discrimination at any educational institution, educational program or activity receiving federal financial assistance (as cited by Edwards, 2010, p. 300). Ineffective enforcement practices by the U.S. Department of Education's Office of Civil Rights have led many educational institutions to weaken their resolve in promoting a gender equity environment (Kennedy, 2010). Disparities within education have impeded many African American female students from taking upper-level math and science courses in high school, majoring in STEM fields in college and securing STEM careers upon entering the workforce. Examining and improving the detrimental schooling experiences that deter African American female students from pursuing STEM careers, may spark a change in vocational choices that will aid African American female students in reaching their full potential (Farinde & Lewis, 2012). For this disquisition, I focus on the academic arena as the organizational setting.

From elementary to high school, young Black girls have historically underperformed in the areas of math and science in comparison to their White counterparts, and this has negatively impacted their intentions to pursue careers in STEM fields (Raines, 2012). However, research shows that the lack of Black women in STEM fields is not attributable to a lack of intelligence or interest, but is instead owed to a racist and sexist education system in America that has disengaged, under-educated, and underutilized females of color (Farinde & Lewis, 2012; Ko,

Kachachaf, Ong, & Hodari, 2013; Syed & Chemers, 2011). Rather than cultivating a passion for math and science exploration, African American female students are taught the fundamentals, but are often not further challenged academically in regular math and science courses. Though AP (advanced placement) courses by definition offer a higher degree of rigor, not all high schools provide AP courses at a higher, academically challenging level (Van Langen & Dekkers, 2005). Even though Title IX legally prohibits the denial of female students from public school courses, gender segregation in the classrooms still occurs. Once African American female students are identified as low achievers, they are tracked from primary education to secondary education and placed in lower-level courses that stifle academic growth (DeSena & Ansalone, 2009).

According to The School and Staffing Survey completed during the 2011-2012 school year, among the nation's 628,400 public school teachers, 1.7% felt that they were not at all prepared to teach, 17.3% felt somewhat prepared, 43.6% felt well prepared, and 37.4% believed they were very prepared to instruct students. In the state of North Carolina alone, of the 21,000 teachers surveyed with less than five years of teaching experience, 20.5% felt somewhat prepared to teach; 43.9% felt well prepared, and 35.6% felt very well prepared to teach in the classroom (U.S. Department of Education National Center for Education Statistics, 2012).

In addition to the lack of rigorous instruction in the STEM fields, Ahram, Stembridge, Fergus, and Noguera (2014) stated that inexperienced teaching staff is at the heart of achievement gaps between students of color and their White peers as many urban schools possess significantly greater unique and physical challenges than do suburban and rural schools. Urban schools operate in densely populated areas serving significantly more students. These schools have higher concentrations of poverty, greater racial and ethnic diversity, larger

concentrations of immigrant populations and linguistic diversity, and higher student transfer rates (Ahram et al., 2014). These high turnover rates coupled with an inexperienced teaching staff make it difficult for school administrators to build high performing schools with a strong teacher core to address the needs of students.

In 2007, Tsui stated that student achievement in STEM courses are enhanced by educational access, rigorous math and science high school curriculum, teachers with superior math and science skills, access to equipment, and lab activities. If we know these things, then why do we continue to allow this discriminatory practice of denying students access to the educational opportunities they need to compete in more challenging college preparatory coursework?

Another challenge to African Americans' academic success has been "summer loss" or The Faucet Theory. Entwisle, Alexander, and Olson (2007) conducted a study on Baltimore City Schools and noted that a significant amount of summer loss occurred when students were not in school. The Faucet Theory, or summer loss, supports the notion that during the academic year all students benefit from academic resources. However, during the summer, students from poorer families cannot compensate for academic resources as middle-class families can. Children from poor families reach an academic plateau or fall behind due to two and a half months of lost instruction. In other words, while the faucet is "on," all students are reading, studying, and learning; however, when the faucet is "off", many students suffer disproportionately because of the absence of the instruction of teachers, interaction with peers, access to educational technology, or tutorial support in an academic setting. Tsui (2007) asserted that providing access to summer bridge programs could help promote high achievement for underrepresented students in grades K-12 in preparation for post-secondary schooling.

Women's underrepresentation becomes even more apparent as they transition from secondary school to college, as they are outnumbered by their male peers in most of their STEM courses (Perna et al., 2009; NSF, 2015). The lack of women in the field and the isolation that women experience has been referred to as a "chilly climate" that some say explains why many Black women withdraw from majors in STEM fields (Allan & Madden, 2006).

Institutional culture in college classrooms can have negative effects on African American women's persistence. Therefore, it is encouraged that counterspaces be established as "safe places" for women of color to find support to persist in STEM majors. Solórzano and his colleagues (Solórzano et al., 2000; & Solórzano &Villalpando, 1998), who defined counterspaces as academic and social safe spaces that allow underrepresented students to: promote their own learning wherein their experiences are validated and viewed as critical knowledge; vent frustrations by sharing stories of isolation, microaggressions, and/or overt discrimination; and challenge deficit notions of people of color (and other marginalized groups) and establish and maintain a positive collegiate racial climate for themselves. Microaggressions also necessitate counterspaces for women of color. Sue et al. (2007) described microaggressions as "brief and commonplace daily verbal, behavioral, or environmental indignities, that communicate hostile, derogatory, or negative racial slights and insults toward people of color" of which the perpetrators are often unaware. Microaggressions exacerbate the sense of not belonging and in this way are linked to the isolation felt by women of color and members of other underrepresented groups in STEM education (Joseph, 2012; Justin-Johnson, 2004; Shain, 2002; Valenzuela, 2006).

Micro aggressions such as not being included in e-mails, study groups, academic and social gatherings, or professional organizations are all examples of passive—aggressive behaviors that prevent Black women from persisting in STEM fields (Rosenthal, London, Levy, & Lobel, 2011). However, these scholars, among others (Ellis, 2001; Nu~nez, 2011; Yosso, 2006; Yosso et al., 2009), identified such counterspaces as essentially homogeneous, defined by race/ethnicity or gender—for example, all-African–American or all-female spaces. Additionally, the psychosocial weight of having to perform better in classes and refute racial and sexist stereotypes can take an enormous toll on Black women's mental and physical health (Haynes, 2014). Being the focus of microaggressions by White peers or authority figures has profound emotional consequences (Smith, Hung, & Franklin, 2011) and creates instances of stress for women of color and other underrepresented students who must choose whether to ignore them, or respond but risk being seen by peers and professors as "too sensitive" (Yosso et al., 2009, p. 661), which has ramifications in relationships, collaborative academic work, and intellectual respect (Charleston, Adserias, Lang, & Jackson, 2014). Women of color experiencing microaggressions and isolation often have to contend with a layer of stress in addition to the inherent challenges of succeeding in higher education (Camacho & Lord, 2011; Carlone & Johnson, 2007; Ong, 2005). Counterspaces offer women of color alternative engagement experiences in STEM education, countering the distractions many face because of their racial/ethnic and gendered identities.

Social Justice

Faculty, staff, and some students may intentionally or unintentionally project their own biases toward African American women in STEM majors. Biases are embedded in the walls of

academia and must be torn down. Walls take the form of restricted access to academic resources and exclusion from meetings, student, and professional organizations. Each of these are examples of social injustice that if left unaddressed and uncorrected will lead to African American women being forced to change academic programs and settle for careers that are deemed more acceptable by the dominant culture. Such circumstances would continue a heretofore cycle of generational poverty in African American female-headed households.

Frankly, it just is not fair! It is not fair that women of color, specifically African American women, are constantly having to prove themselves over and over again. It is not fair that African American women are expected to run faster, jump higher, alter their appearances to make the dominant culture feel comfortable and smile during the process while still being undermined, overlooked, and undervalued. Not supporting African American women in STEM programs dilutes the entire academic experience for not only Black women but other students and professors in academia. Supporting this population brings a much broader and unique perspective that is not presented by White men or women or any other ethnic group. If more African American women were supported in STEM majors, more African-American women's voices would be heard when they interact with medical professionals. Their voices would be heard.

Consider this: a 32 year – old college-educated Black woman, who is a bank executive who lives in an upper-middle - class neighborhood, has been experiencing painful cramps and heavy periods off and on for a few years. She is single and has yet to have children. After meeting with various doctors, her current physician, who happens to be male and not a person of

color, informs her that she has fibroids and advises her to have a hysterectomy, leaving her unable to have children.

Another woman, divorced, 60 years old, and a retired custodian, who also happens to be Black, lives in a low-income neighborhood. She finds a lump in her breast. She does not have a history of breast cancer in her family, but she does have a history of ovarian cancer in her family. She was diligent about conducting her monthly self-breast exams and having her yearly mammograms. However, she finds a lump her most recent mammogram missed. Her doctor, a male, orders multiple tests and results conclude the lump is cancerous. Her best option told to her by her doctor is to have a mastectomy.

A close friend of mine, who resides in North Carolina is 58 years-old. She is married, a mother of one daughter and a retired educator. She was diagnosed with pancreatic cancer in the fall of 2016. Like the 60 year -old woman previously mentioned, she had no family history of this particular form of cancer. She was a health fitness nut who ran marathons, ate healthily, and never smoked nor drank excessively. It took her dramatic weight loss to prompt the doctor to order CA 19-9 Carcinoembryonic antigen (CEA), which is the blood test to detect pancreatic cancer. She said that when her results came back her tumor markers were well over the low range of 37 U/mL.

During her cancer journey, she remained hopeful by attending a cancer support group for almost 17 months, undergoing chemotherapy, radiation, and alternative methods. We talked two to three times a week. She would say how some of the nurses, who were often White, would be a bit impatient or even dismissive with her when she would inquire about details of her chemo treatment as if she did not need to know what other anti-nausea medication should be prescribed

to offer some relief. She would intentionally seek out the Black nurse who would access her port (the small area where she receives her chemo treatments) so she would have a friendly, familiar face that would offer support, guidance, and, needless to say, compassion. She and her husband noticed a pattern in some medical staff, who were usually White nurses or physician's assistants. They would be syrupy sweet when they needed her permission to take tissue samples for research, though not necessarily sweet in their actual care for her. She passed away June 2018, she was only 59.

These narratives of passive-aggressive relationships between patients and healthcare professionals offers a glimpse of what it is like to be sick and Black in America. These types of interactions are just as dangerous and deadly as Jim Crow in the segregated south. As a matter of fact, history has shown that Black women are more likely to be ignored, misdiagnosed, and misunderstood by healthcare professionals than White females who present the same health concerns. Nancy Krieger, Ph.D., professor of sociology and epidemiology at Harvard T.H. Chan School of Public Health says:

> . . . Black women born prior to 1965 in Jim Crow states were the hardest hit by segregated laws. Black women born and raised during the segregated South are more likely to have estrogen-receptor negative breast tumors, which are more aggressive and less responsive to traditional chemotherapy. (Stallings, 2018, p.111)

Segregation took an enormous toll on Black women's health. For more than 100 years, the toxic stress of discrimination deteriorated Black women's health. Dr. Arline Geronimus, a research professor at the University of Michigan's Population Studies Center, refers to this as "weathering", the eroding of one's physical, psychological, and emotional health. Geronimus

says "over time the stresses lead to poorer health outcomes—as well as premature aging, since it can literally shorten our telomeres, the protective caps at the ends of our chromosomes." She added that Black women between the ages of 49-55 were estimated seven and a half years older, biologically, than their White counterparts. In other words, when a house has continually been battered by storms it will eventually list, sag, and crumble; the health of Black people in America is corroded by the relentless assaults of racism. (Stallings, 2018, p. 112).

In an October 2018 article in *O Magazine* entitled *"*Getting Sick While Black,*"* author Erika Stallings stated, "no matter their background, education, income, Black women are chronically failed by the American healthcare system" (p.109). Sadly, there is plenty of anecdotal and factual evidence to suggest that there is a color-based bias in the American health care system, affecting even well-educated, upper middle-class patients of color (Stallings, 2018). Black women are negatively impacted by the U.S. healthcare system and are dying from diseases that traditionally plague men. According to the Kaiser Family Foundation in 2014, Black women are twice as likely to die from such diseases as diabetes, heart disease, and cancer than White women (Orgera & Artiga, 2018).

A 2016 study in the *Journal of Clinical Oncology* found that Black women, regardless of their risk level, are less likely than White women to undergo genetic testing because physicians are less likely to recommend it to them. Genetic testing for the BRCA2 gene mutation is used to determine if a woman has inherited a condition that elevates her risk for breast and ovarian cancer. Early testing can serve as a guide to assist the physician and patient in exploring treatment options that will make mastectomies and hysterectomies less likely. Some physicians offer the aforementioned procedures as a solution to remedy the problem, whereas this may not

be the only solution (McCarthy, et.al 2016). The disparity in the treatment with women in the American healthcare system, when diagnosed with cancers of the breast or the female reproductive organs, is valued less as compared to a man in the United States being diagnosed with prostate cancer. Dr. Mae C. Jemison, physician, astronaut, and principle of 100 Year Starship, stated:

> when a man is diagnosed with testicular cancer, testicles are not removed to prevent the spread of cancer. Why is that so, you may ask? Because most oncologists are men. As more women become oncologists, the conversations about treatment options for breast cancer changed from using mastectomy as a last resort, not a first choice (Hinnant-Crawford, 2016, p. 251).

Supporting more Black girls in STEM courses early in the educational pipeline will not only help to improve America's workforce, but more importantly, have a profound impact on saving lives, specifically Black women.

Finding Solutions

Addressing the myriad of issues that African American women face throughout their academic and professional careers may seem daunting, but there are solutions that institutions can employ to help lessen the divide. With regards to the internal barriers—identity and academic self-efficacy—that African American women face, more than 30 years of research involving the gender divide in STEM fields has revealed significant differences in participation rates, attitudes, and perceptions of males and females (Charleston, George, Jackson, Berhanu & Amechi, 2014). These studies have found that female students are often forced to make choices between their gender identities as females and the perceived STEM identity that is

predominantly White, middle class and male (Ong, Wright, Espinosa, & Orfield, 2011). Such choices may ultimately lead Black women to adopt strategies that would make the dominant culture feel more comfortable in their presence. One such strategy is code switching, the practice of changing how speakers engage in conversations across race, ethnicity, and gender boundaries. Code switching is a sociolinguistic term that refers to the process of changing one's style of communication to suit the socio/politico/cultural context of exchange (Nuri-Robbins & Bundy, 2016). This change can also be applied to their speaking style, such as tone, dialect, pitch, rate of speed, or even the language spoken. Code switching also refers to non-verbal communication such as body language, attire, and attitude (Nuri-Robbins & Bundy, 2016). Code switching is learning to shift one's behavior due to unwritten and unspoken rules imposed by the dominant culture on marginalized populations. Being made to feel inferior, Black women may begin to think that they do not belong. These messages may not be conveyed verbally but being excluded by their peers sends a message that they are not welcome. Here is how we can correct the problem in the classroom.

According to Green and Walker (2004), people code switch because they are oppressed by their environments. Those individuals who are systematically marginalized must learn strategies for fitting into where they are as a means of protecting themselves. For example, a woman of Black-Cuban descent, where Spanish is her first language, may feel very comfortable speaking in her native language. If she finds herself in mixed company, where she is in the minority, she may find herself switching her speaking style. This is an example of fitting in. W. E. B. DuBois speaks to this type of behavior in *The Souls of Black Folk.* He refers to this as working from 'behind the veil" or assuming a "double-consciousness." These two concepts are still relevant today and speak to what it means to be Black in America.

> The veil concept primarily refers to three things. First, the veil suggests to the literal darker skin of Blacks, which is a physical demarcation of difference from Whiteness. Secondly, the veil suggests White people's lack of clarity to see Blacks as "true" Americans. And lastly, the veil refers to Blacks' lack of clarity to see themselves outside of what White America describes and prescribes for them. (DuBois, 1994, p. 2)

Sadly, it seems it is still necessary for Blacks to alter themselves, their identity, in some manner. For Blacks living in two Americas—one White and one Black—they have had to learn how to circumnavigate in both worlds in order to survive.

For many African American women, resisting and overcoming the effects of the "double bind" (i.e., being both Black and female) may create a unique set of barriers affecting their persistence in STEM fields (Green & Walker, 2004). The burden of being associated with the double negative (two strikes) has hindered Black females in many ways, as the stereotypes about race and gender lead to their mistreatment, negative interactions and labeling, instead of their being treated as individuals. The intersectional identities of minority women play an important role in the development and persistence of these women in STEM fields (Ong, Wright, Espinosa, & Orfield, 2011).

Even though the literature continues to emphasize the problems that result from African American women having to navigate these conflicting identities on the institutional level, policies created to attract women of color to STEM fields have simply opened the doors without changing the culture (Johnson, 2007). Expecting women to continue to code switch is unreasonable; other solutions should be sought. Addressing the structural and institutional barriers that exist is the first step. Changing the culture is key. Studies show that institutions with smaller class sizes that make a concentrated effort to support (e.g., free tutoring, a small

faculty-to-student ratio, and faculty who focus more on teaching than research) women and minorities in STEM fields have higher persistence rates (Johnson, 2007). Why not start there?

At the doctoral level or as college faculty, African American women face even more obstacles in advancing their careers in their respective fields (Charleston et al., 2014). In a *Harvard Business Review* article entitled "Five biases pushing women out of STEM*,"* women provided the primary reasons that affected their decisions to stay or leave the STEM profession: (1) consistently having to prove themselves, (2) the tightrope, (3) the maternal wall, (4) the tug of war, and (5) isolation. Among the women studied, African American women were exposed to the greatest mistreatment. Seventy-seven percent of African American women felt they had to prove themselves over and over again entering a male-dominated profession as compared to 65% of Latinas, 64% of Asians, and 63% of Whites (Williams, Phillips, & Hall, 2014).

The tightrope is explained as being able to find the right balance between masculinity and femininity. There is the notion that competence is a masculine trait, and women should only display feminine behavior. If a woman is too feminine, she is portrayed as weak; if she is too aggressive, she is viewed as masculine. Therefore, a woman in a STEM field must find the "proper balance" in order to co-exist in this field. The third bias is the maternal wall, where it is assumed that women lose their competence and competitive edge after having children. Because of this, many women may delay childbearing in order to advance in their careers.

In a 2014 executive summary titled *"Double Jeopardy? Gender Bias Against Women of Color in Science"* evidence shows that many women in STEM careers feel that they are competing with other women for the "female" spot on the team, hence the term "tug of war."

Hewlett (2014) noted that "gender bias" is the common denominator, manifesting in cultures that are hostile toward women, but it is especially so for African American women.

Charleston et al. (2014) expressed that Black women in STEM experienced more instances of sexism at their places of employment when faced with family-related matters (e.g., maternity leave) as compared to White women. Black women may feel more pressure to put off having children for fear of creating another set of obstacles in their careers. Haynes (2014) echoed these sentiments and stated that not only do Black women experience more pressure in finding the proper work/family balance, but they are also faced with being exploited more by their tenured peers to perform excessive work and support faculty in research at the expense of fulfilling their own scholastic pursuits. Women of color are constantly delegitimized and their work undermined within STEM communities, so they are expected to prove that they possess the skill in addition to the credentials to be a part of the STEM field. These women often find themselves taking on additional projects and fighting to serve on or chair committees all in hopes of proving that they are worthy of sitting at the table with the men.

Many Black women in STEM fields have expressed the need to advocate for other Black women in the field to improve working conditions and increase the representation of younger women of color through recruitment, mentoring, volunteerism, charity work and other activities. (Charleston et al., 2014).

Social Injustice

For 56 years, affirmative action laws have provided access and opportunities for women, minorities and persons with disabilities ensuring that individuals in these protected classes would not be subjected to discriminatory acts (Brunner & Rowan, 2007). However, with the enactment of these laws, government and educational institutions have opened doors for traditionally overlooked populations with one hand, and then slammed the doors shut with the other. Many

organizations have provided access but have done little to improve the cultural atmosphere. Minorities enter an unwelcoming environment and are left alone to find the support and resources that they need in order to function. Even though there are math and science course offerings that are open to whoever wishes to enroll in them, Black women interested in STEM fields are treated as less than equal and are steered toward majors that are deemed *socially acceptable.* It is unfair that these women, who are intellectually gifted and fiercely motivated, are pushed out of STEM majors and careers without being given the chance to succeed. According to The American Association for University Women (2015), the gender pay gap for women begins one year after college graduation. This is especially true for women who are not in STEM fields. Persuading African American women to "settle" for alternative majors and career choices could contribute to an even more reduced living wage for them and their families, and this has major implications.

Forty percent of all women with young children are the sole or primary breadwinners in their families (Bibler, 2015). Within African American households those numbers are higher—53% of African American women with young children are the primary breadwinner (Bibler, 2015). However, Black women are more likely than White women to work in the lowest-paying occupations (e.g., service, health care support, and education) and less likely to work in the higher-paying engineering and tech fields or managerial positions. The working poor rates for Black women were 14.5% compared with 6.6 % for White women. Black women were paid 63% of what non-Hispanic White men were paid in 2014. That means it takes the typical Black woman nearly seven extra months to be paid what the average White man makes in a year (AAUW, 2015).

So, when you consider that 44% of Black households are headed by single women (compared to 16% of White households), taking into consideration low-wage careers, is crucial. On top of being overrepresented at the low-paying end of the spectrum, it stands to reason, then, that Black women would be underrepresented at the top, and they are. Black women make up only 1% of the high-paying engineering workforce and 3% of computing. For those African American women who do manage to break into STEM careers, they earn 25% less than their White female counterparts (NSF, 2015). In spite of the fact that wages for STEM occupations averaged $79,640, which is 1.7 times the national annual average wage for all occupations (United States. Bureau of Labor Statistics, 2015), discriminatory pay and promotion practices and the hostile environment are driving many women out. This is clearly a social justice issue: inequality of educational opportunities and employment opportunities for African American women. I have implemented an effective intervention to increase the representation of African American women in STEM fields.

Student Apathy

In this section of my disquisition, I introduce a disturbing and growing trend on the national and local levels in education, attitudes at the root of this problem, and its implications for student success.

Students are not studying. Atkinson (1957) originally defined expectancies as, individuals' anticipations that their performance will be followed by either success or failure. Eccles et. al., (1983) expanded Atkinson work and further discussed how individuals' expectancies success, subjective task values, and other achievements beliefs mediate their

motivation and achievement in education settings. Collins expands the theory even further as it applicable to Black students:

...Achievement motivation theory offers some insight into Black students' decision to either adopt a "cool pose" (low achievement motive) or become high achievers. Black students' choice to disengage and create a self-selected isolation where one tends to reject others as a survival mechanism to avoid any expected or possible rejection from others. (Collins, 2018, p.152)

The lack of motivation may negatively impact students' psychological well-being and their decision to even pursue STEM programs due to feelings of inadequacy and uncertainty about their academic performance and their ability or willingness to persist in challenging and hostile conditions (Collins, 2018).

In a 1997 study, Ford and Harris concluded that females tend to have multiple and pluralistic identities. Inclusive of racial and gender issues, Ford (2013) avowed that more studies should be conducted that relate to identity development of Black females only. She claimed that Black females have unique traits, needs, and threats that warrant individual attention. (Collins, 2018). Ford's F^2AME Model addressed concerns regarding the invisibility of females' unique, racial, and gender needs. F^2AME comprises of four major achievement components: psychological, social-emotional, academic, and cultural. These components further detailed positive traits of Black females that help them succeed in achievement settings. This is important because it offers a cultural context of racial and gender identity separate from dominant-group influences.

Causes and Effects

In the K-12 sector, many educators have failed to challenge students by providing courses with academic rigor that would stimulate them intellectually and socially (Howard & Reynolds,

2008). Many students are leaving high school unprepared for ensuing the rigor of college, arriving to college with poor reading and writing skills (Ryan, Moss, & Moss, 2015). In a 2006 national survey of college professors, 37% agreed that most of the students they teach lack basic skills needed for college-level work. About 40% agreed that students are not well prepared in terms of organization and planning and reading and understanding difficult material (*Chronicle of Higher Education*, 2006).

At all levels, parent apathy is a dominant factor that feeds student apathy (Benders, 2011). Many parents eagerly send their children to school and expect the school system to do all the work. Yet, when students return with poor grades or a rise in behavioral issues, parents look to teachers and administrators to blame. Parents who are best able to assist their children acquire the cultural capital that is most valued in society position themselves to provide important advantages for their children in their quest for academic success (Howard & Reynolds, 2008). Many black parents recognized that they personally lacked knowledge and awareness of where science can lead and felt that this might be a disadvantage for themselves and their children (Archer, DeWitt, & Osborne, 2014). For Black parents who possess a high level of science, cultural and educational capital, the likelihood of their children expressing an interest in a STEM subject increases greatly (Archer, DeWitt, & Osborne, 2014). But for many Black families, especially those from underprivileged backgrounds, may not be aware of resources available for their daughters, how to access those resources, and the variety of STEM majors and careers available for their daughters aside from the traditional nursing degrees. Azevedo (2011) argues that hobbies and regular activities are important for the reinforcement and development of particular lines of science interest. (Archer, DeWitt, & Osborne, 2014). Black students out-of-school activities tend to be self-directed/peer led as compared to White students who benefitted

from highly structured, adult organized science related experiences. Black parents, particularly those from working-class backgrounds, are disproportionately likely to be excluded from the possession of science capital, which will negatively impact the likelihood of children developing or sustaining science aspirations. (Archer, DeWitt, & Osborne, 2014). With the successful collaboration of science educators, Black parents and their daughters can benefit from the redistribution of economic, social, and cultural capital and make certain that Black females and their families are no longer systematically less privileged in society. Thus, decreasing apathetic behaviors of students and parents.

Implications in higher education

According to UCLA's Higher Education Research Institute, students are increasingly disengaged from the academic experience. College students are spending less time doing homework, are not communicating with professors outside of the classroom, are less active in student organizations, and are bored in class (Ryan, Moss, & Moss, 2015). Today's average college student spends about 15 hours per week studying (Lipka & Berrett, 2010). A full-time college student enrolled in 12 credit hours (the minimum required to be full-time) should study at least two hours for every credit hour enrolled that would total 24 hours of study time outside of the classroom. Adding to that the preparation gap, a continuing trend reveals that the percentage of students who are required to read the assigned material before class is declining (Lineweaver, 2010). The preparation gap works to the student's advantage with the student putting in as little effort as possible and disadvantages the professor, preventing them from teaching material necessary for students to be successful in the class**.** The preparation gap works to the professor's disadvantage because he or she is behind in material that needs to be covered in class. For

students who do not wish to participate in lectures, this is great; for professors who wish to teach, this creates undue stress and frustration.

Once in higher education two general attitudes toward coursework and grading emerge, both suggesting apathy toward learning: entitlement and offensive behavior (Benders, 2011; Ryan, Moss, & Moss, 2015). Students expect that (1) classes will be made easier; (2) professors will curve grades, extend deadlines, and accept substandard work; and (3) they will be rewarded with stellar grades. When apathetic students are expected to perform at a college level many will take offense with the professor by displaying rude or distracting behavior in the classroom. Some professors will refuse to apply codes of conduct to students, so they relax their standards to accommodate students. Those aspiring for tenure or who are on a limited teaching contract soon realize, as do the students, the power of administrative evaluations. For that reason, many teachers and professors will coddle students in the academy rather than take the risk of holding them to higher standards (Ryan, Moss, & Moss, 2015).

This current state of academic affairs is exhausting and depressing. Many parents and educators have failed to socialize many young people to understand and appreciate the enriching experiences that are being afforded to them. This is a vicious cycle that if not corrected at all levels will continue to get worse. In the next section, I provide a narrative about North Carolina Central University, a historically Black college in the southeastern part of the United States, and its efforts to combat student apathy and the low persistence of African American women in STEM gateway courses.

Problem of Practice in the Local Context

HBCUs are the largest producers of minority STEM talent in the United States. Gasman and Nguyen (2014) reported that for the years 2006 to 2010, HBCUs represented 50% of the top 20 colleges awarding bachelor's degrees in STEM fields to African American students. In 2012, HBCUs enrolled 8.5% of all African American undergraduates according to the U.S. Department of Education. In 2011, 24% of Black science and engineering (S&E) doctorate recipients received their bachelors' degrees from historically Black colleges and universities (NSF, 2013). HBCUs invested heavily in developing summer bridge programs and improving gateway STEM courses with curriculum and academic support innovations (Roach, 2015).

NCCU, located in Durham, North Carolina, was established by Dr. James Edward Shepard in 1909 as a National Religious Training School and Chautauqua. North Carolina Central University became the first public liberal arts institution for African Americans in the nation. The University is now a master's comprehensive institution that offers bachelors and master's degrees, a Juris Doctor, and a Ph.D. in Integrated Biosciences to a diverse student population. With 8,600 students and more than 40 STEM programs (North Carolina Central University, 2016a), NCCU turned its focus to enrollment management, reanalyzing their approach to marketing, recruiting, and admitting students. For the 2014–15 academic year, NCCU developed an aggressive plan to attract first-year students, increase the pipeline of transfer students, and analyze the growing rate of "stop outs"—students looking to re-enroll in higher education after taking a break of a year or more from higher education (American Council on Education, 2015).

Prior to being admitted to their academic departments, students at NCCU must pass the Collegiate Assessment of Academic Proficiency (CAPP) Test. Students are encouraged by their

academic advisors to take the CAPP Test midway through their sophomore year. The test has five sections: writing essay, writing skills, mathematics, science, and reading. Each section is 50 minutes and is scored by personnel in the University's testing center. Scores are placed in the student's folder and forwarded to their academic advisor.

At NCCU, STEM gateway courses are included within the general education course (GEC) curriculum. Gateway courses are entry- and lower-level science, mathematics, physics, chemistry, and biology courses that students have to complete prior to being admitted into upper-level courses. Since 2012, science and mathematics gateway courses have maintained a 25% or higher drop, failure, incomplete, or withdrawal (Ds, Fs, Ws, and Is) rate (North Carolina Central University, 2016e). During the 2013-2014 academic year, semester failure rates were Biology 1100: DFWI 36.4% Fall and 22.3% Spring; Biology 1300: 50.6% Fall and 45.5% Spring; Mathematics 1000: 29% Fall, 24.8% Spring, and 35.1% Summer; Mathematics 1080: 42% Fall, 51% Spring, and 36.8% Summer (see Appendix A). These high percentages can be attributed to many factors including students' lack of awareness of and usage of supplemental instruction and tutorial services and poor recruitment and the hiring and training of supplemental instruction leaders and peer tutors. In fall 2016, I administered a Student Interest Survey in the following courses: BIOL 1300 and MATH 1100 (see Appendix B). For MATH 1100, 21 students were surveyed. From those numbers, 86% stated that they have never used supplemental instruction or tutorial support; 14% have used tutorial support; 95% stated that they were unaware of supplemental instruction or tutorial support; 43% felt that they did not need the support; 19% said that support conflicts with their schedule; and 14% replied other, stating they were passing the course. When asked if they had ever used supplemental instruction or tutoring for another course, 72% replied no. When asked if they were satisfied with tutoring, 29% replied yes. For

BIOL 1300, 24 students were surveyed. From that total, 54% responded that they never used supplemental instruction or tutoring services, 46% had used the services. For those who responded no, 38% were not aware of supplemental instruction or tutoring, 46% felt that they did not need the support, and 15% stated scheduling conflict, 33% replied using supplemental instruction or tutoring for other courses and being pleased with the services. As Director of Supplemental Instruction and Tutoring at NCCU, my duties consist of (1) creating and maintaining partnerships with colleagues (e.g., department deans, chairs, directors, and academic advisors), (2) marketing tutorial services across the campus community, and (3) recruiting high performing students who were hired and trained to serve in the roles of supplemental instruction leaders or tutors at the institution in hopes of increasing student retention and persistence.

In 2015, NCCU experienced a record number of applicants—more than 13,600—and enrolled 1,137 first-time freshmen and 413 transfer students for the 2015-16 academic year. NCCU's first-year student demographics include 742 females (66%) and 383 males (34%). The ethnic make-up of this student population was: 3 American-Indian/Alaskan Native (0.27%), 11 Asian (0.98%), 870 African American (77.42%), and 59 Hispanic (5.24%) (North Carolina Central University, 2015c**).** That same year, North Carolina Central University met their first-year retention goal of 83% (North Carolina Central University, FACTS, 2016g).

North Carolina Central University Key Performance Indicators for 2015-16 are based on the five goals of the "2020 Measure of Progress Strategic Plan." The University is focusing efforts on (1) increasing retention and graduation rates; (2) enhancing academic distinction; (3) distinctiveness and community engagement; (4) internal communications using QSI; and (5) teaching, learning and research (North Carolina Central University 2020 Strategic Plan, 2010).

Former Chancellor Charlie Nelms spearheaded the creation of University College in fall 2007 to provide a smoother transition for first-year, second-year, and entering undergraduate transfer students. In fall 2008, University College provided students with academic advising, academic counseling, mentoring, tutorial support, cultural enrichment, and student development seminars. Focusing its efforts on student success during the first two years of their academic career helps ensure a seamless transition to their respective departments (North Carolina Central University, 2016f).

This retention-based initiative is supported by monies awarded to the institution through the U.S. Department of Education Title III Funds—also known as Competitive Grants or Cooperative Agreements. This funding helps eligible institutions of higher education (IHEs) become self-sufficient and expand their capacity to serve low-income students by improving and strengthening their academic quality, instructional management, and fiscal stability (U.S. Department of Education, 2016). A five-year grant provides centralized services in collaboration with other tutorial programs on campus (e.g., The Writers Studio, Supplemental Instruction and Tutoring Services). These funds are used to offer tutorial assistance and incorporate technology and create databases for students who participate in the program.

To increase the likelihood of student success in STEM programs in 2012, NCCU was awarded $1.5 million from the GlaxoSmithKline Foundation for science and math student scholarships and program enhancements (North Carolina Central University, 2012b). Dr. Celeste Williams, Director for the GlaxoSmithKline STEM Foundation at North Carolina Central University, oversees The North Carolina GlaxoSmithKline Foundation STEM Scholars Program. This five-year grant supports NCCU as it seeks to increase the number of women and minorities who graduate in STEM programs (North Carolina Central University, 2012b). The

monies provide students with peer mentors as well as faculty and professional mentors who are strategically in alignment with each student's career goals and interests. Students take part in residential learning communities and benefit from professional internships during the summer. The following criteria must be met. Students accepted must (1) be a new freshman or a current freshman; (2) have a high school or college GPA not lower than a 3.0 and STEM grades not lower than a "B"; (3) live in an assigned residence hall; (4) participate in program meetings, activities, and summer programs/courses; and (5) complete two college courses. Students who participate in the program and maintain a GPA of 3.4 or higher receive partial tuition support, individualized student success plans, and preparation for graduate entrance exams (North Carolina Central University News, 2015a).

The Biomanufacturing Research Institute and Technology Enterprise (BRITE) at NCCU is bridging the gap between current research and public awareness. Since 2008, the BRITE Future Scholars Program has provided professional development opportunities to educators and hands-on science activities for over 10,000 students in the K-12 community (North Carolina Central University, 2016b). Natacha Janvier-Derilus, recruiter and advisor of BRITE, stated that

> many students in STEM majors at Central struggle in gateway science and math courses. That's where our summer bridge program comes in handy for students in grades K-12 who are interested in science. We want and need to keep them engaged early on in these subjects and provide them and teachers with the resources and confidence that is needed to persist in STEM fields (2016). BRITE's Summer Camp for middle school and high school students is a one-week retreat that is open to all students in North Carolina that provides students information about science careers in lab settings and connects teachers with resources and new approaches to teaching science. By increasing exposure to

cutting edge research and increasing awareness and self-confidence in fun and engaging environments, BRITE is striving to increase and retain women and minorities in STEM fields (2016).

The Biomedical/Biotechnology Research Institute (BBRI) at NCCU was created under the leadership of Chancellor Dr. Julius L. Chambers. Dr. Chambers wanted to create a research and training facility that would address and seek to develop solutions to diseases that disproportionately affect those from underrepresented populations. BBRI resources consist of 17 investigators, 35 trainees—including current students and postdoctoral students—and 38 research and support personnel. With $1 million invested in the planning from Glaxo Wellcome, $3.1 million from NIH for the study of cardiovascular research, and $12 million donated by the North Carolina Legislature, BRITE has been able to offer financial assistance in the form of scholarships, stipends, summer research opportunities, and assistantships for participants (North Carolina Central University News, 2015a; North Carolina Central University, 2016c).

Under the leadership of Chancellor Nelms, "the intention [was] to surround students with the faculty and staff who demonstrate a passion and commitment to science education that will help carry them through these challenging programs" (North Carolina Central University, 2012). Since the inception of the GlaxoSmithKline support in 1986, NCCU has been awarded over $3.5 million in various grants to support women in STEM. The U.S. Department of Education also bestowed $750,000 to NCCU to accomplish the following: (1) pre-college enrichment activities in science, (2) tutoring and enhancement of research skills for college students in science, (3) faculty training to develop specific science research and education skills, (4) curriculum development in STEM, (5) renovation of STEM labs/classrooms, and (6) other activities that

reduce barriers for minorities entering STEM fields (North Carolina Central University News, 2015b).

In order to address the challenge of increasing and retaining more minorities and women in STEM programs, Dr. Saunders-White collaborated with North Carolina State University (NCSU) in Raleigh and established a Three + Two Physics-Engineering Dual-Degree Program with NCSU. Under this five-year program, electrical and computer engineering students admitted to NCCU complete three years of their physics curriculum before transferring to NCSU for completion of requirements for both degrees over the next two years. From there, the program is designed to meet the requirements of both universities and provide graduates with knowledge of mathematics, science and engineering in order to broaden their career opportunities. This program increases access, diversity, and enrollment in a STEM discipline at both institutions (North Carolina Central University, 2016d).

African American Women Voices in STEM Majors

Significant barriers that hinder African American women are inadequate academic preparation and institutional characteristics and practices (Perna et al., 2009). To help combat these barriers that African American women experience once in STEM majors, a predominantly Black women's college in the southern region of the United States is successfully addressing those issues. Spelman College, an HBCU women's college located in Atlanta, Georgia is a private, highly selective women's college with programs that are specifically designed to attract, retain, graduate, and promote Black women in STEM majors and careers (Bozeman & Hughes, 2004; Perna et al., 2009).

In 2006, Spelman awarded the 57th highest number of bachelor's degrees in all fields to Black women. With the highest number of bachelor's degrees awarded to Black women in mathematics, the third largest number in physical sciences, and the fourth highest number in biological sciences (*Diverse Issues in Higher Education*, 2007), Spelman College has created a culture of care by creating an environment where Black women can succeed. African American women in STEM majors who benefited from Spelman's "culture of care" stated that at Spelman they "had more confidence as a person and individual"; and they were "in an environment where they were set up to succeed" (Perna et al., 2009). Black female students in STEM-related fields stated that structural characteristics, peer support, faculty encouragement, academic support services, and undergraduate research opportunities all aided in their success (Espinosa, 2011; Perna, et al., 2009).

African American Women in the STEM Pipeline

State Level

In this section, I briefly highlight the contributions that African American women have made in North Carolina. In addition, I focus on wage disparities and unemployment trends as well as their effects on African American households, the contributions of post-secondary institutions to improve student success, and the need to fill STEM positions in North Carolina. From the 1940s to the 1970s Black women in Durham played a leading role in desegregating public facilities, creating equal employment opportunities, and addressing poverty (Greene, 2005). In the 1960s and 1970s, middle-class women in Charlotte organized support of a minimum wage for domestic workers and improved housing (Hess, Hegewisch, Youngmin, & Williams, 2013). Women in North Carolina have transformed, strengthened, and sustained the state in many ways; yet women earn less than men and are more likely to be poor, although they

achieve higher levels of education overall. In addition, women in North Carolina experience persistent racial and ethnic disparities.

In 2010, White women in the Triangle metropolitan area had average earnings of $35,400. Black women earned, on average, $29,000. That is a pay gap of $6,400 a year (Hess, 2013). These challenges are often under-recognized but must be addressed. For example, women make up close to half (47%) of North Carolina's workforce, yet many are living in poverty. Black women are more likely to be living in poverty (52%) as compared to White women (30%) and are only surpassed by Hispanics (64%).

The recession significantly affected both women and men in North Carolina. In 2010, 9.1% of women and 11.7% of men in the state were unemployed and actively looking for work, a higher rate than in the United States overall. However, among women, unemployment varied considerably across racial and ethnic groups. Black women had an unemployment rate of 13.5%, whereas White women were at 7.6% (Hess et al., 2013). This disturbing trend does not need to continue.

In 2012, the unemployment rate for African Americans was 17.3%, whereas Whites were at 6.7%. African American workers have historically been underrepresented in public-sector employment. State and local public-sector job losses have hit them the hardest (Cooper, Gable, & Austin, 2012). The recession also compounded harmful employment trends decades in the making. Many Black workers live and work in North Carolina communities with declining industries. North Carolina had an unemployment rate of 9.2 % – the fifth highest state unemployment rate. Governor McCrory signed into law a bill that has drastically cut unemployment benefits. The cuts in the new law are harmful for everyone, but especially for women. That same year the unemployment rates for Black women was 13.8%. To add insult to

injury, the new law restricts eligibility by disqualifying workers from benefits if they have to leave a job for health reasons or because of undue family hardship—a change that will particularly impact women (Vogtman & Lane, 2013). These reductions in unemployment benefits not only have a negative impact on daily living conditions, but the additional income could have supported women at local community colleges by enabling them to enroll in courses that would provide opportunities for them to pursue STEM related careers, which could raise their household income considerably.

By the year 2020, 42% of North Carolina jobs will require a post-secondary STEM credential. Presently, there are 400,000 STEM jobs in North Carolina; by 2020 these positions will lead to the creation of another 70,000 STEM-related jobs (North Carolina Commission on Workforce Development, 2011). This is a problem because the U.S. workforce is in high demand to fill key STEM positions for the national health and security of our country. African American women are not aggressively pursuing majors in STEM, as compared to their White male and Asian counterparts. The United States must implement intervention strategies to close the STEM gap in order to compete with other countries. The lack of STEM-related skills will negatively impact African American women's chances to compete for employment, wages, and leadership in STEM fields (North Carolina Commission on Workforce Development, 2011; Olson & Labov, 2012).

According to the U.S. Department of Bureau of Labor Statistics (2014), the Durham-Chapel Hill area had an average (mean) hourly wage of $26.85 in May 2014, about 18% above the nationwide average of $22.71. Durham, North Carolina, had some of the largest detailed occupations within the computer and mathematical group that included applications software developers (3,930), software developers, systems software (2,680), and computer user support

specialists (2,520). Among the higher paying jobs were applications software developers and computer network architects, with mean hourly wages of $50.09 and $48.37, respectively. At the lower end of the wage scale were computer user support specialists ($26.85) and web developers ($31.65).

Institutions of higher learning can bridge the STEM skills gap by addressing the high demand of unfilled STEM positions on local, state, and global levels. This can occur through acknowledging the barriers that Black female students encounter in STEM related fields and providing the necessary support for higher education.

Historically Black Colleges and Universities

Many historically Black colleges and universities (HBCUs) around the country have collaborated with the NSF (NSF) to improve undergraduate education and increase persistence rates for African Americans, in general, and African American women, particularly, in STEM programs. The Historically Black College and Universities Undergraduate Program (HBCU-UP) at North Carolina Central University that began in fall 1998 (NSF, 2001) seeks to increase participation of underrepresented groups in science, mathematics, engineering and technology. In fall of 1998, $42 million was awarded over a course of five years to 14 HBCUs. The five-year cooperative agreements are an expansion of the original three-year agreements that allowed more undergraduate institutions to improve the quality of programs and increase student enrollment and degree completion in STEM.

North Carolina Agricultural and Technical University (NCA&T), an HBCU located in Greensboro, North Carolina, is an 1890 land-grant university (North Carolina A&T University, 2016c). In 1890, Congress enacted the Second Morrill Act that mandated “a separate college for

the colored race." The Agricultural and Mechanical College for the Colored Race (now NCA&T) was established as that school in the state of North Carolina by an act of the General Assembly ratified on March 9, 1891. In 1915, state legislators changed the college's name to the Agricultural and Technical College of North Carolina, and in 1967, they advanced to university status. NCA&T became a constituent university of the University of North Carolina System in 1972.

According to NCA&T College Profile (2016), in fall 2015 the student population was 10, 852. Undergraduates consisted of 8,494 full-time students and 859 part-time students. Graduate students were 656 enrolled at full-time status, and 843 classified as part-time students. NCA&T offers 55 undergraduate degrees through eight colleges and schools with an option to apply to participate in the honors or study abroad programs. Undergraduate degrees are offered in Colleges and Schools of Agriculture & Environmental Science, Arts & Sciences, Business & Economics, Education, Engineering, Nursing, and Technology. The graduate school offers 23 masters' concentrations through 31 degree programs and 11 doctoral concentrations through nine doctoral degree programs as well as a number of certificate programs through colleges.

NCA&T is ranked as the top public HBCU in the nation (*U.S. News and World Report Best Colleges*, 2016; North Carolina A & T State University 2016d). In addition to these accolades, NCA&T College of Engineering (1) ranks in the top third of best engineering programs in the nation, (2) ranks number one for conferring the most engineering degrees to African Americans, (3) is the home of the NSF Engineering Research Center (ERC), (4) has a nationally ranked MSIT Online Program in the School of Technology, and (5) has secured over $20 million in research grant funding through the School of Agriculture and Environmental Sciences (*U.S. News and World Report*, 2014). For the fiscal year 2010–11, NCA&T generated

more than $60 million in sponsored programs and more than $6 million in appropriations for agricultural research and cooperative extension. It also generates contracts with major international companies, foundations, and federal agencies to secure funding to enhance academic programs and to provide student scholarships.

To increase the numbers of African American women in the STEM pipeline, the School of Technology at NCA&T implemented a Females in Technology (FIT) Boot Camp. FIT invites rising juniors and seniors to participate in a three-day residential program. Here, women receive hands-on research experience, mentoring from female faculty in STEM programs, and team building and public speaking skills (NCA&T, 2016a). This experience serves as a launch pad to empower young women to envision themselves pursuing and persisting in STEM majors.

To monitor student success at North Carolina A & T, the Center for Academic Excellence implemented Starfish CONNECT**,** an educational support networking system that facilitates interactions between students, advisors, instructors, tutors, and other campus staff. Starfish's retention philosophy approaches student success from a holistic viewpoint. The program facilitates online scheduling from within the course management system (Starfish, 2016), and it incorporates an early warning system (EWS). EWS automatically assesses student performance from submissions by instructors, advisors, and other campus staff. This feature provides professors and advisors immediate and easy access to evaluate student performance early and consistently throughout the academic semester, improving student retention and persistence (NCA&T, 2016b; Starfish, 2016). Starfish also allows for better communication between students, professors, and advisors by providing an effortless flow of communication. Starfish provides measurable evidence to administrators as to what services and programs are

proving the most beneficial to student success. This program was designed with the students' retention and success in mind.

Predominantly White Institutions

Leichter (2016) posited that predominantly White institutions (PWIs) should emulate HBCU programs that have demonstrated success in helping Black students navigate majors for which pre-college preparation may have been lacking. Many PWIs have partnered with corporations and collaborated with HBCUs to support African American students in STEM programs.

In the spring of 2016, Indiana University (IU) made history by graduating eight African American women who earned PhDs in STEM fields. In 2007, Dr. Adam Herbert, the first African American president of Indiana University, created a STEM initiative that would create university partnerships with 14 HBCUs to increase diversity, enhance the ability to attract grants at both IU and HBCUs, and enhance the HBCUs' capabilities by leveraging IU's resources (Indiana University, 2015). Indiana University, located in Bloomington, Indiana, has a student population of 48,515, over 500 academic programs, 200 undergraduate majors, and 200 research centers and institutes; it is globally ranked as one of the 50 most innovative universities in the world (Indiana University-Bloomington, 2016a; Indiana University-Bloomington, 2016b).

From these partnerships, IU was able to establish such programs as IU's Groups Science, Technology, Engineering and Math Initiative, a program created for first-generation, under-served students interested in becoming research scientists, physicians and professionals in allied health fields. Women in STM, a part of the Groups STEM Initiative, is a residential living and learning STEM community for women. These programs are housed under the Groups STEM

Initiative, which has provided access and opportunities for women pursuing STEM majors. (IU News Room, 2013). Women in STM is operated through the Office of the Dean of Students in partnership with Residential Programs and Services and with the support of the Office of the Provost and Executive Vice President. The Groups Scholars Program, including Groups STEM, reports to the Office of the Vice President for Diversity, Equity and Multicultural Affairs. In order to track the effectiveness of these collaborations and partnerships, Indiana University uses FLAGS early alert warning system.

FLAGS (Fostering Learning, Achievement, and Graduation Success) is Indiana University's early alert system for providing feedback to students on their academic progress. Instructors use the FLAGS system to provide real-time assessments of a student's attendance, academic performance, participation and preparation. This information is provided to offer suggestions on how students might be able to improve their performance and achieve an optimum academic outcome (Indiana University-Bloomington, 2016c). The FLAGS early alert system becomes available to faculty for review beginning the second week of the term at IU-Bloomington and remains available for updates through the last day of classes. The outcomes have shown that early alert warning systems are effective intervention tools for administrators and students in higher education.

Theory of Improvement

Many students, especially those who enter higher education underprepared, need academic support in various forms, including academic advising, academic or personal counseling, mentoring, developmental education courses, summer bridge programs, or some form of tutorial support. For the purpose of this intervention, I introduced the concepts of (a)

peer educators and (b) soft skills and their roles in student success. Peer educators are defined as tutors, peer assisted learners, Supplemental Instruction leaders (SI), and academic mentors who provide academic support in post-secondary institutions. Peer educators work in academic learning centers, tutoring or writing centers, developmental studies departments, or other educational supportive learning environments in two-year or four-year institutions (Lipsky, 2011). In these various roles, one of the duties of a peer educator is to teach students various soft-skills (e.g. time management, highlighting, note taking) that when used properly can promote successful lifelong skills. In order to be successful in college and beyond, students need to know how to properly organize their time. With the guidance of a peer educator, students learn how to create SMART Goals (Smart, Measurable, Attainable, Realistic, and Timely) and develop critical thinking skills. By taking a larger goal and breaking it into smaller goals, setting dates of when that goal is to be achieved and resources/materials that are needed to achieve that goal, a student can begin to achieve academic success. Necessary resources can take the form of scheduling appointments to meet with professors and academic advisors during scheduled office hours and utilizing the services of the office of disability services if the student has disclosed that they have a documented disability to the peer educator that may have a negative effect on their success in the classroom. Materials that can aid in student success are proper note taking techniques, learning how to study for different types of tests, and becoming acquainted with the campus culture. These are all techniques that a peer educator can embed in tutorial sessions to assist students. Supplemental instruction leaders and peer tutors are two academic supportive resources that are accessible to students at NCCU.

To provide clarity, I distinguished between and SI leader and tutor. Supplemental instruction and tutoring are venues of support that when exercised, can empower students to be

successful in the classroom. Encouraging students to realize the benefits and the effectiveness of such services, especially for those who are coming from traditionally overlooked populations, can be a lifesaver for many. However, there is a tendency for some academic and social support programs to isolate their students from other students and programs on campus, creating marginalization. That isolation can serve to stigmatize students and undermine their motivation to succeed (Tinto, 2004). If students are feeling marginalized, they may become reluctant to seek out needed academic support. Resources like supplemental instruction and tutorial support should ensure that academic support services are in place to support high performing students in low-performing courses while not compromising the academic integrity of the courses and teaching students to find the proper balance in challenging programs. I briefly distinguish between supplemental instruction and tutoring in the next section.

Supplemental Instruction and Tutoring

Supplemental instruction (SI) is a non-remedial academic support or peer tutoring program based on the concept that students are more likely to persist in college if they feel a sense of belonging to their educational institution. SI and tutoring are very effective retention tools, improving student performance and reducing attrition (Martin & Arendale, 1992; Tinto, 2004; Zaritsky, 1994). The SI model differs from that of the traditional tutoring model. Whereas tutoring assists students who are normally performing poorly in classes, SI (1) targets all students in high risks courses; (2) is led by SI leaders who have successfully passed the course and are receptive to the struggles and needs of students in the class; (3) has SI leaders who are required to attend all class lectures and labs and complete assignments, modeling appropriate student behavior for other students; (4) has SI leaders who are trained to see themselves as facilitators who demonstrate how to process information through analysis,

synthesis, and application; (5) has SI leaders attend an extensive training program and meet with the supervisor weekly to continue learning; and (6) has SI leaders who engage students in the learning process (Zaritsky, 1994).

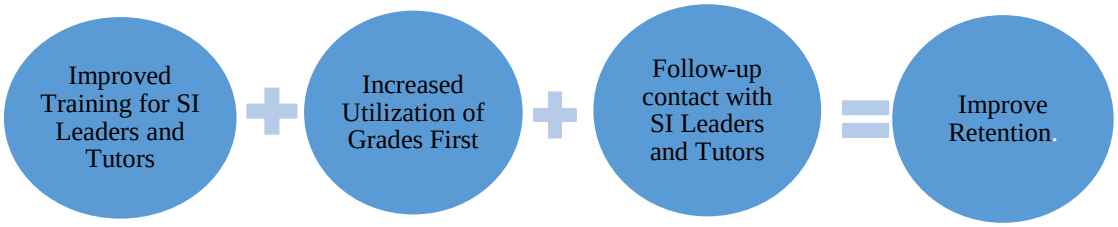
SI was developed by Deanna C. Martin at the University of Missouri-Kansas City in 1973 to help support students enrolled in difficult courses. All sessions are designed to get students working together to develop learning strategies and master course content while reviewing material and preparing for quizzes and tests (University of Missouri-Kansas City, 2016). SI is a nontraditional form of tutoring that focuses on collaboration, group study, and interaction for assisting students in undertaking "traditionally difficult" courses. SI targets courses that have a minimum 30% rate of students that drop, withdraw, or fail, and then provides a trained peer who has successfully negotiated the course to assist its current students. Through 50-minute SI sessions, students are provided with course-specific learning and study strategies, note-taking and test-taking skills, as well as the opportunity for structured study time with peers (Texas State University, 2016). SI is a resource offered at many colleges and universities for students who are enrolled in gateway courses.

Tutoring is another very valuable student learning aid that is widely used as an intervention to enhance student performance and persistence (Tsui, 2007). A tutor can be a faculty member, staff member, graduate student, or an undergraduate in upper-division courses. The benefits of peer tutoring have proven to be useful for the tutor and for those being tutored. Tutoring is provided in a more traditional setting, usually one-on-one, where the tutor is focused solely on the student.

Wood and Tanner (2012) listed seven key characteristics of an effective tutor. The tutor is intelligent, nurturing, Socratic, progressive, indirect, reflective, and encouraging. These seven

characteristics are used in the INSPIRE Model. According to the INSPIRE Model, students benefit most from the tutor/ tutee interaction when the tutor is intelligent—very knowledgeable of the material—and nurturing—able to build comfortable rapport with students who are struggling in courses. Using the Socratic Method, the tutor prompts continuous probing, trying to elicit appropriate solutions to the problem. The goal is to get the tutee to become a more critical thinker. Here, questioning is vague and becomes more direct with the tutor offering hints to tutees only as a last resort. Providing leading questions or hints until a solution is reached is known as "deliberate practice." Tutors apply a progressive approach in which the tutor "diagnoses" where the academic difficulty may lie. Next is the indirect approach to tutoring. The best tutors focus on the errors that are made so that tutees can change their approach to solving the problem. Reflective thinking in the tutoring process allows the tutor to ask the tutee to articulate what they are doing and how this aid in solving the problem; this is referred to as metacognition. Finally, by encouraging the tutee, the tutor can help them achieve a positive self-image so they can help to build the tutee's confidence in their abilities.

Utilizing supplemental instruction (SI) and tutorial services can greatly improve the self-efficacy and retention of African American women in STEM courses. When utilized early and applied consistently, SI and tutoring can improve student retention leading to persistence and graduation (Hurley, Jacobs, & Gilbert, 2006). My intervention consists of altering the processes associated with the hiring and training process of SI leaders and tutors, increasing the utilization of Grades First, and providing follow-up contact with SI leaders and tutors. Figure one (listed below) illustrates the institutional support at NCCU that was designed to improve student persistence and retention. Figure 1



Re-structuring the SI/Tutorial Hiring and Training

Figure 1: Re-structuring the SI/Tutorial Hiring and Training Process

In efforts to increase the retention of African American women in STEM gateway courses at NCCU, high performing students were recruited via flyers posted across campus (see Appendix B), NCCU campus announcements, and The Juice—NCCU student radio station. The

hiring criteria for SI leaders and tutors were (1) an "A" in the course(s) for which they are being hired to tutor, a (2) minimum grade point average (GPA) of 3.0 on a 4.0 scale, (3) 30 semester hours of earned college credit, (4) attendance at NCCU for at least one semester, and (5) faculty or staff recommendation. Prospective SI leaders and tutors were required to complete a student application for employment, pass a criminal background check, and submit a short essay expressing why they wish to become a SI leader or tutor. New and returning SI leaders and tutors were required to attend an orientation training session as well as mandatory meetings that were held throughout the semester. During the initial meeting SI leaders and tutors read and signed off on NCCU University College Student Worker Family Rights to Privacy Act (FERPA) Statement and Understanding Form (see Appendix C), followed by training in Student Ethics, Disability Services, and Active Shooter on Campus—by various NCCU campus partners. Next, I addressed the absence of embedding time management and note-taking strategies within SI and tutorial sessions.

SI leaders and tutors were instructed on the method of teaching students how to manage their time. The formula used by NCCU academic advisors and academic counselors is to encourage students to study two hours for every credit hour of enrollment (2 hours x 12 enrolled credit hours = 24 minimum study hours per week). SI leaders and tutors were required to administer a time management sheet to their tutees (see Appendix D). SI leaders and tutors were instructed on the Cornell Note Taking Method. Educator and author of *How to Study in College*, Walter Pauk, developed the Cornell Note Taking Method in the 1950s (Pauk, & Owens, 2013). This method reduces the amount of paper that is utilized while promoting student reflection. SI leaders and tutors took the following steps to promote the 5Rs: (1) record all meaningful information during the lecture; (2) reduce notes after lecture, summarizing all key words, ideas,

and facts; (3) recite, study properly in your own words without looking at notes; (4) reflect on your own ideas and opinions; and (5) review briefly before reading or studying any new material (see Appendices F and G).

Grades First is a software system that was created in 2006 to provide academic support for coaches and support staff in tracking the attendance of college athletes in study hall (Grades First, 2016). Since its inception, Grades First has grown to a campus-wide comprehensive student management system that aids academic advisors, faculty, and staff with integrated solutions that incorporate early alert, advising management, e-mail, and tutoring management services. However, the underutilization of the Grades First tutorial management features at NCCU is problematic with disadvantages stemming therefrom.

The tutorial management features of Grades First have many benefits, including (1) the potential to decrease no-shows, (2) management of referrals and walk-ins, (3) monitoring of student activity, and (4) organization and reporting of data. Decreasing student no-shows can help reduce wasted appointment time by sending an email to the student and tutor once an appointment is made. E-mail reminders are automatically sent to the student and tutor once an appointment is made and is then sent again within 24 hours of the scheduled appointment. I received referrals from advisors, faculty, and various offices (e.g., disability services, counseling services) that aided tutorial staff in providing better support for at-risk students. Next, monitoring student activity was documented in the Tutor Notes Section. Here, tutors documented missed appointments and time spent tutoring, method(s) of instruction used, and tutorial notes that can be retrieved at a later time by either the student or another tutor. Organizing and reporting of data allowed me, as the director, to access data via Tutor Analytics. Tutor Analytics allowed me to gather information for each course, such as (1) the number of

students who have used SI and tutoring services, (2) how many students scheduled appointments and how many were walk-ins, (3) what courses required the most tutorial support and what courses required the least, (4) how much time was spent on tutoring students per course, and (5) what the final grades were for students who utilized SI and tutorial services.

Grades First was very successful in tracking the success of students in the Student Support Services Program at Western Carolina University (WCU). In my role as Assistant Director of Student Support Services at WCU, I required graduate assistants and tutors to utilize Grades First by posting their availability when scheduling advising and tutoring appointments with students. This directive allowed the GA's and tutors to better manage their time by (1) effectively planning for each student's specific needs prior to the tutoring session, (2) documenting notes in the Tutor Notes Section for faculty and advisors to view, (3) documenting time spent during the tutoring session, (4) providing quick and multiple reminders to communicate between tutor and tutee via e-mail or text messages, and (5) providing accurate data regarding services that were provided. Within my first year at WCU, the University's Student Support Services (SSS) Program student retention rate increased 7% from 75% to 82% (Western Carolina University, 2014).

Grades First was installed at NCCU in fall 2008. Several faculty members are not using Grades First to post fifth-week or mid-term grades; this puts many professional staff at a disadvantage when it comes to working with students. Using the early alert feature of Grades First would (1) allow academic advisors, counselors, faculty, and staff at the institution to provide more intensive outreach for students of concern—making appropriate referrals to SI leaders and tutors; (2) track student progress in all courses, especially at-risk students; and (3)

provide the necessary data for the director of SI and tutoring to properly plan adequate academic support for future semesters.

Grades First allows tutors to submit notes regarding how the student's tutoring session develops, schedule their availability, and plan student sessions accordingly. Grades First also monitors students who are actively seeking academic support, tracks the most requested courses, and determines the final outcome for students who utilized SI and tutorial services versus students who did not take advantage of educational assistance.

Methodology

The Design Team consisted of Jacqueline Owens, Director of Supplemental Instruction and Tutoring; and Angela Street, Training Specialist and Seminar Designer. To evaluate the merit of this intervention, I measured how well SI leaders and tutors integrate time management, note taking, and knowledge of course content in SI and tutorial sessions. I tracked students' progression of grades earned of a C or better on quizzes and exams as well as enrollment in the next required course. I collected data using quantitative and qualitative methods employing an improvement science framework. The improvement science framework seeks to improve flawed organizations by (1) identifying the problem and why the problem exists, (2) observing the problem, (3) deciding if the problem is capable of being tested to implement an intervention, and (4) determining if the intervention warrants a change that will result in improvement.

I administered a short item pre-assessment survey to SI leaders and tutors at the beginning of my intervention to determine their level of competence in incorporating time management and note-taking skills in their SI and tutorial sessions. The post-assessment survey was administered to SI leaders and tutors after they received training in time management and

note-taking skills (see Appendices G and H). To successfully implement an intervention tool that would reduce the low persistence of students in gateway courses at NCCU, I utilized an improvement science methodology.

> A science of improvement offers a productive synthesis. It melds the conceptual and methodological strength associated with scientific study to the contextual specificity, deep clinical insight and practical orientation characteristic of action research. It emphasizes multiple, small rapid tests of change by varied individuals working under different conditions. Each test provides a bit of evidence, a bit of local learning. (Bryk, 2011, p.8)

I utilized The Model for Improvement Framework—the PDSA Cycle. The PDSA Cycle (Plan, Do, Study, Act) seeks to make improvements by implementing change. According to Langley et.al., (2009), The Model for Improvement was founded on three simple questions: What are we trying to accomplish? What changes can we make that will result in improvement? How will we know that a change is an improvement? I used these questions to guide my research and implementation plan.

What are we trying to accomplish? I am attempting to address the low persistence of African American women in STEM gateway courses at North Carolina Central University.

What changes can we make that will result in improvement? My plan improved the way SI leaders and tutors are trained, by improving the quality of SI leaders and tutors as well as the way we use Grades First so that its potential benefits can be fully realized. The goal is to increase the number of students who receive SI and tutorial support and increase the number of African American women in STEM. I evaluated the Student Satisfaction Surveys and how well SI leaders and tutors incorporated soft-skills into their sessions. These outcomes provided

immediate feedback. I determined where to intervene with my training. I required SI leaders and tutors to administer a Student Satisfaction Survey to students at the conclusion of SI and Tutorial sessions (see Appendix I). All tutors documented the following in the Tutor Notes Section.

(1) Did the student arrive or were they a no-show?

(2) What was the duration of the session?

(3) What subject was covered and what materials were utilized?

(4) What methodology was employed?

(5) Did the student arrive prepared?

(6) Did you encourage the student to schedule a follow-up appointment?

(7) Has the student completed the student satisfaction survey?

To increase the likelihood that the intervention was successful, the intervention was evaluated every 30, 60, and 90 days to determine its effectiveness. A design team was selected to assist with implementing the intervention.

How will we know that a change is an improvement? An improvement is indicated by the following: an increase in students seeking tutorial and supplemental support and an increase in students making significant progress in at-risk courses from a failing grade to a final grade of a "C" or better. African American female students will do better and feel encouraged in STEM classes and enroll in the next course of study in their program of study.

Pre 90 Day Cycle

The Design Team consisted of Jacqueline Owens, Director of Supplemental Instruction and Tutoring; and Angela Street, Training Specialist and Seminar Designer.

Plan. I required prospective SI leaders and tutors to submit an application for employment, an application to complete a criminal background check, and a statement expressing their desire to work as an SI leader or tutor. I required new and returning SI leaders and tutors to attend an orientation training session that covered (1) FERPA (The Family Right to Privacy Act), for which students must sign a statement of understanding; (2) Student Ethics; (3) BANNER training; (4) Campus Safety/Active Shooter on Campus; and (5) Grades First. The bulk of the training would rest on improving the quality of supplemental instruction and tutorial services, and the effectiveness of Grades First. Training in Grades First allowed tutors to create their availability, properly plan for their sessions, and document their tutorial sessions. I submitted the student identification numbers of the tutors to the Training Specialist and Grades First Designer who gave tutors a secure passcode and access to specifically designated screens that allowed them to schedule their availability and utilize tutor notes. Tutors have restricted access because Grades First houses students' schedules, grade point averages, and other sensitive information, like whether they are categorized as being at-risk or whether they are receiving services from counseling or disability services. The Training Specialist and Seminar Designer provided the necessary training for new and returning tutors each semester. Because SI leaders are paired with one professor, they did not need access to Grades First. SI leaders documented students' contacts per the Student Sign-In Sheet (see Appendix J) and used The Leaders Guide for Supplemental Instruction to aid in the instructional process. I, along with the SI Leaders Guide, helped support SI leaders as they provided support to students. To determine the effectiveness of this intervention, SI leaders, tutors, and students receiving services were administered surveys to gather their responses. These data were used to regulate the services that were provided.

Do. Prior to beginning the intervention, a five-item survey was administered to SI leaders and tutors via Qualtrics to ascertain their responses as to how often they were using Grades First and in what capacity (see Appendix C). I tracked the following STEM gateway courses: MATH 1100 and BIOL 1300. SI leaders were instructed on how to develop lesson plans that directly reflected their professor's lectures. The number of meetings that occurred between the professor and the SI leader was at the discretion of the professor. SI leaders were required to meet with their professor to develop lessons plans. These plans were used during SI sessions to reinforce the weekly lectures.

SI leaders were required to attend every lecture to model "good-student behavior" in the classroom, serving as a role model for students. SI leaders also assisted the professor, if needed, with the proctoring of exams and encouraging students to attend SI or tutorial sessions. SI leaders were also required to maintain a SI session sign-in sheet. Students signed in and the SI leader recorded the material that was covered during the session. At the conclusion of each week, SI leaders gave one copy of the sign-in sheet to the professor and returned the original to the Director of Supplemental Instruction and Tutoring. These documents were used to evaluate how many students were utilizing SI at the College. SI leaders also administered the Student Satisfaction Survey at the conclusion of each SI session and then submitted the results to the Director of Supplemental Instruction and Tutoring.

Tutors were instructed to create and maintain their availability four weeks in advance, which included scheduled appointments and walk-ins. Tutors documented the following in the Tutor Notes Section: when the student arrived, if the student was prepared for the session, and if the student was late, or a no-show. The tutor was also responsible for providing comments in the comments section that offered useful information to the student, academic advisor, professors,

director of supplemental instruction and tutoring, and other professionals at the institution. At the conclusion of the sessions, students who used tutorial services were given a Student Satisfaction Survey to complete. Tutors then returned all completed surveys to the Director of Supplemental Instruction and Tutoring. The survey recorded (1) the course(s) for which the student received tutorial support, (2) if the session proved helpful, (3) if the student would use tutorial services again, (4) whether they learned how to successfully manage their time, and (5) if they had improved their note-taking skills.

Study. I monitored the effectiveness of this intervention by establishing a starting point of when I would intervene and how often. I interceded if 70% of tutors had not documented student contact in Tutor Notes. Contact was made to the tutors via email in Grades First. After 30 days of implementing this intervention, I determined whether the improvement effort was working by accessing data in the Tutor Analytics Section of Grades First. This allowed me to view (1) the percentage of students who were using tutorial services, (2) the percentage of those who scheduled appointments and kept appointments, (3) those who were walk-ins or no-shows, and (4) what courses required the most tutorial support. I scheduled mandatory one-on-one meetings with all SI leaders and tutors to see if they had embedded the Cornell Note Taking Method and Time Management Skills within their SI or tutoring sessions. The goal was to increase the use of tutorial services and to improve student success in those courses.

I then reviewed in 60 days, and again in 90 days, by assessing SI Session Log-In Sheets, surveys, Grades First Tutor Notes, and Tutor Analytics. I was able to determine if the services were being utilized more frequently and if the services were proving effective by tracking students' progression of grades on quizzes and exams and their enrollment in the next required

course. I conducted observations of SI sessions and tutorial meetings to determine if the quantity and quality of support was improving. I met individually with SI leaders and tutors to gather their thoughts regarding these improvement efforts.

Act. I referred to results from my assessment to determine if my intervention should continue as planned or if modifications were required. Modification would be necessary per information gathered from Student Satisfaction Surveys when students' comments reflect poor support and poor learning from SI leaders or tutors. If this was noted, I met with SI leaders and tutors again and reiterated the process of how to instruct students in the area of time management and note taking and stressed to SI leaders and tutors the importance of incorporating these learning strategies into their sessions. If SI leaders and tutors failed to meet their expected obligations after repeated instruction, then they were replaced.

Participants

Selected supplemental instruction leaders and tutors were those who (1) had a minimum classification of sophomore standing, (2) had successfully earned a grade of an A in the course, (3) had completed the necessary course pre-requisite or co-requisite, and (4) used the required materials and successfully engaged students during their SI or tutorial sessions. Supplemental instruction leaders and tutors were given the opportunity to participate by signing the Consent to Participate Form (see Appendix K).

Survey Instruments

Qualitative Methods

After participants signed the consent to participate form, I observed SI leaders and tutors during their student sessions. I observed SI leaders once a semester during their assigned

lectures for 10 to 15 minutes to determine how well they were introducing various soft skills during lecture times. I also observed SI leaders once a semester for 50 minutes during their small group sessions to assess how well they facilitated course content, soft skills, and engaged students during SI sessions. I also observed tutors once a semester for 30 minutes to assess how well they embedded soft skills, subject matter, and engaged students during tutorial sessions. I collected data using field observation notes, observing all SI leaders and tutors within their first 30 days of the semester. During the observations, I monitored the interaction between the SI leaders, tutors, and tutees and studied what methods were used in their meetings (see Appendix L).

Focus Groups

I concluded with a focus group discussion at the end of the semester with 4-6 SI leaders and tutors. I transcribed all observations and focus group interactions using In-Vivo. I selected the In-Vivo method of data analysis because it would provide me with a richer assessment of the SI leaders and tutors' experiences in their own words. In Vivo, "honors the participant's voice and allows the researcher to record patterns in the setting" (Miles, Huberman, & Saldaña, 2014, p. 74). Giving voice to the data allowed me to explore current and additional areas where intervention is needed.

I opted to conclude my qualitative analysis with a focus group discussion because I wanted SI leaders and tutors to engage in dialogue and share their experiences working in academic supportive roles with their peers. I selected two SI leaders and two tutors based on the courses in which they provided academic support. SI leaders and tutors were assigned a

pseudonym to protect their identities. The focus group interaction was audio recorded and clear instructions were read to participants as to what the expectations were during the meeting.

Quantitative Methods

For the purpose of this intervention, I administered a survey to SI leaders and tutors to determine their knowledge and how often they used Grades First. I also administered a pre- and post-SI/Tutor survey to determine a starting point for their knowledge of study skills methods and interventions. SI leaders and tutors administered a Student Satisfaction Survey to tutees at the conclusion of their meetings. Utilizing a descriptive statistics approach, the data collected revealed participants' responses to the questions

Summary

The poor retention of Black women in STEM gateway courses and low graduation rates is a national problem and a problem at NCCU. I have identified two factors that contribute to this problem. First, I addressed the inadequate training of SI leaders and tutors. In the second part of my intervention I sought to increase the involvement of students in tutorial services. For far too long African American women have been subjected to multiple barriers that have prevented them from achieving academic, social, and financial prosperity. Successful performance in STEM gateway courses is necessary for students to persist in STEM majors. The purpose of this intervention was to assist Black female students at NCCU in increasing their pass rate in gateway courses in STEM areas and to ultimately lift their level of participation in STEM courses, majors, and careers. Increasing self-efficacy, improving the roles of supplemental instructors and tutors at NCCU, and improving the utilization of Grades First can enhance the

overall quality and services that are provided at NCCU to promote greater success for African American women in STEM gateway courses.

Process of Intervention

Fifteen tutors and supplemental instruction leaders were invited to participate in this intervention research study. Four individuals (one supplemental instruction leader and three tutors) responded. During the course of this intervention, I gauged the progress and met with academic support leaders prior to the beginning of Fall 2018 semester, and then individually, once a week for 11 weeks and concluded with the focus group meeting at the end of the semester.

Pre-30 Days

Prior to beginning the intervention, I had a brief and informal meeting with the academic support leaders. During the course of the meeting, I asked the SI leader and the three tutors what they knew or remembered about any soft skills. Their responses informed me that training was needed to ensure that the peer educators were knowledgeable and confident in their interactions with their tutees.

To begin the intervention, SI leader and tutors were administered a pre and post assessment survey to assess their soft skill knowledge and how often they use Grades First. The data from the pre-assessment survey revealed that one (25%) academic support leader was somewhat knowledgeable in the areas of time management and Cornell Note Taking Method; whereas three (75%) of the academic support leaders were very knowledgeable in Time Management and Cornell Note Taking Method.

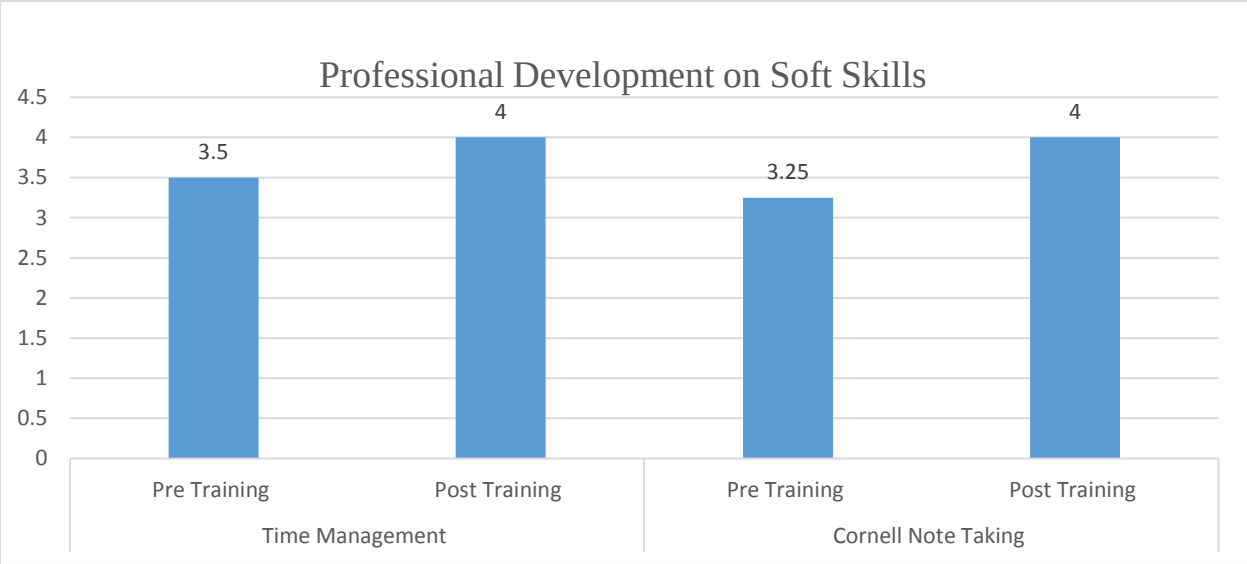
After I reviewed these findings, I distributed a time management worksheet, ink pens, colored pencils, and highlighters. I explained that for every credit hour that a student is enrolled, he or she should multiply that number by two. That total is a good rule of thumb as to the number of hours a student should study outside of class to earn at least a "C". Therefore, 13 credit hours multiplied by two equals a minimum of 26 hours devoted each week for study. I instructed the academic support leaders to select a writing tool of their choice. I instructed the academic support leaders to have their student list each individual activity in its own color. For example, extracurricular activities would be red, when they wake up blue and when they go to bed green, when they eat their meals in the same color and their classes are scheduled in ink.

Next, academic support leaders calculated their study time and listed those hours on the time management worksheet. The SI leader and tutors were surprised to learn the amount of time they had available to study over the course of seven days. Peer educators instructed their students at the beginning of the tutorial sessions and inquired as to how much time the student dedicated to studying as well as where and how they studied. They were to teach and give the time management sheet to their students after completion. I proceeded to teach my team the Cornell Note Taking Method to share with their students.

I divided a sheet of notebook paper into three sections. I then showed the peer educators how to label the paper with "keywords" on the far left side of the paper, "notes" in the middle of the paper, and "summary" listed on the bottom six lines of the paper. The goal was to select the most important material to be transferred to the paper, with keywords that served as clues, and the bottom of the paper served as a summary for notes from the lecture. The total time taken to teach these two soft skills was seven minutes.

After brief training, the post-assessment survey of Time Management and the Cornell Note-Taking Method revealed that four (100%) of the academic support leaders were very knowledgeable and were able to teach these particular soft skills to their students (See figure 2). Next, I inquired about the utilization of Grades First and the capacity in which it is used. Three tutors used Grades First that documented student contact, listed their availability, and emailed students' appointment reminders if necessary. Tutors noted using Grades First 3-4 times a week.

Figure 2



I contacted the SI leaders and tutors via student email and required them to submit their fall work hours. I secured work locations for each individual every semester because the University does not have a centralized tutoring center. By working in shared spaces, tutoring locations were carefully selected and finalized prior to the beginning of each semester in order to provide academic support. I secured the locations to provide academic support and finalized the tutorial and SI leader schedule. Tutor and Supplemental Instruction schedules were displayed on the University's website, in classrooms and resident halls, and in various departments on campus.

The director contacted campus partners such as Campus Police, Office of Disability Services, Reference Librarians, Counseling Center, and other academic offices and solidified ongoing workshops for the academic support leaders. I trained an experienced academic support leader who assisted new and returning SI leaders and tutors in my absence on the process of entering tutor availability in Grades First and how to document hours worked in BANNER for payroll.

The First 30 Days

I met individually with each academic leader who participated in this intervention. During the meeting, I reiterated the process of how to teach the time management formula and that it should be introduced at the beginning of each session. I also stated that tutors and SI leaders should ask the students to show their notes so the tutor and SI leader can gain a better understanding of the student's note taking abilities in preparation for introducing the Cornell Note Taking Method.

I advised the academic support leaders to encourage the student to explain what area(s) was causing them difficulty. I checked tutor availability in Grades First to ensure that it was displayed properly and checked to be sure that tutors had documented notes in Grades First. I met with the SI leader and instructed her to make sure that her SI sign-in sheets were fully completed.

Next, the academic support leaders were required to schedule a one-on-one meeting with me. During the one-on-one meetings, the academic support leader and tutor were encouraged to mention any situations that they felt had a negative impact on the student or their work performance. From these meetings, I relocated the SI leader to another location that was quieter and better for learning. I again checked Grades First to ensure that tutors had documented

student contact in the tutor notes section and had their availability listed. I also made sure that tutors' student contacts and completed surveys were equal. If tutors had neglected to have a student complete a survey, they made contact with the student via Grades First email and reminded the student to complete the survey. I met with the SI leader and was pleased that her newly assigned location was better suited for learning. Her documentation on the sign-in sheets had improved greatly. I monitored student satisfaction surveys weekly and checked for positive and negative comments and shared those comments with the SI leader and tutors.

The Second 30 Days

After 60 days, I revisited the intervention and noticed that tutors had documented notes in Grades First, SI sign-in sheets were completed correctly, and Student Satisfaction Surveys were provided to students at the conclusion of every session and returned to me each week. I conducted observations of SI leader and tutors and noted comments of their interactions with student on the observation form. Academic support leaders had successfully embedded soft skills into their sessions and introduced additional soft skills to aid the student. Surveys revealed that students' soft skill knowledge showed improvement.

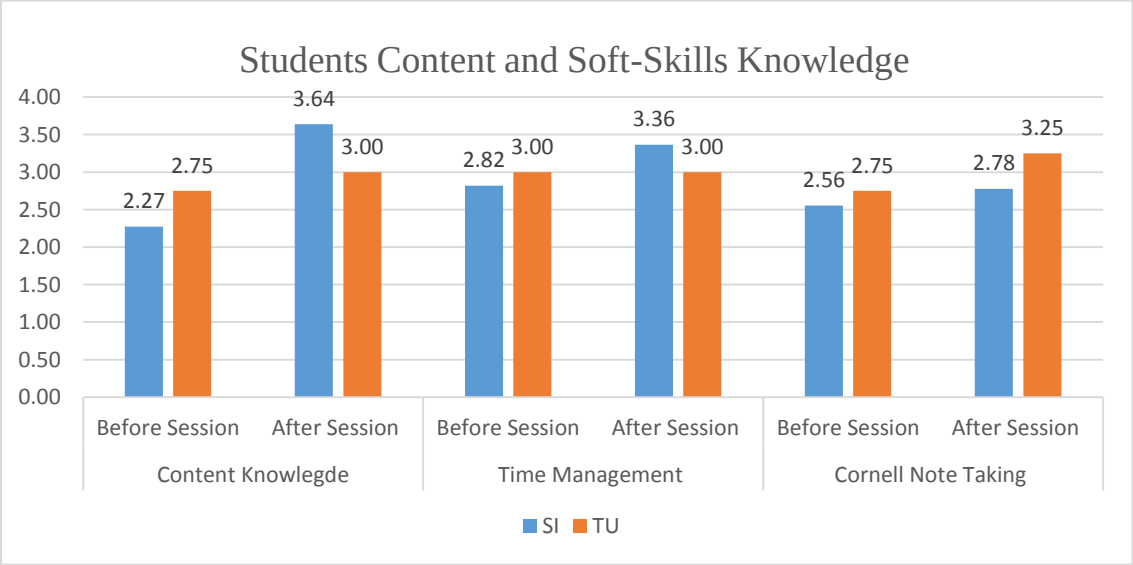
The Last 30 Days

After 90 days, I met individually with the SI leader and tutors and discussed their interactions with students from the observations. The SI leader noticed a significant improvement in her student's participation, note-taking skills, improved usage in time management, and better attitude in the classroom. Tutors who met with students noticed an improvement in their time management skills. At the conclusion of each meeting, I encouraged

them to continue reinforcement of the instructed soft skills and course content in every session and applauded them for their efforts.

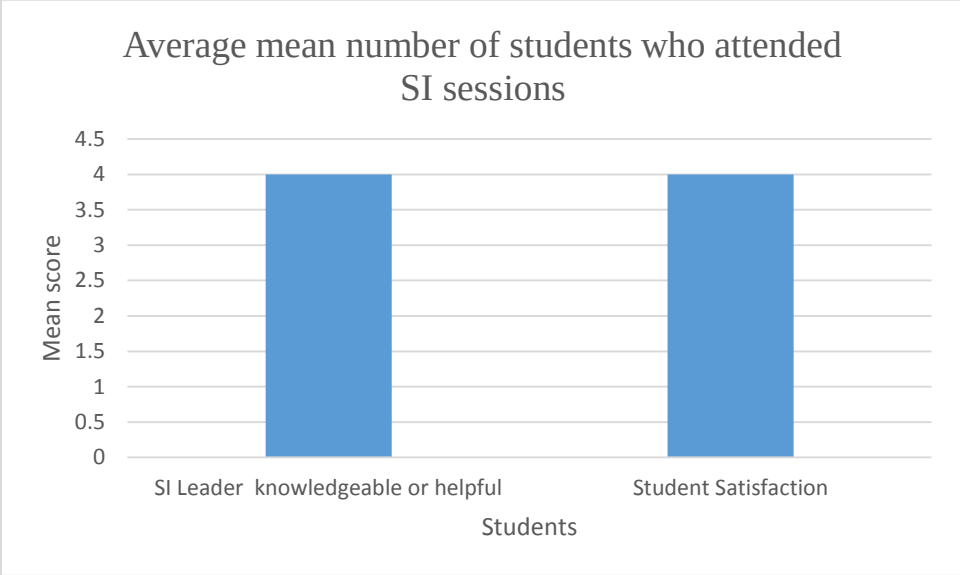
To understand the impact of the training of the sample SI leader and tutors, I measured the content knowledge, time management, and Cornell Note Taking Method knowledge of the students before and after training. The data revealed that before training, students who met with SI leader scored lower (M=2.27, SD=.79) in the area of content knowledge; after training students scored much higher (M=3.64, SD=.93). Before training in the area of time management, scores were lower (M=2.82, SD=.88); after training scores improved (M=3.36, SD= .80). Before training of Cornell Note Taking Method, M=2.56, SD=.88; after training; M= 3.36, SD=.80. Findings revealed students who met with tutors scored higher after training. Content knowledge before: M=2.75, SD 1.5; after: M=3.00, SD=1.15, time management: M=3.00. SD=.81; after: M= 3.0, SD=3.0; Cornell Note Taking Method: M=2.75, SD=.957; after: M= 3.25, SD=.957 (See figure 3).

Figure 3



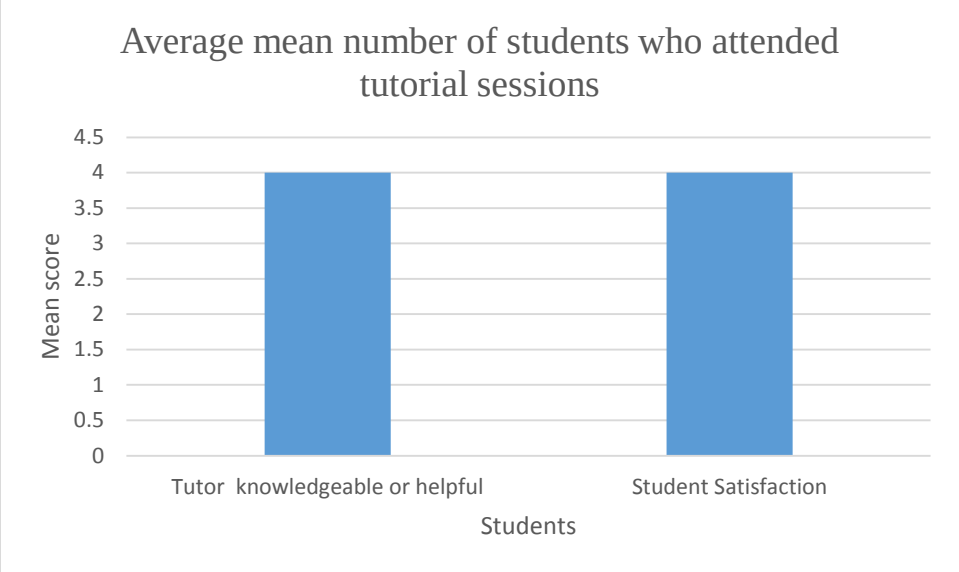
Students also rated the knowledge and assistance of their academic support leader as well as overall service provided. Two students who were serviced rated the knowledge and assistance of their SI leader at 100%. The same students were also 100% satisfied with the services that they received from their SI leader (See figure 4).

Figure 4



Tutors were also rated by their tutees. Three students (100%) surveyed felt that their tutors were very knowledgeable and helpful during their tutorial sessions. These same students also reported being 100% satisfied with the services that they received (See figure 5).

Figure 5



Such findings are encouraging among academic support leaders and educational leaders that embed soft skills with content knowledge and training for academic success.

Below a table is provided that highlights the pre-30 days, first 30 days, second 30 days, and the final 30 days in the intervention.

Table 1. Chronological Overview of Intervention

Time point	Detailed intervention
Pre-30 Days	Created marketing brochures /flyers and vetted referrals from department chairs, professors, and colleagues; hosted informational meeting for prospective tutors. Distributed employment applications to potential hires, reviewed applications and transcripts, conducted interviews, and contacted references. March 2017- April 2017. Director
First 30 Days	Administered soft-skills pre and post- test to SI leaders and tutors; accessed SI leaders and tutors content knowledge, made offers to SI leaders and tutors, notified supervisor and human resources of new hires, reserved tutoring locations for upcoming semester, and ordered supplies for SI leaders and tutors. April 2017 – July 2017. Director
Second 30 Days	Coordinated new hire orientation with campus partners; requested Grades First Training and access for new hires; cancelled Grades First access for those no longer working as SI leaders and tutors. April 2017-July 2017. Director, Training Specialist, SI leader, tutor, and graduate assistant.
Final 30 Days	Executed new hire orientation, taught and reviewed soft-skills with SI leaders and tutors, and assigned SI leaders and tutors room locations. August 2017. Director

Findings

Using a mixed methods approach, the data revealed 193 students were eligible for supplemental instruction. Of that number, 45 students participated in supplemental instruction. In regard to tutorial services, 202 students took part in tutorial services Fall semester. For the sake of this intervention, two students met with an SI leader and three students met with tutors. Of those numbers, five students were studied for this intervention.

Qualitative Findings

For the sake of confidentiality, one supplemental instruction leader and three tutors used pseudonyms. Two females (Suzi and Sophia) and two males (Jim and Tom) participated in this intervention. Qualitative data and quantitative data from student satisfaction surveys revealed three common themes: student apathy, frustrated and overwhelmed faculty, and students economically and academically underprepared.

Student Apathy. Suzi, how did your role working as an SI leader provide insight to burdens some professors experience with student learning?

> I worked very close with my professor. I knew that some students would goof off in the classroom; talking, texting, walking in and out of the classroom as a student I just blew it off. Working as an SI leader and with Dr. Jones, I was able to experience what some professors go through. I had to watch myself that I did not get an attitude when students were talking while I would be promoting our tutorial services, when I was available to assist them and how and why they should come to class and SI sessions prepared. A lot of them (students) were so rude, it was like they did not care. When they came to me, they expected me to do their homework. They did not want to learn; they just wanted the answers. (Suzi, SI leader).

Supplemental instruction leader Suzi stated that students were disruptive in class, lacked motivation, came to sessions unprepared, and expected her to do their homework.

Absent Faculty. Qualitative data from four academic support leaders revealed that professors appeared to be burned out and overwhelmed with their teaching loads.

I spoke briefly with a MATH 1100 professor, Dr. Smith, in the hallway prior to visiting his class that he invited me to meet him during his office hours. When I went to meet with Dr. Smith his door was closed, lights off, nowhere to be found. I went to the MATH department and they did not know where he was. I went back the following week in attempts to catch up with Dr. Smith and again he was not in his office, even though his office hours stated that he would be in. I kinda got an idea of how some students must feel. (Tom, tutor).

Oh yeah, Dr. Jones is awesome. I never had any problems finding her. But I would notice that some of the other professors may be "missing." She is very nice, but she is tough also. She needs to be. Her class is a pre-requisite. If you don't perform well in this class how do you expect to do well in the upper level biology courses? A few times I would be meeting with her as we planned for my sessions and she would get off track and begin fussing about the students. I don't think she meant to complain. She says she does not know what else to do to get them motivated to learn. (Suzi, SI leader).

For me, I would see some professors get into heated discussions with students around exam time because they (students) would want to know if the professor would give extra credit if they did poorly. This one professor said that creating extra credit is more work for him to grade. There was this one student who did not come to class for weeks and then shows up the last two weeks of the semester and demanded, during the class that the professor allow her to take quizzes that she missed! She had not communicated with the professor, and the professor said no and that she could speak with him after class. Well, that did not go well. They got into this argument, the female student cursing at the

> professor the professor cursing back. The professor eventually called campus police to escort the student out of the class. It was crazy. You know in many cases, if the students would come to class and do the work, and get help from tutors, you can pass many classes with a C. It is better than an F. (Sophia, tutor).

Three academic support leaders, one supplemental instruction leader and two tutors empathized with the frustration that many professors felt in their interactions with apathetic students on a daily basis.

Underprepared Students. Results from the data revealed that students are underprepared economically and academically.

> I have had a few students who have come to me for tutoring and they did not have their textbooks. Some just don't think to bring their books, and I work with them the best I can and encourage them to bring ALL their materials to the next session; if they come. I have met with a few students who come to tutoring because they could not purchase their textbooks. They don't have the money. I had this one guy who could not log into Blackboard and get his access code because of an outstanding balance. When he (his family) were able to make a payment, he was way behind. (Sophia, tutor).

Jim, I have heard you reference the "magic pill" during your interactions with students. What do you mean by that?

> Many of them may not know what to bring. Some would bring their homework assignment and just want the answers and then leave. Many students do not want to know how to become a better student, they just want a quick fix, a "magic pill" to get

> them through this "painful" experience. With me, after the first meeting, they know if they come back, come prepared. Bring your books, notes, etc., and come ready to learn. Don't waste my time talking about things that don't matter. (Jim, tutor).

Did you see any improvements in their demeanor?

> Their body language changed. Their posture showed that they began to have more confidence in their abilities. At the beginning of the semester, they acted like they were intimidated to ask me for help, as the semester progressed, they would run up to me after class and show me their test grades! It felt good helping them improve not only their grades, but self- confidence. At the end of the semester they both passed the course with a B!! (Suzi, SI leader).

Tutor Jim experienced students who attended tutorial sessions were not prepared to learn due in part to not having the financial resources to purchase textbooks or were not granted the necessary access code to complete online assignments due to past due balances. He also stated that a majority of those who would attend, just wanted the answers to pass the exam, and not necessarily wanted to learn the material. Suzi experienced academic growth with her students. Students were receptive and learned various soft-skills and applied those skills with classroom material and excelled in their class.

Implications and Recommendations

My intervention has been effective on a small scale. It is my recommendation that in order for this intervention to be successful on a larger scale, a few things are needed (1) faculty buy-in, (2) centralized tutoring center, (3) academic support resources, (4) professional staffing

to support the tutoring center, and (5) professional tutors with a higher hourly rate of pay to attract and retain quality tutors.

Many faculty members with whom I have spoken believe that if students attend class, purchase the necessary supplies and copy the Power Point that would prove successful in students passing their class. But data have shown that many students come to college academically underprepared from a K-12 system after being *"told"* how and when to study, instead being *taught* how to study. These academic support leaders have stated that when students are taught various soft skills, while learning the course content, they can transition from marginal to high-performing students. A centralized tutoring center can help aid in this necessary transformation.

Centralized Tutoring Center

A centralized tutoring center would be an enormous investment for the institution. Offering tutorial services for GEC courses, in one location, instead of having tutors dispersed in multiple locations can prove promising. Students, faculty and staff would have easy access to academic support in one designated area. Science courses that require a lab for experiments, tutorial support for those courses offered in the science building, and formalized staffing would be necessary to assist the NCCU community.

I propose a staff consisting of (1) a full-time administrative assistant who can assist in processing all hiring documents, coordinating staffing logistics and scheduling of tutors and SI leaders and (2) two graduate assistants (GA)—one to serve as a math coordinator and one to serve as a science coordinator. These GA's would assist the director in coordinating what math and science courses would warrant tutorial support based on the current DFWI report. GA's would be responsible for training the SI leaders and tutors for those courses, conducting one-on-

one meetings as well as observations for those areas. Additionally, two work-study students could assist the professional staff with the daily operations of the office. It is recommended that a KIOSK area be established where students can sign-in, check-out, and schedule future appointments. Work-study students could assist students in the KIOSK area. I also propose a small technology area where students could complete an online version of the Student Satisfaction Survey before they leave the center. The director should be included in conversations with leadership as it pertains to the overall success of SI and tutorial services and potential impact on student success and the success of SI leaders and tutors. It is recommended that the centralized tutoring center be housed in the library with the director and necessary staff.

To further enhance academic support at NCCU, I recommend hiring persons with teaching or tutorial experience to work as professional tutors. A professional tutor is someone who has earned a bachelor's degree and has extensive knowledge of the subject(s) that he or she will to tutor and is working or has retired from the field wherein they will be providing academic support.

Professional tutors are more reliable, more professional, and more resourceful in providing academic support and are better mentors because they are working in or have worked in careers that undergraduates desire. In order to attract and retain professional tutors, the hourly rate of pay needs to be increased. Similar positions at two and four-year institutions in the state of North Carolina are paying professional tutors $19-$23 per hour. Therefore, it is my recommendation to increase the rate of pay to help retain professional tutors and not to lose them to other colleges or universities.

Resources

Tutor and SI leaders needed desktop resources such as legal pads, dry erase markers, and textbooks that can serve as reference guides to aid in instruction. It would also be beneficial if SI leaders and tutors are provided opportunities to attend local and regional tutoring workshops and conferences to enhance their professional development. Presently, the director of SI and tutoring is working to acquire tutor certification for tutors and SI leaders at NCCU through the Association with College Reading and Learning Association (CRLA).

Membership affords student professionals a sense of community with other student colleagues serving in similar positions by providing a forum to exchange ideas and methodologies to further enhance and improve student success. CRLA membership includes access to newsletters, discounts to attend national conferences, and eligibility to apply for awards and scholarships for graduate studies, institutes and professional development. Ongoing professional development opportunities to attend local, regional, and national conferences for the director and all tutorial staff is paramount to provide quality support to students, faculty and staff.

Impact for Leadership

Cross-Training of Brittany

Restructuring of the existing SI and tutorial program at NCCU allowed tutors and SI leaders to serve in non-traditional roles. Doing so has enabled them to develop their leadership skills. In my absence, Brittany assumed the role comparable to a program coordinator. Because Brittany was in a newly assigned, yet temporary employee, leadership role, I guided her and used her (1) attention to details; (2) current knowledge of tutorial and supplemental instruction services; (3) knowledge of campus resources and integrated student database technology; (4)

ability to make well informed and appropriate tutorial and SI referrals, and, (5) content knowledge of selected science courses. This allowed SI and tutorial services to continue in my absence.

Mentorship from Suzi

Suzi stated that while interacting with students as an SI leader, she felt obligated and honored to serve as a mentor to the students she assisted -- specifically, the female student because they were pursuing the same academic program in which Suzi is enrolled. Suzi noted that being a nursing major, given the competitiveness and the stress of the program, it helps to have someone who is further along in the process who can provide insight, guidance, and offer a listening ear to up and coming health care students.

Recommendations for Other Leaders and Educators

Literature supports the idea that there is a need for equity and multicultural education in STEM courses in the K-12 and post-secondary pipeline. Brandi Hinnant-Crawford, assistant professor of Educational Research at Western Carolina University, says "equity pedagogy would appeal to different learning styles and multiple intelligences as well as incorporate cooperative learning opportunities" (Hinnant-Crawford, 2016, p. 253). It is also my recommendation that multicultural education in STEM be addressed and supported. It is imperative that educators do not project their own biases toward girls and minorities in STEM courses because by doing so they create barriers and undermine a girl's ability to perform well in the classroom.

Hinnant-Crawford (2016) further suggests that integration of multicultural content is necessary to illustrate to students of color that excellence in mathematics and science is not only achievable but is heavily rooted in Indian and northern African cultures. Students, especially

those from underrepresented populations, need to make a connection to their success in academics through their ancestry. Doing so can help demonstrate to students that excellence in math and science is achievable and that with access, support, and persistence students can excel in courses traditionally dominated by White males.

Increasing access and providing ongoing support to Black girls and women in STEM courses can be achieved in a variety of ways. Supportive resources include successful recruitment practices exposing girls to summer bridges programs beginning in grades K-12 leading to post-secondary education. Summer bridge programs provide mentoring and academic support in a fun, educational, and supportive climate. Such programs can help prevent summer loss as well as provide hands-on activities for students interested in STEM careers.

Connecting students to peer and professional mentors can serve as a catalyst for African American women to not only pursue a STEM major but to also graduate with a STEM degree. Mentors, whether peer or professional, can offer guidance to their mentee to make certain that their charge avoids unnecessary pitfalls that can be detrimental to their academic or professional career.

Access to academic support services such as tutors, textbooks, and technology may ensure that women are not falling behind in their classes. Financial support would help decrease the burden of financing their college education. Connecting these students to campus and professional organizations can help prepare them to work in STEM fields. The need to change the attitudes and behaviors of educators, health care professionals, and students as well as improve the overall process of recruiting, educating, mentoring, and retaining this special population of girls and women is not only beneficial for the overall economic welfare of the

United States; it is also important to countless lives of women, specifically Black women that could be saved.

The need to re-structure supplemental instruction and tutoring services at NCCU is vital to the overall success for students in need of academic support. Collaboration with departments chairs, effective marketing strategies, successful recruitment of high performing students with excellent content knowledge of STEM courses, academic support leaders who taught soft-skills and provided the social capital necessary during tutoring sessions, as well as the implementation of the improvement science framework and the PDSA Cycle , proved that supplemental instruction and tutoring are highly effective tools that when used early and often can aid in the retention of Black females in STEM gateway courses.

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Footnotes

[1] African American women and Black women are used interchangeably.

Appendix A

NORTH CAROLINA CENTRAL UNIVERSITY
DFWI and Passing Rates for Selected Courses

TERM	COURSE	GRADE													DFWI		PASSING	
		A	B	C	D	F	I	NF	NW	W	WC	WE	WF	TOTAL	N	PctN	N	PctN
FALL 2013	BIOL1000	84	119	80	22	18	.	2	10	7	7	.	.	349	66	18.9	283	81.1
	BIOL1100	15	33	57	25	23	1	.	7	1	3	.	.	165	60	36.4	105	63.6
	BIOL1300	34	50	85	74	54	.	2	8	8	27	.	.	342	173	50.6	169	49.4
	ENG1110	149	323	190	64	39	3	7	28	15	5	.	.	823	161	19.6	662	80.4
	ENG1210	65	162	75	21	15	.	4	15	3	4	.	.	364	62	17	302	83
	HEDU1531	215	226	147	63	62	2	1	32	8	13	.	1	770	182	23.6	588	76.4
	HIST1320	244	206	172	74	34	2	5	14	12	17	.	1	781	159	20.4	622	79.6
	HUM2410	201	112	62	17	19	3	1	4	3	5	.	.	427	52	12.2	375	87.8
	HUM2420	129	110	110	18	26	.	3	7	8	5	.	.	416	67	16.1	349	83.9
	MATH1000	84	167	127	53	40	.	17	17	7	20	.	.	532	154	29	378	71.1
	MATH1080	12	23	41	23	23	.	.	2	.	7	.	.	131	55	42	76	58
	MATH1100	202	185	142	62	66	11	26	29	15	48	.	.	786	257	32.7	529	67.3
	MATH1110	70	124	122	46	58	1	1	20	4	13	.	.	459	143	31.2	316	68.9
	MATH1200	16	21	44	44	27	1	11	3	5	13	.	.	185	104	56.2	81	43.8
	PEDU1541	553	181	64	12	23	1	3	12	3	7	.	2	861	63	7.32	798	92.7
	SCI1220	38	27	11	3	1	1	1	1	.	2	.	.	85	9	10.6	76	89.4
	SPAN1151	159	133	64	23	32	5	4	21	12	12	.	.	465	109	23.4	356	76.6
	SPAN1152	164	114	36	15	6	2	2	21	5	7	.	3	375	61	16.3	314	83.7
SPR 2014	BIOL1000	56	99	100	49	33	.	6	12	.	10	.	.	365	110	30.1	255	69.9
	BIOL1100	29	23	21	10	7	.	.	2	.	2	.	.	94	21	22.3	73	77.7
	BIOL1300	15	48	70	34	41	.	6	2	7	21	.	.	244	111	45.5	133	54.5
	ENG1110	29	71	49	29	17	.	6	23	5	5	.	.	234	85	36.3	149	63.7
	ENG1210	160	280	204	60	37	2	4	34	12	30	.	.	823	179	21.8	644	78.3
	HEDU1531	220	190	105	48	49	23	12	14	4	19	.	.	684	169	24.7	515	75.3
	HIST1320	190	186	131	46	11	4	4	20	11	17	.	.	620	113	18.2	507	81.8
	HUM2410	133	143	61	27	28	.	5	7	6	4	.	.	414	77	18.6	337	81.4
	HUM2420	207	128	109	38	48	4	.	7	8	4	.	.	553	109	19.7	444	80.3
	MATH1000	105	18	32	12	5	8	3	13	5	5	.	.	206	51	24.8	155	75.2
	MATH1080	14	32	52	34	39	.	.	16	3	12	.	.	202	104	51.5	98	48.5
	MATH1100	112	137	140	71	56	3	41	55	11	49	.	.	675	286	42.4	389	57.6
	MATH1110	35	89	140	35	44	2	5	26	5	8	.	.	389	125	32.1	264	67.9
	MATH1200	12	23	36	36	32	2	5	5	3	18	.	.	172	101	58.7	71	41.3
	PEDU1541	323	72	30	2	2	.	4	10	3	6	.	.	452	27	5.97	425	94
	SCI1220	36	22	10	4	1	.	1	1	1	4	.	.	80	12	15	68	85
	SPAN1151	106	111	111	39	43	1	7	18	5	13	.	.	454	126	27.8	328	72.3
	SPAN1152	237	168	58	18	11	2	3	23	1	12	.	.	533	70	13.1	463	86.9
SUM 2014	BIOL1000	28	26	13	7	2	.	.	6	.	2	.	.	84	17	20.2	67	79.8
	BIOL1300	11	11	14	8	2	.	.	2	.	.	.	.	48	12	25	36	75
	ENG1110	40	42	26	5	2	.	.	3	1	2	.	.	121	13	10.7	108	89.3
	ENG1210	32	17	18	5	4	.	3	9	.	5	.	.	93	26	28	67	72
	HEDU1531	27	13	10	7	1	1	.	2	.	.	.	.	61	11	18	50	82
	HIST1320	35	29	13	5	8	1	.	2	2	5	.	.	100	23	23	77	77
	HUM2410	95	27	6	1	5	2	1	7	2	1	.	.	147	19	12.9	128	87.1
	HUM2420	86	32	21	1	2	5	1	3	.	1	.	.	152	13	8.55	139	91.5
	MATH1000	5	7	5	9	1	.	.	1	.	2	.	.	30	13	43.3	17	56.7

NORTH CAROLINA CENTRAL UNIVERSITY
DFWI and Passing Rates for Selected Courses

TERM	COURSE	GRADE													DFWI		PASSING	
		A	B	C	D	F	I	NF	NW	W	WC	WE	WF	TOTAL	N	PctN	N	PctN
	MATH1080	3	13	20	11	4	.	.	5	.	1	.	.	57	21	36.8	36	63.2
	MATH1100	44	52	65	18	19	3	1	31	3	12	.	.	248	87	35.1	161	64.9
	MATH1110	21	37	54	13	17	2	4	15	.	1	.	.	164	52	31.7	112	68.3
	MATH1200	5	11	24	4	10	4	4	1	1	2	.	.	66	26	39.4	40	60.6
	PEDU1541	96	14	2	.	.	.	1	3	.	1	.	.	117	5	4.27	112	95.7
	SCI1220	14	2	3	1	1	.	.	.	.	.	.	.	21	2	9.52	19	90.5
	SPAN1151	75	56	28	10	23	2	2	6	1	7	.	.	210	51	24.3	159	75.7
	SPAN1152	117	28	29	11	16	.	2	12	1	2	.	.	218	44	20.2	174	79.8

Appendix B

NORTH CAROLINA CENTRAL UNIVERSITY

UNIVERSITY COLLEGE

ACADEMIC SUCCESS AND ENRICHMENT SERVICES

Fall 2016

STUDENT INTEREST SURVEY

MATH 1100 or BIOL 1300

Directions: Please answer the following questions below regarding supplemental instruction and tutoring services by circling your responses. Thank-you!

1. Have you ever used supplemental instruction or tutoring services for this course?

   Yes No

2. If you answered No, please select your reason from the choices below.

   - Not aware of supplemental instruction or tutorial support.
   - I don't feel that I need the support.
   - The days and times that supplemental instruction or tutorial support is offered conflicts with my schedule.
   - Other

3. If you selected other, please explain why below.

4. Have you ever used supplemental instruction or tutoring for another course(s)?

   Yes No

5. If you answered yes, where you satisfied with the services?

   Yes

Appendix C

UNIVERSITY COLLEGE

ACADEMIC SUCCESS AND ENRICHMENT SERVICES

SUPPLEMENTAL INSTRUCTION AND TUTORIAL SERVICES

Have you benefitted from the support of an SI Leader or Tutor in a challenging course?

Do you enjoy helping your peers become successful in class?

Are you searching for a part-time job with flexible hours?

If you answered yes, please come to the SI and Tutorial Interest Meeting.

WHEN: Mon. Oct. 17, 2016

6-7 p.m.

WHERE: Alexander-Dunn Room 120

Refreshments Provided!

PLEASE CONTACT

MS. JACQUELINE OWENS

DIRECTOR, SUPPLEMENTAL INSTRUCTION AND TUTORING

(919) 530-6973 OR www.jowens23@nccu.edu

Appendix D

University College
Student Worker – Statement of FERPA and Understanding

_____ _____
Last Name (Student) First Name (Student) **Banner ID#**

The *Family Educational Rights and Privacy Act of 1974 (FERPA)* is a federal law that protects the privacy of a student's educational records. It applies to all educational agencies or institutions that receive funds under applicable programs administered by the U.S. Department of Education. An education record is any record that contains information which is directly related to the student including personally identifiable information such as student name, student ID number, or personal characteristics, grades, GPA, class schedules, class roster, a computer screen, a computer printout, notes taken during an advising session, or a document in a University Office. Education records can exist in any medium including typed, computer generated (monitor screen), video, microfilm, microfiche, email, notepad, and others. Student education records are considered **confidential** and may not be released without written consent of the student, except by provisions outlined in FERPA. All employees, including student workers, have the responsibility to protect education records in their possession. Student information may be accessed only for legitimate educational use. FERPA rights begin the first day of the first term in which the student registers. FERPA rights transfer from the parent to the student when a student reaches the age of 18 or begins attending a postsecondary institution, regardless of age.
The same principles of confidentiality that apply to paper records also apply to electronic data. It is very important that students **protect the confidentiality of their Banner ID number, as well as their usernames and passwords.**

NCCU faculty and staff, including student workers, are expected to adhere to the following:

- Only access information to which they have been given authorized access.
- Must not use another person's system/user ID/password/data without permission.
- May not make or permit unauthorized use of information contained within any NCCU system.
- Are not permitted to seek personal benefit or allow others to benefit personally from information to which they have access by virtue of their position.
- May not knowingly include or cause to be included in any records a false or misleading entry.

- May not knowingly change or delete or cause to be changed or deleted an entry in any record, unless in accordance with NCCU policies and procedures.
- May not remove any official records or copy thereof from the office where it is maintained, copied, or printed via electronic means except in the performance of a person's duties, and in accordance with established policies and procedures.

I understand that by the virtue of my employment with North Carolina Central University, I may have access to records that contain individually identifiable information, the disclosure of which is prohibited by FERPA. I acknowledge that I fully understand that the intentional disclosure by me of this information to any unauthorized person could subject me to criminal and civil penalties imposed by law. I further acknowledge that such willful or unauthorized disclosure also violates NCCU's policy and could constitute just cause for disciplinary action including termination of my employment regardless of whether criminal or civil penalties are imposed.

Student worker signature _____Date _____

Supervisor signature _____Date _____

This form is to be maintained in student's employment file by supervisor prior to allowing access to protected records.

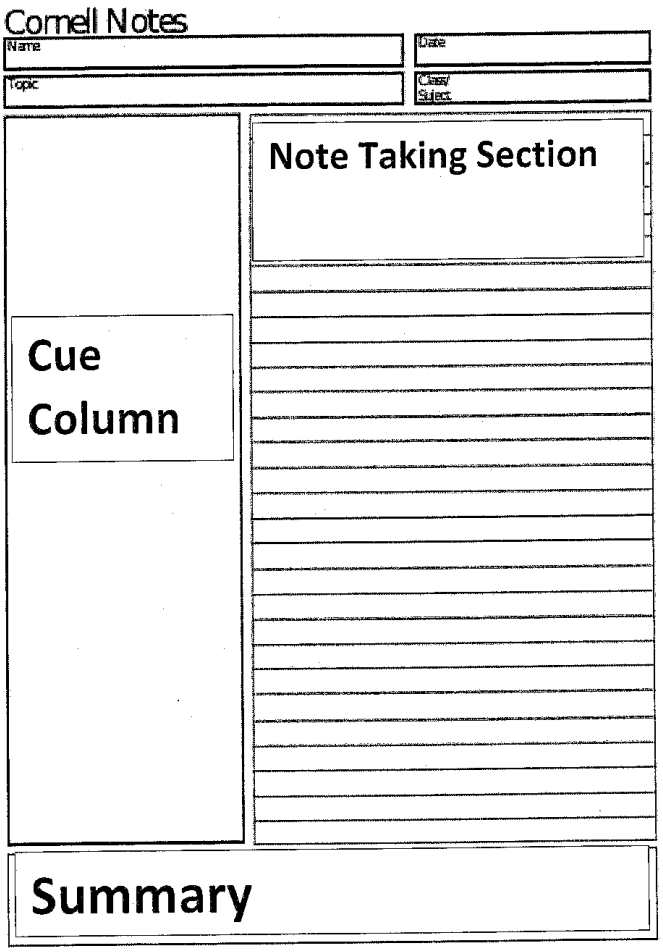
If questions, please contact Ms. Jacqueline D. Owens at (919) 530-6973.

Appendix E

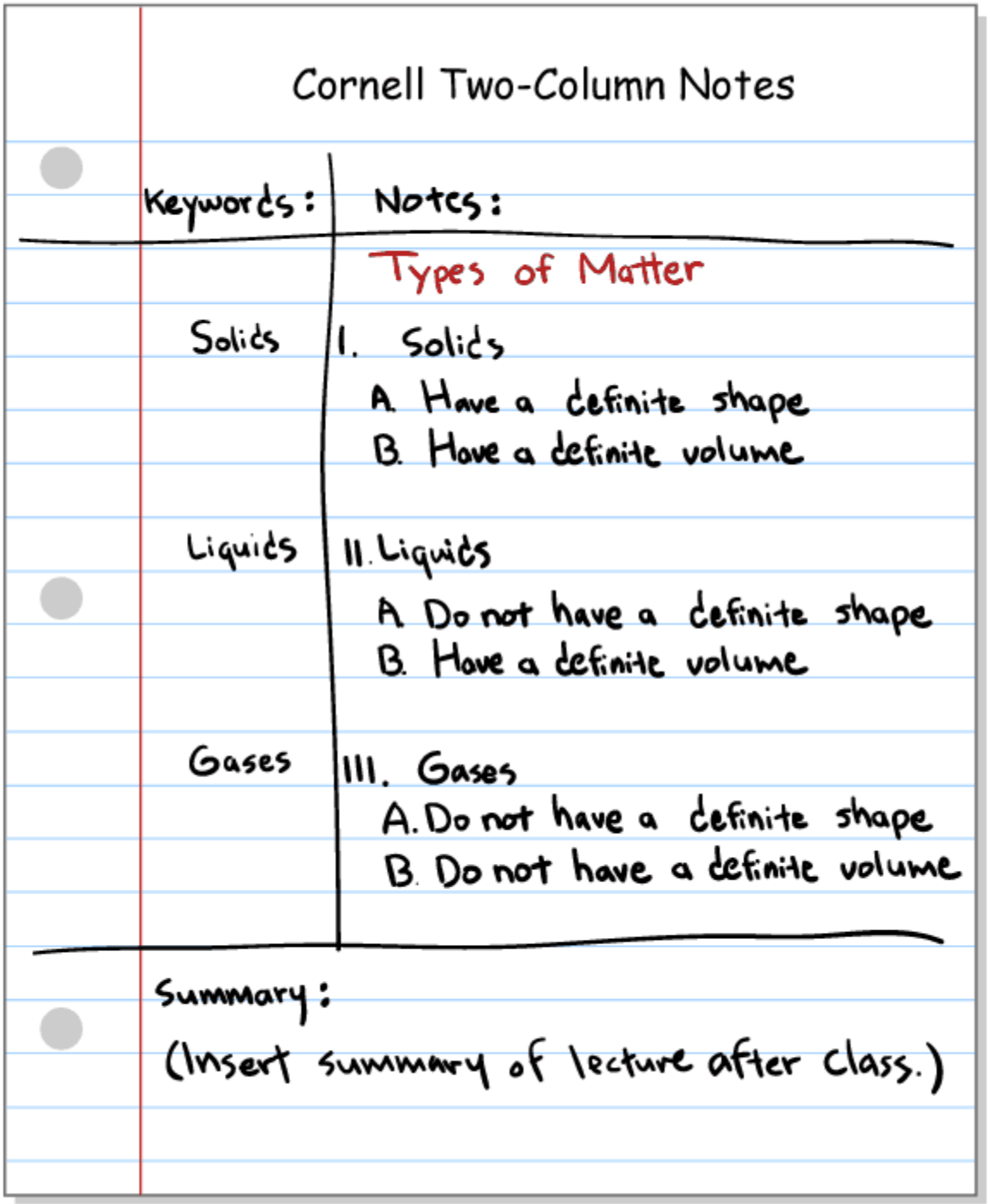
Time Management Worksheet

TIME MANAGEMENT							
Record ALL of your scheduled activities for the week, including the actual time you are in class. Schedule two (2) hours of out-of-class STUDY TIME for each hour you spend in class. Block out time for laundry, meals, naps, exercise, recreation, etc.							
Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
5-5:50am							
6-6:50am							
7-7:50am							
8-8:50am							
9-9:50am							
10-10:50am							
11-11:50am							
12-12:50pm							
1-1:50pm							
2-2:50pm							
3-3:50pm							
4-4:50pm							
5-5:50pm							
6-6:50pm							
7-7:50pm							
8-8:50pm							
9-9:50pm							
10-10:50pm							
11-11:50pm							
12-12:50am							
1-1:50am							
2-2:50am							
3-3:50am							
4-4:50am							

Appendix F


Cornell Notes
Name
Date
Topic
Class/
Subject
Note Taking Section
Cue
Column
Summary

Appendix G


Cornell Two-Column Notes
Keywords:
Notes:
Types of Matter
Solids
I. Solids
A. Have a definite shape
B. Have a definite volume
Liquids
II. Liquids
A. Do not have a definite shape
B. Have a definite volume
Gases
III. Gases
A. Do not have a definite shape
B. Do not have a definite volume
Summary:
(Insert summary of lecture after class.)

Appendix H

NORTH CAROLINA CENTRAL UNIVERSITY

UNIVERSITY COLLEGE

ACADEMIC SUCCESS AND ENRICHMENT SERVICES

SUPPLEMENTAL INSTRUCTION AND TUTORIAL SERVICES

PRE-ASSESSMENT SURVEY

Directions:

Please circle one answer to each question.

How knowledgeable are you in the area of time management?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

How knowledgeable are you in Cornell Note Taking Method?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

Appendix I

NORTH CAROLINA CENTRAL UNIVERSITY

UNIVERSITY COLLEGE

ACADEMIC SUCCESS AND ENRICHMENT SERVICES

SUPPLEMENTAL INSTRUCTION AND TUTORIAL SERVICES

POST- ASSESSMENT SURVEY

Directions:

Please circle one answer to each question.

After receiving training, how would you rate your knowledgeable in the area of time management?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

After receiving training, how would you rate your knowledgeable in the area of Cornell Note Taking Method?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

Appendix J

NORTH CAROLINA CENTRAL UNIVERSITY

UNIVERSITY COLLEGE

ACADEMIC SUCCESS AND ENRICHMENT SERVICES

STUDENT SATISFACTION SURVEY

Student's Name: _____

First Name Middle Initial Last Name

Student ID #: 820_____ First Generation Student: Yes _____ No_____

Classification: _____ Major: _____ Date: _____

Tutored by: _____ Course: _____

Today I received the following service(s): Select all that apply

Supplemental Instruction Tutoring Writing and Speaking Studio

How would you rate your knowledge of: content, skills, or subject prior to receiving service(s) from the Supplemental Instruction, Tutoring, or the Writing and Speaking Studio?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

How would you rate your knowledge of: content, skills, or subject after receiving service(s) from Supplemental Instruction, Tutoring, or the Writing and Speaking Studio?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

How would you rate your knowledge of time management prior to receiving services?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

How would you rate your knowledge of time management after receiving services?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

How would you rate your knowledge of note taking (Cornell Method) prior to receiving services?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

How would you rate your knowledge of note taking (Cornell Method) after receiving services?

Not at all knowledgeable Knowledgeable

Somewhat knowledgeable Very knowledgeable

My SI Leader, Tutor, or Writing and Speaking Studio Tutor were extremely knowledgeable and helpful.

Agree Somewhat Agree Somewhat Disagree Disagree

I was satisfied with the services received today.

Agree Somewhat Agree Somewhat Disagree Disagree

Appendix K

NORTH CAROLINA CENTRAL UNIVERSITY

UNIVERSITY COLLEGE

ACADEMIC SUCCESS AND ENRICHMENT SERVICES

SI Session Planning Sheet

Motto: Truth & Service

SI Leader: _____ SI Session Date: _____

(First Last)

Course Instructor: _____ Course Name: _____

Session Objective: _____

Time Session Began: _____ Time Session Ended: _____

Opening Process (Anticipatory Set):

1. Arrange seats in a semi-circle if possible.
2. Have students sign-in using the Attendance Roster.
3. Set agenda with group.
4. Remember to relax and be flexible.
5. Is this the final session before an exam? ( ) Yes ( ) No If Yes, Exam # _____.

Name (Print)	Last four digits of Banner ID # (Never Social Security #).

Comments:

A Title III Funded Program.
Revised 3/2016

Appendix L

Western Carolina University

Consent Form to Participate in a Research Study

Project Title: Increasing the Retention Rates of African American Females in Science, Engineering, Mathematics, and Technology (STEM) Gateway Courses at North Carolina Central University.

Principal Investigator: Dr. Kofi Lomotey, Disquisition Chair

Jacqueline D. Owens, Doctoral Student and Director of Supplemental Instruction and Tutoring at North Carolina Central University.

Description and Purpose of the Research: I will be focusing on improving the way Supplemental Instructors and Tutors are currently trained at NCCU. I intend to do so by re-structuring the recruitment, hiring and training process and by offering ongoing training in the areas of FERPA, and Student Success Skills. Tutors specifically will receive initial and ongoing training in Grades First, a student management database to track students who meet with tutors in high-risk courses, the frequency of those meetings, the methods that were used to engage students with tutors during those sessions, the number of students who scheduled appointments and those who successfully kept their appointments as well as no-shows and walk-ins, and lastly, the percentage of students who successfully passed the course at the end of the semester who utilized tutorial services. Tutors will document all student contact in the Tutor Notes section of Grades First that will allow myself, academic advisors/academic counselors, and professors to track students' progress. The purpose of this research is to improve the outcomes of African American females in STEM gateway courses at North Carolina Central University. By improving student retention in these courses, these students will be admitted into their academic programs and graduate in a timely manner. By providing access to and training in Grades First, Peer Tutors will be able to provide the academic support and properly document student contact that will allow the researcher to build a comprehensive tutorial program.

What you will be asked to do: Tutors will be required to schedule their availability in Grades First four weeks in advance. This schedule is in sync with the academic advisors and academic counselors at the institution who will be able to view the tutors' availability, location, and subject areas. SI Leaders will be paired with one professor in a high-risk course and therefore are not required to schedule their availability Grades First, however, they are required to maintain office hours to meet with students who are enrolled in that professor class and maintain a sign-sheet for

students. By doing so, academic advisors and academic counselors will be able to schedule tutoring appointments or refer students to SI during advising sessions.

Students and tutors will receive appointment confirmation from Grades First that is then forwarded to both parties' student e-mail accounts. Creating availability should take no more than fifteen minutes. Documenting time spent with tutors in the Tutor Notes Section in Grades First will be done at the conclusion of each of tutoring session and should take no more than five minutes per student.

The Tutor Notes section is a completed template in which tutors will document their start and finish time of the tutoring session, answer "yes" or "no" questions regarding the tutee's preparation and participation, and close with suggestions offered to the tutee for the next session and submit. There will not be any video or audiotaping.

Data collection will be collected from: Student Satisfaction Surveys from SI Leaders and Tutors, per The Title III Grant. These surveys will be administered at the end of each tutoring and SI session and returned to researcher. Grades First will be used to ensure that tutors are correctly entering notes in the Tutor Notes section of Grades First. The researcher will also retrieve data from Tutor Analytics, which will provide how many students have used tutorial services and for what courses.

Risks and Discomforts: Tutors and SI Leaders have been trained on FERPA, Academic Integrity, and best practices to ensure that they are providing quality support to students. Tutors also are required to attend regularly scheduled meetings and training sessions to be in compliance with best practices. I anticipate no risks from participating in this research.

Benefits: There are no direct benefits to you for participating, except to support your peers in their academic and social development in this research study. The study may help us better understand why students are not utilizing tutorial services, what courses require the most tutorial support. I am willing to share the results from this study to interested participants.

Privacy/Confidentiality/Data Security: Participant data is only accessible to those who are granted access to Grades First. Therefore, if a Biology 1300 Tutor A works with Biology 1300 Tutee X enters notes in the Tutor Section of Grades First for Biology 1300 Tutor B, to later retrieve to assist Biology 1300 Tutee X. Data is protected by keeping passwords and logins confidential. Students and Tutors will log-out of Grades First at the conclusion of each session. Tutors and SI Leaders sign a FERPA acknowledgement & confidentiality form during their new hire orientation. The researcher keeps all documentation in a locked file cabinet located in the researcher's office. The researcher in the only person with a key to the file cabinet. Data will be

shared four times a year for quarterly reports, mandated under The Title III Grant. Data will be submitted to the Interim, Associate Dean of Academic Success and Enrichment Services, who will then forward data to the Dean of University College. Results will also be used to inform the researcher if the intervention is effective. Participant data will be destroyed after seven years.

Voluntary Participation: Participation is voluntary, and you have the right to withdraw your consent or discontinue participation at any time without penalty. If you choose not to participate or decide to withdraw, there will be no impact on your employment. If participants wish to withdraw, they must notify the researcher in writing, preferably via e-mail. However, tutors are required to post their availability and document tutees contact in Grades First.

Compensation for Participation: No compensation will be given.

Contact Information: For questions about this study, please contact Jacqueline D. Owens at 919-530-6973 office or jowens23@nccu.edu. You may also contact Dr. Kofi Lomotey the principal investigator and faculty advisor for this project, at klomotey@wcu.edu.

If you have questions or concerns about your treatment as a participant in this study, you may contact the Western Carolina University Institutional Review Board through the Office of Research Administration by calling 828-227-7212 or emailing irb@wcu.edu.

[Examples of signature variations – choose language as applicable to your study]

[Signed consent is not necessary in all situations, and not recommended if your study is otherwise anonymous. If you think that signatures will not be practical/possible or could jeopardize your research, please describe in your IRB application how you plan to document consent (i.e. asking participants to click on an "I approve" box).]

I understand what is expected of me if I participate in this research study. I have been given the opportunity to ask questions and understand that participation is voluntary. My signature shows that I agree to participate and am at least 18 years old.

Participant Name (printed): _____

Participant Signature: _____ Date: _____

Name of Researcher Obtaining Consent: _____

Researcher Signature: _____ Date: _____

If you would like to receive a summary of the results, once the study has been completed, please write your email address (as legibly as possible) here:

_____

[Use when direct quotes or audio/video may be used]

I do □ or do not □ give my permission to the investigators to quote me directly in their research.

The investigators may □ or may not □ digitally record this interview.

Participant Name (printed): _____

Signature: _____ Date: _____

[Parent/legal guardian consent for a minor's participation]

My signature below indicates that I give consent for my child, _____, to participate in this study. I understand what is expected of my child and that his/her participation is voluntary.

Parent/Guardian Name (printed): _____

Signature: _____ Date: _____

Appendix M

North Carolina Central University

University College

Office of Academic Success and Enrichment Services

Student Employee Observation Form

Observation Form to be Completed by Director of Supplemental Instruction and Tutoring.

Name: _____ SI or Tutor (circle one)

Director: _____

Subject: _____

Quarter: 1st 2nd 3rd 4th (circle one)

Criteria	Yes	No	N/A	Comments
Arrived prior to the student(s) arrival.				
Had the necessary supplies to conduct the session (i.e. markers, worksheet, etc.)				
Solicited feedback from the students on content to cover in session.				
Distributed sign-in sheet during the first 10 minutes of the session (if applicable).				
Used techniques learned in the training to re-direct the question and allow the student(s) to assist (if applicable).				
Student employee attempted to engage the student(s).				
The student employee held the session for a minimum of 30 minutes (tutors), or 50 minutes (SI).				
Encouraged student(s) to complete the survey at the end of the session.				

Waited till the student(s) left before leaving.				