FACTORS THAT PROMOTE SUCCESS IN WOMEN ENROLLED IN STEM DISCIPLINES IN RURAL NORTH CAROLINA COMMUNITY COLLEGES

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ABSTRACT

FACTORS THAT PROMOTE SUCCESS IN WOMEN ENROLLED IN STEM DISCIPLINES IN RURAL NORTH CAROLINA COMMUNITY COLLEGES

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Women have historically been underrepresented in the fields of science, technology, engineering, and math (STEM fields). The underrepresentation of women in STEM may be attributable to a variety of factors. These may include different choices men and women typically make in response to incentives in STEM education. For example, STEM career paths may be less accommodating to people who are less resilient. Another factor may be that there are relatively few female STEM role models. Perhaps strong gender stereotypes discourage women from pursuing STEM education and STEM jobs. The factors that contribute to success and the barriers that impeded success must be identified before any steps can be taken to improve the educational outcomes for women in STEM disciplines. Consequently, relatively little is known about the role of resilience in academically successful adult women in rural community colleges enrolled in STEM disciplines and the mechanisms that underlie the performance deficits that occur as a result of stereotype threat effect. This mixed method study addressed those knowledge

gaps by determining: (1) if high resilience is positively correlated to high grade point average for women enrolled in STEM disciplines in rural community colleges in North Carolina, and (2) if stereotype threat effect is a risk factor for these women. Quantitative data were collected by using "The Resilience Scale" (Wagnild & Young, 1987) and through examination of grade point average of students from Datatel data management software. Qualitative data were collected through semi-structured focus group interviews. Findings from this study indicate high resilience is positively correlated to high grade point average for women enrolled in STEM disciplines in rural community colleges in North Carolina, and stereotype threat effect was a risk factor for low-scoring women (i.e. those women who reported resilience scores less than 121 and grade point averages lower than 2.70) and was not a risk factor for high-scoring women (i.e. those women who reported resilience scores of 147 or higher and grade point averages of 2.70 or higher). Overall, qualitative data analysis revealed both high-scoring and low-scoring women in STEM disciplines were affected by stereotype threat effect. However, low-scoring women were negatively impacted by stereotype threat and high-scoring women were able to use pressures associated with stereotype threat as motivation for success. Based on results from this study four principal factors were found that influence the success of women in STEM disciplines. These factors include elimination of stereotype threat, enhancement of resilience of female students, expansion of female gender representation on community college campuses, and development of positive instructor-student and advisor-student relationships. While this study does not, and cannot, explain why gender differences in STEM exist, it does provide data and insight that will enable

more informed policymaking for community college administrators in order to increase success of women in STEM disciplines. The findings provide definitive evidence of a need to encourage and support women in STEM education with a goal of gender parity.

CHAPTER ONE: INTRODUCTION

The science, technology, engineering and math (STEM) workforce is critical to the United States' global competitiveness and innovative capacity; however, women are vastly underrepresented in STEM jobs and among STEM degree holders, despite making up nearly half of the U.S. workforce (Rosenburg, 2011). This leaves an untapped resource to expand STEM employment in the United States, as there is wide agreement that the nation must do more to improve its competitiveness. According to the United States Census Bureau's 2009 American Community Survey (ACS), women comprise 48 percent of the U.S. workforce but just 24 percent of STEM workers (Garvin, 2011). In other words, half as many women are working in STEM jobs as one might expect if gender representation in STEM professions mirrored the overall workforce. The gender gap in hard sciences, defined as one of the natural sciences or physical sciences, is even more pronounced as researchers predict that gender representation in science faculties will not reach equality for another century (Hill & Rogers, 2012).

It is useful to examine the extent to which college-educated workers have STEM degrees, since the gateway for many high-paying STEM jobs is a STEM degree. The 2009 ACS provides a rich new data source for analyzing the link between undergraduate studies and subsequent employment. The ACS data on undergraduate fields of study show that women account for nearly half of employed college graduates age 25 and over, but only about 25 percent of employed STEM degree holders and an even smaller share about 20 percent – of STEM degree holders working in STEM jobs (Garvin, 2011).

There were 2.5 million college-educated working women with STEM degrees in 2009 compared to 6.7 million men. Half as many women are working in STEM jobs as would be expected if gender representation in STEM professions mirrored the overall workforce (Garvin, 2011).

College-educated women are much less likely than men to major in STEM fields. Even when women choose STEM degrees, their typical career paths diverge substantially from their male counterparts (Garvin, 2011). About 40 percent (2.7 million) of men with STEM college degrees work in STEM jobs, whereas only 26 percent (0.6 million) of women with STEM degrees work in STEM jobs (Garvin, 2011).

The underrepresentation of women in STEM majors and careers may be attributable to a variety of factors. These may include different choices men and women typically make in response to incentives in STEM education and STEM employment (U.S. Department of Commerce, Economics, and Statistics Administration, 2011). For example, STEM career paths may be less accommodating to people cycling in and out of the workforce to raise a family, or it may be because there are relatively few female STEM role models (U.S. Department of Commerce, Economics, and Statistics Administration, 2011). Perhaps strong gender stereotypes discourage women from pursuing STEM education and STEM careers.

The purpose of this study was to determine if low resilience factors are a risk for women enrolled in STEM disciplines in rural community colleges in North Carolina and if stereotype threat effect also impedes success for these women. Resilience is the process of adapting well in the face of adversity, trauma, tragedy, threats, or significant

sources of stress (American Psychological Association, 2014). A "risk factor" as defined in this context is any characteristic of a person (such as gender), a situation (such as being the only female in an all-male science course), that increases the likelihood of poor outcomes on class performance (Randolph, Fraser & Orthner, 2004). Stereotype threat effect is defined as a "socially premised psychological threat that arises when one is in a situation or doing something for which a negative stereotype about one's group applies" (Steele, 1997, p. 614),

As a female instructor in a STEM discipline at a rural community college in North Carolina, I feel a personal obligation to female students to pursue this research. Over the last decade, I have made strong ties with female students. During this same time period, the agricultural economy which rural culture and community relies heavily on for a source of income has eroded in our valley of Appalachia. In its place, a minimum wage service economy is taking over. Women indoctrinated with the values of hard work and self-sufficiency find jobs at fast food restaurants or mega-discount stores. Proud of their heritage, attached to the land, and tied to their families, most women don't want to leave home. They wonder why education – especially STEM education – matters in a rural community where academic achievement offers few visible rewards.

Nature and Significance of the Problem

Our nation has profited from a leadership role in development and implementation of cutting edge research and technology for decades (Obama, 2011). The investment made in science and engineering research in universities, government laboratories, and industry has benefited the United States repeatedly in jobs generated,

exports sold, and productivity (Obama, 2011). In order to remain a viable entity in a competitive environment the nation must bring more of its resources to bear by developing a society that has superior education and can provide the technological innovation needed for the new century. A diverse population of engineers and scientists will be necessary in this new work force.

The present and projected need for more STEM employees, joined with the reality that women encompass an increasing percentage of the workforce pool, support programs, policies, and resources that encourage greater involvement by these populations in STEM careers and education. The National Science and Technology Council and the Commission for the Advancement of Women and Minorities in Science, Engineering and Technology have recognized the threats inherent in a society characterized by gender disparity (Bordonaro, Borg, Campbell, Clewell, Duncan, Johnson, Johnson, Matthews, May, Mendoza, Sideman, Winters, & Vela, 2000). The threats remain, regardless of the progress that has been made over the past twenty years.

Attracting and retaining more women in the STEM workforce will maximize innovation, creativity, and competitiveness (Hill, Corbett, & St. Rose, 2010). Scientists and engineers are working to solve some of the most vexing challenges of our time—finding cures for diseases like cancer and malaria, tackling global warming, providing people with clean drinking water, developing renewable energy sources, and understanding the origins of the universe (Lacey & Wright, 2009). Engineers design many of the things we use daily—buildings, bridges, computers, cars, wheelchairs, and X-ray machines. When women are not involved in the design of these products, needs

and desires unique to women may be overlooked（Frehill, Brandi, Di Fabio, Keegan, & Hill, 2009). For example, "some early voice-recognition systems were calibrated to typical male voices. As a result, women's voices were literally unheard . . . Similar cases are found in many other industries. For instance, a predominantly male group of engineers tailored the first generation of automotive airbags to adult male bodies, resulting in avoidable deaths for women and children" (Margolis & Fisher, 2002, pp. 2–3). With a more diverse workforce, scientific and technological products, services, and solutions are likely to be better designed and more likely to represent all users (Hill, Corbett, & St. Rose, 2010).

The factors that contribute to success and the barriers that impede success must be identified before any steps can be taken to improve the educational outcomes for women in STEM disciplines. Many researchers have attempted to make sense of the relatively low numbers of women in STEM fields, leading to the rise of a number of explanations (Rossiter, 2012; Mason, Goulden, & Frasch, 2012; Tulshyan, 2010; Good, Woodzicka, Wingfield, & Lylan, 2010; Miyake, Kost-Smith, Finkelstein, Pollock, Cohen, & Ito, 2010; Moss-Racusin, Dovidio, Brescoll, Graham, & Handelsman, 2012; Yeager & Dweck, 2012; Kooken, Welsh, Mccoach, Johnson-Wilder, & Lee, 2013).

Researchers have studied issues related to discrimination, motivation, and performance. Social psychologists have examined how certain social-psychological events may apply directly to the STEM fields, and may explain the relative lack of gender diversity within these fields. Possible explanations for this phenomenon include stereotype threat effect and low resilience. Stereotype threat arises from the fear that

one's actions will confirm a negative about one's in-group. This fear creates additional stress, consuming valuable cognitive resources and lowering task performance in the threatened domain (Good, et al., 2010). Individuals are susceptible to stereotype threat whenever they are assessed in a domain for which there exists a negative stereotype about a group to which they belong. Stereotype threat has been shown to undermine the academic performance of women and girls in math and science to the extent that standard measures of academic achievement often underestimate the abilities of women and girls in these subjects (Miyake, et al., 2010). Laboratory experiments have also found that individuals who identify strongly with a certain area (e.g. math) are more likely to have their performance in that area hampered by stereotype threat than those who identify less strongly with the area (Moss-Racusin, et al., 2012). This means that even highly motivated students from negatively stereotyped minority groups are likely to be adversely affected by stereotype threat and, as a result, may come to disengage from the stereotyped domain (Miyake, et al., 2010). Negative stereotypes about women's capabilities in mathematics and science drastically lower their performance in mathematics and science courses as well as their interest in pursuing a STEM career (Good, et al., 2010).

Yeager and Dweck (2012) define resilience as any "behavioral, attributional, or emotional response to an academic or social challenge that is positive or beneficial for development." Moreover, resilience as an attribute of an individual that manifests their capacities to engage in activities that make it likely they will overcome adversity and achieve conventional or unprecedented levels of psychosocial development (Benard, 2004). In the context of education, the adversity can take many forms including a failing

grade, struggle beyond the student's tolerance, boredom, embarrassment due to poor performance, poor quality curriculum or instruction, and non-supportive teacher-student or student-student interaction (Yeager & Dweck, 2012). When studying resilience it is recognized that it is not the instructor's or researcher's perception of the experience that matters; it is the student perception of the adversity that is paramount (Johnston-Wilder & Lee, 2010). The positive outcome of an individual who is resilient can be proximal as in reengagement evidenced by improved participation in the classroom, greater understanding of the material, enhanced interest and enjoyment, and improved performance on assessments, or distal as in persistence in taking higher levels of STEM coursework and majoring in STEM careers (Kooken et al., 2013).

CHAPTER TWO: REVIEW OF LITERATURE

Presently, U.S. jobs are developing fastest in careers that demand skills and comprehension stemming from a strong grasp of science, engineering, and technology (Banerji, Cunningham, Fiszbein, King, Patrinos, Robalino, & Tan, 2010). Business leaders are warning of a critical shortage in skilled domestic workers, particularly in computer and information technology (Ruark & Graham, 2011). This deficiency will affect the ability of the U.S. to compete in the global marketplace. The business community is not isolated in its need to create and sustain a highly skilled domestic STEM workforce. Both the academic world and the Federal government have a vested concern in discovering methods to increase their pools of science and technology educators and researchers. In 2009 the Program for International Student Assessment (PISA) report, which ranks countries around the world according to their students' achievement in math and science, ranked the United States #23 in science and #31 in mathematics among the 60 countries and five other jurisdictions (such as Hong Kong and Dubai) included in the assessment (Fleischman, Hopstock, Pelczar, & Shelley, 2010). A nation that depends on innovation for its prosperity, that has unsurpassed universities and research centers, and that has long prided itself on the ingenuity and inventiveness of its technical elite, must devise ways of making solid careers in science once again (Benderly, 2010).

At the same time, STEM workers continue to be significantly White and male and capable women and minorities remain overwhelmingly underrepresented in the

available pool. If individuals from these underrepresented groups were represented in the U.S. STEM workforce in correspondence with their fractions in the total workforce population, ironically, this shortage would essentially be filled (National Science Board, 2010). Therefore, it continues to be a necessity for this nation to nurture the scientific and technical aptitudes of all its citizens, not only those from groups that have customarily had employment in STEM areas.

In the past decade we have witnessed a reinvigorated national emphasis on education in STEM fields, driven in large part by concerns that there will be a shortage of individuals qualified to meet the projected growth of STEM occupations (National Academy of Sciences, 2007). Current conversations about lack of gender equality in STEM fields, as evidenced by the relatively low share of scientists who are women, often center on the need to increase the number of females entering postsecondary programs in STEM as a crucial solution to address the future workforce needs of the nation (Riegle-Crumb, King, Grodsky & Muller, 2012). Because gender achievement gaps have important educational and societal implications, many researchers have attempted to account for the relatively low numbers of women in STEM fields. As a framework for this discussion, the following categories of explanations are proposed: biological explanations, lack of female interest, structural explanations, and social-psychological explanations.

Biological Explanations

Biological explanations tend to focus on gender differences in areas such as cognitive skills. One of the most persistent gender gaps in cognitive skills is found in the

area of spatial skills, specifically on measures of mental rotation, where researchers consistently find that men outscore women by a medium to large margin (Guay, 1977; Linn & Petersen, 1985; Voyer, Voyer & Bryden 1995; Sorby & Baartmans, 2000; Sorby, 2009; and Schmelz, 2014). While no definitive evidence proves that strong spatial abilities are required for achievement in STEM careers (Ceci, Williams, & Barnett, 2009), many people, including science and engineering professors, view them as important for success in fields like engineering and classes like organic chemistry. The National Academy of Sciences states that "spatial thinking is at the heart of many great discoveries in science, that it underpins many of the activities of the modern workforce, and that it pervades the everyday activities of modern life" (National Research Council, Committee on Support for Thinking Spatially, 2006, p.1).

A study published by Tzuriel and Egozi (2010), describes an intervention that is effective in eliminating the gender gap in spatial abilities. "Given the value of good spatial skills in math and science, this study tells us that it's possible to implement intervention programs and develop curricula aimed at overcoming gender differences that many believe have a biological contribution," (Tzuriel & Egozi, 2010, p. 1428). Tzuriel and Egozi studied more than 100 first graders, placing about half of them in a training program that focused on expanding working memory, perceiving spatial information from a holistic point of view rather than based on particular details, and thinking about spatial geometric pictures from different points of view. The other children were placed in a control group that took part in a substitute training program. After eight weekly sessions, initial gender differences in spatial ability disappeared for those who had been

in the first group. While the research doesn't yet show that the intervention leads to better achievement in STEM for women, this is a positive direction for supporting women's achievement and eventual contributions in these areas.

Lack of Female Interest

Among the reasons put forward as potential contributors to gender disparity in the STEM fields, interest is often identified as a critical factor that may lead to the low number of females entering these fields. Interest is a central predictor of educational choices (Benbow & Minor, 1986; Hansen & Sackett, 1993; Lapan, Shaughnessy, & Boggs, 1996), degree completion (Webb, Lubinski, & Benbow, 2002), occupational choices both within and outside of the STEM areas (Fouad, 1999; Parsons, Adler, & Meece, 1984), and job satisfaction (Barge & Hough, 1988; Morris, 2003). Lack of interest in the STEM fields or finding other fields to be more interesting is also the top reason given for women switching out of the STEM majors and jobs (Preston, 2004; Seymour & Hewitt, 1997). For decades, results obtained from developing revisions of the Strong Interest Inventory (Campbell, 1974; Hansen & Campbell, 1985; Harmon, Hansen, Borgen, & Hammer, 1994; Donnay, Morris, Schaubhut, & Thompson, 2005), as well as other interest inventories, have documented sex differences in vocational interests.

Su, Rounds, and Armstrong (2009) examined the magnitude and variability of sex differences in the STEM interest areas in a meta-analysis where interests were classified by RIASEC type (Realistic, Investigative, Artistic, Social, Enterprising, Conventional). Results showed that men prefer working with things and women prefer working with

people. Men showed stronger Realistic and Investigative interests, and women showed stronger Artistic, Social, and Conventional interests. Sex differences favoring men were also found for more specific measures of engineering, science, and mathematics interests.

In their three year interview study, Seymour and Hewitt (1997) found that perceptions that non-STEM academic majors offered better education options and better matched their interests was the most common (46 percent) reason provided by female students for switching majors from STEM areas to non-STEM areas. The second most frequently cited reason given for switching to non-STEM areas was a reported loss of interest in the women's chosen STEM majors. Additionally, 38 percent of female students who remained in STEM majors expressed concerns that there were other academic areas that might be a better fit for their interests. Preston's (2004) survey of 1,688 individuals who had left sciences also showed that 30 percent of the women endorsed "other fields more interesting" as their reason for leaving.

Structural Explanations

Rossiter (2012) offers two possible structural explanations for the low number of women in STEM fields: hierarchical segregation and territorial segregation. "Hierarchical segregation" is described as a decrease in the number of women as one "moves up the ladder of power and prestige." There tends to be a lack of gender diversity in the upper echelons of many occupations where the highest positions are typically held by men (Schiebinger, 2014). Rossiter (2012) also puts forth the concept of "territorial segregation." The term territorial segregation (or occupational segregation) refers to how the STEM fields have traditionally been dominated by men, making it difficult for

women to enter these occupations (Mason, Goulden, & Frasch 2011). This concept supports the idea that women "cluster" in certain fields of study. For example, women are more likely to teach and do research in the humanities and social sciences than in the natural sciences and engineering (Schiebinger, 2014). The majority of women in college tend to choose majors such as psychology, education, English, and performing arts (Tulshyan, 2010).

Even within the STEM fields, females tend to be concentrated in the "soft" sciences: life, behavioral, and social sciences (Mason, Goulden, & Frasch, 2011). Jobs in these fields often have lower salaries and are accorded less prestige (Good, et al., 2010). Women drop out of STEM fields at all stages of their careers, the metaphor of the leaky pipeline has been used to describe this phenomenon (Schiebinger, 2014). According to Pell (2012), the pipeline has several major leaks spanning the time from elementary school to retirement. One of the most important periods is adolescence. Teachers often give boys more opportunity to figure out the solution to a problem by themselves while telling the girls to follow the rules (Schiebinger, 1999) Teachers are also more likely to accept questions from boys while telling girls to wait for their turns (Mason et al., 2011). This is partly due to gender expectations that boys will be active but that girls should be quiet and obedient (Hilary, 2008). Girls also have less laboratory experience because they are given fewer opportunities to gain such experience than are boys (Mason et al., 2012). In middle and high school, courses dealing with mechanics and computers as well as the more rigorous science and mathematics courses are mainly taken by male students and also tend to be taught by male teachers (Schiebinger, 2001). Girls' lack of

opportunities to practice their math and science skills can lead to a loss of self-esteem in their math and science abilities (Pell, 2012). Such low self-esteem may prevent women and girls from entering science and math fields (Good et al., 2010). Many females will end up not taking enough math classes to qualify for three-quarters of majors in college (Schiebinger, 2014).

Social-Psychological Explanations

Although some of these attempts have reduced gender gaps, interventions in science education have focused mostly on instructional methods. Many have taken into account social-psychological processes that lead to gender differences in performance and learning. One such process involves psychological threat tied to the groups with which a person identifies. The fear of being devalued based on a group identity, such as becoming aware that one could be seen in light of a negative stereotype about one's group, has been shown to undermine performance on difficult tasks (O'Brien & Crandall, 2003).

Stereotype threat effect. People are often scrutinized or stereotyped according to their group membership(s), which may include race, gender, ethnicity, religious affiliation, or age (Sackett, Hardison, & Cullen, 2004). Stereotypes about an individual's group often invoke negative emotions, which can manifest into negative responses from the individual such as low performance on a task, lack of motivation, and self-esteem issues (Sackett, et al., 2004). Research has shown that the threat of being evaluated, judged by, or treated in terms of a negative stereotype can cause individuals to perform worse in a domain in which negative stereotypes exist about a group of which they are a

member (Steele & Aronson, 1995). This phenomenon has been termed stereotype threat (Steele & Aronson, 1995).

Steele and Aronson (1995) introduced stereotype threat as an explanation for the lower scores of Black American students on standardized intelligence tests. The authors had been perplexed by the persistent gap in scores between Blacks and Whites, which endured even if Black students came from well-educated families of middle class standing. However, Steele and Aronson found that Black students scored just as well as White students on standard intelligence tests when the tests were presented as diagnostic tools that did not measure intellectual capacities. They determined that it was not the test itself rather the situational pressure surrounding the test that resulted in poorer scores. Performance decreased when Black students were confronted with the possibility of confirming a widespread stereotype about low intelligence in blacks.

Stereotype threat produces numerous consequences, most of which are negative in nature. Many studies (Boucher, Rydell, Van Loo, & Rydell, 2012; Stoet & Geary, 2012; Désert, Préaux, & Jund, 2009; Schmader, Johns, & Forbes, 2008; Gupta & Bhawe, 2007; Osborne, 2007) have replicated and extended the finding first reported by Steele and Aronson (1995) that invoking group memberships associated with stereotypes can harm performance on tasks where poor performance might confirm stereotypes.

The psychological phenomenon of stereotype threat has been shown to negatively impact the performance of a variety of groups (e.g., racial/ethnic minorities, women, individuals with low socioeconomic status) (Davies, Spencer, & Steele, 2005). In addition to impaired performance, stereotype threat has a number of additional consequences

including decreased intentions to study math and science-related fields in college, and influence on an individual's intentions to pursue certain types of job (Davies, Spencer, Quinn, & Gerhardstein, 2002). Stereotype threat has also been shown to negatively impact minority women's performance in the domain of engineering (Bell, Spencer, Iserman, & Logel, 2003). This impaired performance hinders their ability to enter into such areas and may partially explain the underrepresentation of women and minorities in STEM. Thus, it is important for educators to be fully aware of stereotype threat, its causes, and effects. Such knowledge will enable educators to avoid engaging in behaviors that may reinforce domain-related stereotypes, which may in turn decrease the negative outcomes that are related to stereotype threat effect (Steele & Aronson, 1995).

Stereotype threat is characterized as a situational threat, meaning that it has the potential to occur in any situation in which negative stereotypes about one's group membership are perceived to apply (Crocker, Major, & Steele, 1998; Steele, 1997; Steele, Spencer, & Aronson, 2002). Research also has explored other consequences, outside of reduction in performance that may result from the experience of stereotype threat. For example, stereotype- threatened individuals may experience reduced self-efficacy in stereotype-relevant domains (Aronson & Inzlicht, 2004), lower their aspirations and desire to pursue stereotype-relevant careers (Davies, Spencer, Quinn, & Gerhardstein, 2002; Davies, Spencer, & Steele, 2005), and suffer negative medical and psychological health consequences, including increased general anxiety (Ben-Zeev, Fein, & Inzlicht, 2005; Bosson, Haymovitz, & Pinel, 2004). Anxiety then manifests in underperformance by interfering with one's ability to concentrate on strategies to solve problems (Quinn &

Spencer, 2001). Consistent with these findings, O'Brien and Crandall (2003) suggest that anxiety created by stereotype threat is responsible for performance impairment on difficult tasks.

Stereotypes often affect people's perception of a target group. Stereotypes about what someone in a STEM field should look and act like may cause established members of these fields to overlook individuals who may be highly competent but may not fit people's idea of how a person in a STEM field should appear (Wedell, 2011). The stereotypical scientist or individual in another STEM profession is usually thought to be male (Good, et al., 2010). This indicates that women in STEM fields may not fit individuals' conceptualization of what a scientist, engineer, or mathematician "should" look like and may thus be overlooked or penalized (Eagly & Karau, 2002). The role congruity theory of prejudice states that perceived incongruity between gender stereotypes and the stereotypes associated with a particular role or occupation can result in negative evaluations (Garcia-Retamero & Lopez-Zafra, 2006; Ritter & Yoder, 2004). In addition, negative stereotypes about women's quantitative abilities may lead people to discourage these women from entering or continuing in STEM fields (Miyake, et al., 2010).

Coping strategies used in reaction to stereotype threat. Research has also focused on uncovering the buffering variables, or the coping and compensatory strategies individuals employ in response to the experience of stereotype threat (Aronson, Quinn, & Spencer, 1998; Leyens, Croizet, & Darcis, 2000; Quinn & Spencer, 2001; Spencer, Steele, & Quinn, 1999; Smith & White, 2001; Steele, 1997, 1999; Stone, Lynch,

Sjomeling, & Darley, 1999; Ford, Ferguson, Brooks, & Hagadone, 2004; Aronson, Fried, & Good, 2002; Marx & Roman, 2002; McIntyre, Paulson, & Lord, 2003). For example, the extent to which individuals identify with a given task—derive self-worth from task performance—moderates the effects of stereotype threat. The less an individual identifies with a task, the less susceptible they are to the effects of stereotype threat (Aronson, Quinn, & Spencer, 1998; Leyens, Croizet, & Darcis, 2000; Quinn & Spencer, 2001; Spencer, Steele, & Quinn, 1999; Smith & White, 2001; Steele, 1997, 1999; Stone, Lynch, Sjomeling, & Darley, 1999. Ford, Ferguson, Brooks, and Hagadone (2004) report that coping sense of humor buffers women against the effects of stereotype threat on math performance. Under conditions of stereotype threat, women experience less performance impairment to the extent that they were high in coping sense of humor; and that coping sense of humor buffers women from the effects of stereotype threat by predisposing them to experience less anxiety while taking a math test.

In another study, African American college students appeared to overcome consequences of their negative intellectual stereotype—they received better grades and were more engaged in school—when they were encouraged to view intelligence as malleable instead of an ability that cannot be modified (Aronson, Fried, & Good, 2002). Two sets of studies also suggest that stereotype threat performance deficits can be alleviated when people think about members of their stereotyped group who are competent role models (Marx & Roman, 2002; McIntyre, Paulson, & Lord, 2003).

Methods for reducing stereotype threat effect. Research has revealed ways in which to reduce stereotype threat (Danaher & Crandall, 2008; Good, Aronson, & Harder,

2008; Marx, Stapel, & Muller, 2005; McIntyre, Lord, Gresky, Ten Eyck, Frye, & Bond Jr., 2005; Marx & Goff, 2005; Martens, Johns, Greenberg, & Schimel, 2006; McGlone & Aronson, 2006; Cohen, Garcia, Apfel, & Master, 2006; Johns, Schmader, & Martens, 2005; Nguyen & Ryan, 2008; Walton & Cohen, 2003). Possible methods for remediating the negative effects of stereotype threat include: reframing the task, deemphasizing threatened social identities, providing role models, having the test administered by a member of the stigmatized group, providing external attributions for difficulty, and assuring individuals that they are capable (Danaher & Crandall, 2008).

Reframing the task simply refers to using different language to describe the task or test. One method for doing so might include modifying task descriptions or instructions so that stereotypes are not invoked. For example, women who are preparing to take a math test might be told that the test does not show gender differences or is gender fair (Good, Aronson, & Harder, 2008).

A second method for reducing stereotype threat consists of deemphasizing threatened social identities. Previous research has found that simply removing or changing the location of demographic questions can reduce the occurrence of stereotype threat. For instance, having individuals indicate their gender after the test is finished, rather than at the beginning, has been shown to increase performance on the test (Danaher & Crandall, 2008).

Another method for reducing stereotype threat effect includes providing examples of individuals that have performed successfully in the domain (i.e., providing role models). For example, when female students are exposed to women that have performed

successfully in mathematics and science related fields, they perform better than female students who do not have examples of women with such performance (Marx, Stapel, & Muller, 2005). Similarly, research has shown that simply reading essays about women that have been successful can reduce the negative effects of stereotype threat (McIntyre, Lord, Gresky, Ten Eyck, Frye, & Bond Jr., 2005).

Research has confirmed that having the test administered by a member of the stigmatized group can reduce stereotype threat effect. For example, women will experience less stereotype threat on a math test if the test is administered by a female teacher, just as African Americans will experience less stereotype threat if the test is administered by an African American teacher (Marx & Goff, 2005).

Another method for remediating the negative impacts of stereotype threat involves self-affirmation (Martens, Johns, Greenberg, & Schimel, 2006). Self-affirmation is a general means for protecting the self from perceived threats and the consequences of failure, and can allow people to establish their self-worth (McGlone & Aronson, 2006). This can be done by encouraging people to think about their characteristics, skills, values, or roles that they value or view as important (Schimel, Arndt, Banko, & Cook, 2004). Martens, Johns, Greenberg, and Schimel (2006) provided evidence that encouraging women to self-affirm eliminated performance decrements that typically arise when stereotypes about gender differences in mathematics and spatial ability are invoked. Research has shown that having students self-affirm has longitudinal effects and results in improved performance at the end of a semester (Cohen, Garcia, Apfel, & Master, 2006).

Reducing stereotype threat effect also involves providing individuals with external attributions for any anxiety or difficulty that is associated with the test or task. For instance, a study by Johns, Schmader, and Martens (2005) told students explicit information about the negative impact of stereotype threat. Specifically, students were told that any anxiety they felt is likely to be related to the negative stereotypes that exist about women's performance on mathematics tests. In addition, students were also told that the anxiety is not an indication of their ability to perform well on the task at hand. Having external attributions for difficulty (in this case, anxiety) reduced gender differences that typically arise on mathematics tests as a result of stereotype threat effect.

Stereotype threat is a pervasive phenomenon that can impact a variety of individuals in a number of ways. Current research offers us insight as to what stereotype threat is, how it impacts individuals, what mechanisms drive the relationship between stereotype threat and performance, and how we can begin to remediate some of the damaging impacts of this threat (Nguyen & Ryan, 2008; Walton & Cohen, 2003). While researchers have begun to understand how stereotype threat causes decreases in performance and other negative effects, there is still much research that needs to be conducted in order to completely understand the mechanisms that underlie the performance deficits that occur as a result of stereotype threat effect in women enrolled in STEM disciplines in rural community colleges.

Resilience. Some women in STEM disciplines develop the ability to thrive academically despite many adverse situations (Condly, 2006). The ability to thrive in difficult situation defines the notion of resilience. Resilience refers to an individual's

capacity to withstand stressors and not manifest psychology dysfunction as a result of these stressors (Reivich & Shatte, 2002). The theory of resilience attempts to explain why some students academically achieve even though they encounter many negative psychological situations (Reis, Colbert, & Thomas, 2005).

Researchers argue that resilience is the process (Olsson, Bond, Burns, Vella-Brodrick, & Sawyer, 2003) of overcoming the negative effects of risk exposure, coping successfully with traumatic experiences, and avoiding the negative trajectories associated with those risks (Garmezy, Masten, & Tellegen, 1984; Luthar, Cicchetti, & Becker, 2000; Masten & Powell, 2003; Rutter, 1985; Werner & Smith, 1989). Rutter (1987) describes resilience as the ability to adjust one's circumstances while facing negative life events and to exhibit a positive role in stress and adversity. There seems to be no single definition of resilience; however, it is often described as the access to protective mechanisms that altar an individual's response to situations that encompass risk (Reis, et al., 2005).

Resilience after trauma. The theoretical construct of resilience has been used to describe three major categories of phenomena in psychological literature (Masten, Best, & Garmezy, 1990). The first category includes studies of differences individuals may exhibit when recovering from trauma (Waxman, Gray, & Padron, 2003). In 1979, Rutter conducted a 10-year epidemiological study of children on the Isle of Wight and in inner-city London whose parents had been diagnosed as having some type of mental illness. Rutter found that individual characteristics as well as school environment were the two most important protective factors. Protective factors are individual or environmental

characteristics, conditions, or behaviors that reduce the effects of stressful life events; increase an individual's ability to avoid risks or hazards; and promote social and emotional competence to thrive in all aspects of life now and in the future (Centers for Disease Control and Prevention, 2009). Whereas, risk factors are individual or environmental characteristics, conditions, or behaviors that increase the likelihood that a negative outcome will occur (Centers for Disease Control and Prevention, 2009) Individual characteristics of resilient individuals typically include high self-esteem, high self-efficacy, and autonomy; resilient individuals are also actively engaged in school, have strong interpersonal skills, maintain healthy expectations, and have a high level of activity (Borman & Overman, 2004). Rutter suggested that genetic factors contribute to differences in personality characteristics and intelligence; he also suggested that school connectedness is an important protective factor in terms of providing the children with a sense of achievement, increasing their personal growth, and enhancing their social contacts (Rutter, 1985). School connectedness is defined as the belief by students that adults in the school care about their learning as well as about them as individuals (Centers for Disease Control and Prevention, 2009)

Efforts to improve child and adolescent protective factors have featured interventions designed to address specific risk behaviors, such as alcohol and drug use, gang involvement, and early sexual initiation (Klem & Connell, 2004). However, results from a growing number of studies suggest that greater impact might be achieved by enhancing protective factors that help children and adolescents avoid multiple behaviors that place them at risk for adverse educational outcomes (Calabrese, Goodvin, & Niles,

2005; Condly, 2006; Patton, Bond, Carlin, Thomas, Butler, Glover, Catalano, & Bowes, 2006). Enhancing protective factors also might buffer children and adolescents from the potentially harmful effects of negative situations and events. Protective factors include personal characteristics such as a positive view of one's future, life conditions such as frequent parental presence in the home at key times (e.g., after school, at dinner time), and behaviors such as active participation in school activities (Clark, Miller, Nagy, Avery, Roth, Liddon, & Mukherjee, 2005)

Research has also demonstrated a strong relationship between school connectedness and educational outcomes (Frischberg, Lee, Fletcher, & Webster, 2010; Blum, McNeely, & Rinehart, 2002; McNeely, Nonemaker & Blum, 2002; McNeely, 2004; Klem & Connell, 2004; Blum & Libbey, 2004). The physical environment and psychosocial climate can set the stage for positive student perceptions of school (Frischberg, et al., 2010). According to research by Blum and colleagues, children and adolescents' beliefs about themselves and their abilities are shaped by the extent to which they perceive that the adults in their lives care about them and are involved in their lives (Blum, McNeely, & Rinehart, 2002). Children and adolescents who feel supported by important adults in their lives are likely to be more engaged in school and learning (Patton et al., 2006). In the school setting, students feel supported and cared for when they see school staff dedicating their time, interest, attention, and emotional support to them (Klem & Connell, 2004). Students need to feel that adults care about them as individuals as well as about their academic achievement (Patton et al., 2006).

It is important that both students and adults are committed to learning and are involved in school activities. Students' dedication to their own education is associated with the degree to which they perceive that their peers and important adults in their lives 1) believe school is important and 2) act on those beliefs (Condly, 2006). Students who are personally invested in school and believe that a good education is important for reaching their life goals spend more time on homework and in school activities and have an increased sense of connectedness to school (Patton et al., 2006). Students who are engaged in their own education exhibit behavioral traits such as persistence, effort, sustained attention to tasks, and a higher level of preference for challenge and mastery (Frischberg, et al., 2010). School staff who are dedicated to the education of their students build school communities that allow students to develop emotionally, socially, and mentally, as well as academically. Committed adults engage students in learning, foster mutual respect and caring, and meet the personal learning needs of each student (Blum, McNeely & Rinehart, 2002; National Research Council and the Institute of Medicine, 2004; Clark, et al., 2005).

High-risk groups. The second category of resilience phenomena is made up of people from high-risk groups who obtain better outcomes than would typically be expected of these individuals (Waxman, et al., 2003). The term high-risk will be explored further. Many organizational reports and even some scientific studies simply assume a definition without articulating it. Even among the available definitions, ambiguity is often the defining characteristic. Calabrese, Goodvin, and Niles (2005) report that at-risk children have a greater likelihood of becoming educationally disabled

because of conditions surrounding their births or home environments. Condly (2006) writes of students at risk for becoming delinquent. Indeed, these definitions have legitimacy. However, based on the preponderance of available research, a recurring theme seen throughout the literature is that “at-riskness” is most frequently manifested by poor academic and social skills that promote a general disconnection with the school culture (Frischberg, et al., 2010)

Poor academic performance is a clear indication of "at-riskness" (Bishop, Bishop, Bishop, Gelbwasser, Green, Peterson, Rubinsztaj, & Zuckerman, 2004; Libbey, 2004; Clark, et al., 2005). The concept seems to be both cyclical and progressive, in that academic failure increases the likelihood that a student labeled at-risk will ultimately drop out (Voisin, Salazar, Crosby, DiClemente, Yarber, & Staples-Horne, 2005; Hamre & Pianta, 2005; Patton et al., 2006). But even the concept of poor academic performance is not transparent. Mainstream views (Epstein, Sanders, Simon, Salinas, Jansorm, & Van Voorhis, 2002; Guthrie & Davis, 2003) hold that academic deficiencies are primarily literacy-related.

Another commonly cited definition of “at-riskness”, disengagement from school, is also often considered a self-explanatory concept (Balfanz & Byrnes, 2006; Hanushek & Rivkin, 2006). Where at-risk students are disengaged from their school, underachievers, unmotivated, and/or socially isolated disengaged, unmotivated, or otherwise unhappy in the traditional school environment (Balfanz & Boccanfuso, 2007; Juvonen, Le, Kaganoff, Augustine, & Constant, 2004). Balfanz, Herzog, and Mac Iver (2007) also provide insight by identifying alienation from school among factors such as low self-esteem,

limited language proficiency and lack of positive adult role models; and go on to report that middle-grades students - especially those attending high poverty urban schools with student bodies primarily made up of minority students - continue to be the students most at risk in the United States education system. Disengagement, then, seems to relate to some sort of socio-emotional failure to participate in the school culture (Balfanz, Ruby, & Mac Iver, 2002); Jerald, 2006; Balfanz, MacIver, & Byrnes, 2006).

Data from Allensworth and Easton (2005) indicate that a high percentage of adults who fail to earn a high school diploma report feelings of school disengagement during the middle grade years. The literature documents how middle grades students in high-poverty neighborhoods face greater dangers and temptations than when they were younger and are often recruited into roles that interfere with school attendance and involvement (e.g., as they are recruited by their families to be caregivers, by drug gangs to be cheap labor, or by peers to be colleagues on out-of-school adventures) (Allensworth & Easton, 2005; Neild & Balfanz, 2006; Allensworth & Easton, 2007). Further, high-poverty middle-grades schools are often marked by high degrees of bullying, fighting, teacher turnover, and even teacher vacancies (Balfanz, Ruby, & Mac Iver, 2002; Ruby, 2002; Useem, Offenberg, & Farley, 2007). So, students entering the middle grades in high-poverty neighborhoods are more likely than in the primary grades to experience chaotic, under resourced classrooms and schools (Allensworth & Easton, 2007). Many of these students conclude that not much productive is going on in these schools (Neild, & Balfanz, (2006). In short, students entering the middle grades in high poverty

neighborhoods can experience a range of pull-and push factors that may promote disengagement from schooling (Balfanz & Herzog, 2005; Balfanz & Legters, 2004).

Werner and Smith (1977) conducted a longitudinal study on a high-risk group of children born on Kauai, Hawaii in 1955. Half of the individuals studied were deemed as high-risk in that they were born into poverty and lived in a family environment traumatized by numerous factors including prenatal stress, family instability, psychopathological parents, and other negative child-rearing factors (Werner & Smith, 1977). Werner and Smith found several protective factors that supported resilience: external support systems in the environment, dispositional attributes of the individual, and affectional ties with the family (Waxman et al., 2003). In other words, environmental support systems include the safety of where you live, and the quality of the programs and services available to you (Mackrain & Bruce, 2009). Affectional ties with the family are based on the idea of how loving and caring your family may be, and how much time and support your family offers each other (Mackrain & Bruce, 2009). And finally dispositional attributes of the individual, or within-person protective factors, include your temperament, abilities, skill and characteristics that make you who you are (Mackrain & Bruce, 2009).

Children who exhibited high resiliency suffered fewer illnesses and displayed traits such as self-help skills and language development; in early adolescence, resilient children displayed better communication skills and problem-solving skills; as teenagers resilient individuals displayed positive self-esteem and a higher internal locus of control;

and finally as adults, resilient individuals were able to rely on various source of support within their environment (Werner & Smith, 1977).

Adaptive resilience. The third category of the resilience literature refers to the ability to adapt, despite stressful experiences (Waxman, et al., 2003). Having the flexibility to adapt to the academic climate of the dominant culture is a coping strategy utilized by successfully Black students as noted by Watkins (2012) and Hemmings (1996). Hemmings' study (1996) of six high-achieving African American males revealed that even though these students did have to maintain dual self-images as Black persons and as model students, they "responded *directly* to the particular cultures they encountered in their schools" (p. 45). Hemmings further asserted that these high achieving students did not "act upon universalized perceptions of African American as oppressed or in opposition to whites" but rather "acted out identities in response to their school's formal scheme of things" (p. 45). Thus, these African American students overcame potential barriers to achievement to become academically successful.

A key requirement of resilience is the presence of protective factors that either help bring about a positive outcome or reduce and avoid a negative outcome (Ellis, 2010). Resilience theory, though it is concerned with risk exposure among underrepresented women, is focused more on strengths rather than deficits and understanding healthy development in spite of high risk exposure (Perez, Espinoza, Ramos, Coronado, & Cortes, 2009). Personality characteristics and environmental social resources are thought to moderate the negative effects of stress and promote positive

outcomes despite risks (Bernard, 1995; Kirby & Fraser, 1997; Masten, 1994; Werner & Smith, 1989).

Bernard (1995) reports the importance of personal characteristics in resilience such as social competence, problem-solving skills, and autonomy, sense of purpose and future, and high positive expectations. The more resources an individual has to draw on during times of stress, the better their chances are of dealing with difficulties more effectively (Luthar & Zelazo, 2003). Werner and Smith (1989) report that resilient individuals exhibit good communication skills, a sense of responsibility, achievement orientation, caring attitudes, an internal locus of control, a positive self-concept, and a belief in self-help. Gender has been frequently confirmed as a correlate of resilience, assuming a protective role. Longitudinal studies (Werner & Smith, 1989) indicate that women are generally more skilled than men in accessing and using social supports and resources. Feingold (1994) found that women report more extraversion, trust, gregariousness, and nurturance, which are hypothesized to be important personal protective factors.

Resilience is also an ecological phenomenon (Greene, 2002; Jozefowicz-Simbeni & Allen-Meares, 2002; Richman & Fraser, 2001). Environments may contribute to an individual's risk of various problems, but they can also provide protection to enhance the likelihood of positive outcomes (Ellis, 2010). Resources are positive factors that are external to the individual and help overcome risk, such as adult mentoring, or community organizations that promote resiliency (Perez, et al., 2009).

In addition to social and psychological outcomes, resilience research has also examined academic success and persistence despite stressful events and conditions during childhood and adolescence (Alva, 1991; Wang, Haertel, & Walberg, 1994). Although there are many students who perform poorly and continue the downward trend (Dauber, Alexander, & Entwisle, 1996), there are a significant number of others who are successful (Jimerson, Egeland, & Teo, 1999). Two types of protective factors have consistently been identified as evident among academically invulnerable children: personal protective factors and social protective factors (Garmezy, 1981, 1983; Garmezy & Rutter, 1983; Werner, Bierman, & French, 1971; Werner & Smith, 1982).

Personal and social protective factors promote resiliency and help keep risk factors from becoming overwhelming. Students who do well in the classroom show a positive self-evaluation of their academic status at school (Wylie, 1979) and a sense of control over their academic success and failure (Dweck & Licht, 1980; Dweck & Wortman, 1982; Stipek & Weisz, 1981; Willig, Harnisch, Hill, & Maehr, 1983). Gordon (1996) found that confidence in their own cognitive skills was one of the main differences between resilient and nonresilient minority students. As a result of personal protective factors, high academic achievers excelled because they believed in their own capabilities to achieve. Academically successful students usually have social protective factors. Social protective factors typically appear as a supportive network of family members, friends, neighbors, and teachers whom successful students rely on for counsel and advice in difficult or stressful situations (Alva, 1991; Arellano & Padilla, 1996; Gandara, 1982).

Resiliency in students. Many educational researchers seek to examine the concept of resiliency and to determine why some students exhibit this trait, excelling academically, while others do not (Reis et al., 2005; Johnson, 1997; Gayles, 2005; McClendon, Nettle, & Wigfield, 2000). Several studies concurred that one ingredient essential to success is the relationship with an adult who shows concern for the success of the students (Reis, et al., 2005; McGill, 1997; McClendon et al., 2000, Crosnoe & Elder, 2004; Condly, 2006). Support and acceptance from an adult leads to increased academic resiliency in at-risk students (Worley, 2007).

Student-teacher relations. The relationship between student and teacher has a powerful influence on the academic outcomes of a student (Worley, 2007). Plato contended that educational quality is a predictor of future experiences for students (as cited in Parsley & Corcoran, 2003). There is no single factors that dooms a student's educational experience, nor is there one solution for the problem of academic failure, nevertheless, focus on the teachers is one viable solution for promoting academic success with at-risk students (Parsley & Concoran, 2003).

Peart & Campbell's (1999) study addressed the student-teacher relationship by assessing student perceptions of teacher effectiveness. The participants included 47 African American adults that ranged from high school dropouts to college graduates. Each participant provided his or her life story in a narrative form, with specific information regarding perceptions of teacher effectiveness.

Results indicated several common traits among teachers considered to be effective. With the establishment of a caring student-teacher relationship, teachers with

good interpersonal skills affect the academic success of at-risk students (Worley, 2007). Good student-teacher relations have a positive and significant influence on achievement and classroom preparation (Peart & Campbell, 1999; Sanders & Jordan, 2000). Students indicated that their perceptions of teachers typically were influenced by the teachers' ability to foster positive relationships with students, including concern to the academic and emotional well-being of each individual (Peart & Campbell, 1999).

Additionally, a teacher's ability to motivate students proved to be effective in developing positive student perceptions. Students looked to teachers to set an example by demonstrating characteristics of motivational leaders (Peart & Campbell, 1999). Racial impartiality was another pertinent characteristic in teachers' playing a positive role in the life of at-risk students (Worley, 2007). Many participants in the study indicated that discrimination on the part of a teacher inhibits students from academic growth (Peart & Campbell, 1999).

While there is ample research on underachievement as a result of low resilience among students who are children and adolescents in school, there is a dearth of research that examines the role of resilience in academically successful adult women in rural community colleges enrolled in STEM disciplines specifically.

Conceptual Framework

Miles and Huberman (1994) suggest the use of a pre-existing conceptual framework to guide sampling, the framing of research questions, and developing methodology for data collection and analysis. They state that a conceptual framework explains "the main things to be studied – the key factors, constructs, or variables – and

the presumed relationships among them" (p 18). In this study, the researcher wanted to explore the interrelationships among students' resiliency factors as a variable that promotes academic success, specifically women enrolled in STEM disciplines within rural North Carolina community colleges. The researcher also sought to determine if stereotype threat effect is a risk factor for these students. A "risk factor" as defined in this context is any characteristic of a person (such as gender and ethnicity), a situation (such as being the only female in an all-male science course), or a person's environment that increases the likelihood of poor outcomes on class performance (Randolph, Fraser & Orthner, 2004).

The stereotype threat effect model used in this study is based on Baker and Horton's (2003) work on the physiological effects of stereotype threat, and Steele and Aronson's (1995) work on the effect of stereotype threat on academic performance of minorities. The poorer performance associated with stereotype threat has been attributed to the anxiety and distress caused by association with a negative stereotype (Baker & Horton, 2003). Blascovich, Spencer, Quinn, & Steele (2001), examined the effects of stereotype threat on blood pressure in African Americans. They found that groups placed under stereotype threat displayed larger increases in mean arterial blood pressure (a measure of somatic anxiety) and performed more poorly on difficult test items than African Americans not under stereotype threat (Blascovich, Spencer, Quinn, & Steele, 2001).

The literature discussed in this chapter informed the conceptual framework that guided this study and influenced the interpretation of its results. Figure 1 is an outline of

the stereotype threat effect model that was used for creating the conceptual framework of this study. As the model indicates, negative stereotypes about women's abilities in STEM persist. These stereotypes are related to the anxiety women face in a situation where they have the potential to confirm a negative stereotype about women as a group. A large body of experimental research has found that negative stereotypes affect women's performance and aspirations in STEM (Nguyen & Ryan 2008). Stereotype threat along with low resilience may help explain why some women perform poorly in STEM disciplines. It is therefore important to determine if success is directly related to high resilience, and if stereotype threat further reduces success of women in STEM. By understanding the correlation between success and resilience, and the effects of stereotype threat on success, efforts can be made to increase the likelihood of success for women in STEM.

Numbers corresponding in Figure 1 help to explain the purpose of this study. Women feel motivated by virtue of their role as caregiver to enroll in community college and earn an advanced degree for the betterment of their families; at the same time they have feelings that other students as well as instructors and administrators will place unfair parameters on them through stereotyping (1). The motivational drive to succeed and the negative emotions produced from stereotype threat effect put a great deal of stress on these women (stressors male students would not necessarily encounter) (2). If these stressors are buffered with high resilience (3) then the individual will feel minimal anxiety (4). This low state of anxiety will allow the individual to ameliorate the effects of stereotype threat and therefore stereotype threat effect should not impair performance

in STEM courses (5). If these stressors are not buffered with high resilience (6), this will exacerbate the stressors of stereotype threat for female students. This in turn creates an increase in the level of anxiety (7). State anxiety is manifested either somatically through physical responses, such as sweating and increased respiration, or cognitively through worry or concentration disruption (Baker & Horton, 2003). Furthermore, stereotype threat conditions are associated with deficits in cognitive capacity (Croizet, Després, Gauzins, Huguet, Leyens, & Méot, 2004; Schmader & Johns, 2003), increased anxiety (Osborne, 2001; Spencer, Steele, & Quinn, 1999), enhanced worry (Cadinu, Maass, Rosabianca, & Kiesner, 2005), and changes in self-regulatory behaviors (Seibt & Förster, 2004) which result in performance impairment. Each of these manifestations has been linked to negative effects on academic performance (8) (Steele and Aronson, 1995).

The conceptual framework of this study was based on the large body of experimental research that suggests negative stereotypes affect women's performance in STEM (Nguyen & Ryan 2008), along with the theory of resilience which attempts to explain why some students academically achieve even though they encounter many negative psychological situations such as negative stereotypes (Reis, Colbert, & Thomas, 2005). The conceptual framework generated from the review of the literature led to the purpose of the study.

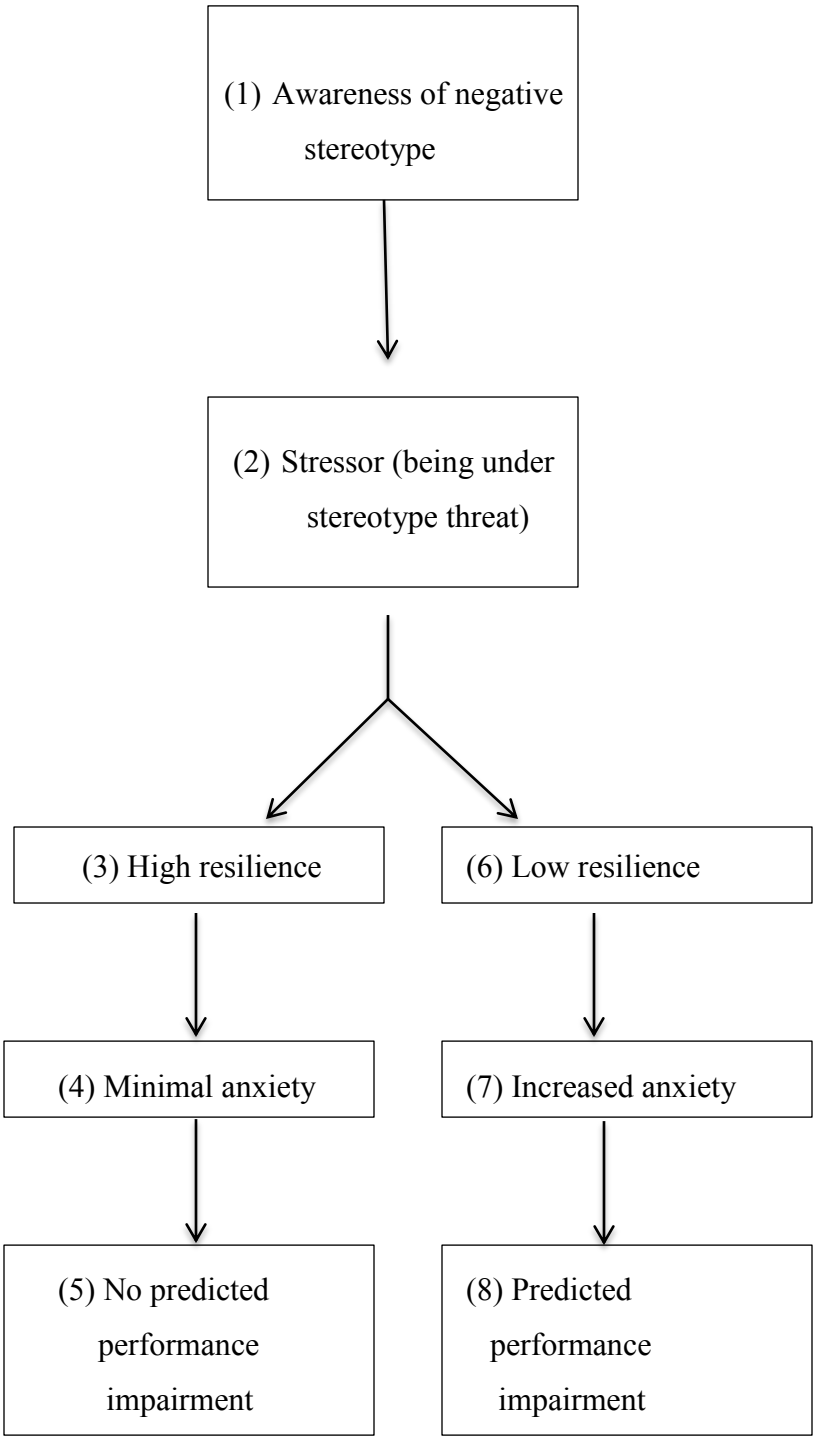

Figure 1. Stereotype threat effect model.

Research Purpose and Questions

The purpose of this study was to determine if low resilience factors such as lack of emotional awareness, low perseverance, having no internal locus of control, and pessimism are barriers to success for women enrolled in STEM disciplines in rural community colleges in North Carolina and if stereotype threat effect also impedes success of these women. The predominant research questions this study sought to answer were (a) is high resilience positively correlated to high grade point average for women enrolled in STEM disciplines in rural community colleges in North Carolina, and (b) is stereotype threat effect a risk factor for women who are enrolled in STEM disciplines in these community colleges? The subquestions were:

1. What are some of the experiences that successful women enrolled in STEM disciplines have had?
2. What are some of the experiences that unsuccessful women enrolled in STEM disciplines have had?
3. What are some common stereotypes that women are cognizant of regarding the ability of women to succeed in STEM disciplines?
4. How does knowledge of stereotypes based on gender affect performance of women enrolled in STEM disciplines?
5. How does knowledge of stereotypes based on gender influence career goals of women enrolled in STEM disciplines?

6. What are the strategies suggested by women enrolled in STEM disciplines that instructors, advisors, and counselors could enact to ameliorate stereotype threat effect?

CHAPTER THREE: METHODOLOGY

This chapter presents a detailed description of methodology used throughout the study. The chapter describes the study's participants and research design, quantitative data collection and analysis procedures, and qualitative data collection and analysis procedures. The chapter concludes with a discussion of how bracketing was used in this study.

Participants and Research Design

In order to identify participants for this study, I used Datatel, data management software that has been fully integrated into the 58 community colleges across North Carolina. Datatel records include the following: gender, ethnicity, current address while enrolled in community college, current phone number while enrolled in community college, current email address while enrolled in community college, birthdate, program of study, courses attempted (unsuccessful and withdrawals), courses completed, courses transferred in from other colleges or universities, semester credit hours awarded, grades earned in all courses, overall grade point average, grade point average in program of study, and duration in community college. Datatel from all 58 community colleges are linked and were available for me to use for this study under the supervision of the Director for Research and Planning at my institution.

The North Carolina Rural Economic Development Center identifies 45 rural community colleges North Carolina. Criteria are based on the USDA description in which ‘rural’ refers to ‘non-metropolitan counties . . . with less than 2500 urban

populations (USDA, 2008). The North Carolina Rural Economic Development Center has labeled community colleges in rural counties as rural community colleges. A list of all rural community colleges is provided (Appendix A). Four rural community colleges located in western North Carolina were chosen for this study.

All four of the community colleges chosen for this study have similar demographics. All community colleges included in this study are two-year, comprehensive, nonresidential, public, post-secondary institutions serving Western North Carolina's Appalachian Mountain region. All four community colleges were founded in 1964 and are governed by a 12-member Board of Trustees. All four community colleges are fully accredited by the Southern Association of Colleges and Schools and all are open door institutions. From the years 2008-2014, 250 associate degrees on average are awarded each year. From the years 2008-2014 the average full time equivalent (FTE) for these institutions were 2,400 students. All four colleges' primary service areas serve populations of around 50,000.

Student body characteristics for all four institutions from fall 2008 to spring 2014 showed that 19 percent of students were either American Indian, Asian, Pacific Islander, Black, Non-Hispanic, or Hispanic while the remaining 81 percent were White, non-Hispanic. Students were 62 percent female and 38 percent male for the total student body population. Students graduating in AS (Associate of Science) degree programs showed 30 percent female and 70 percent male from fall 2008 to spring 2014. Students ranged in age from 16 to 76 with 33 percent in the 18 to 21 years of age range and 38 percent over the age of 30. All four institutions employed around 400 full-time and adjunct faculty

teaching nearly 730 courses resulting in a 1:17 faculty to student ratio. All four community colleges have programs designated for college transfer, technical and occupational students.

I mailed all Deans of AS degree programs at the 4 community colleges a letter (Appendix B), informing them of the study and asking their assistance in helping the researcher to enhance student involvement in the study. A list of potential participants was extracted from Datatel files. All participants were women who had 30 or more semester credit hours in an AS degree program.

Quantitative Research Design and Analysis

Both quantitative and qualitative methods of research design were used in this study. For the quantitative method of this study I used "The Resilience Scale" (Appendix C) that was sent electronically to the list of participants extracted from Datatel. The list of participants also received a brief email (Appendix D) explaining the significance of the study and importance of their involvement.

"The Resilience Scale" measures the degree of individual resilience, "considered to be a positive personality characteristic that increases an individual's adaptation" (Wagnild & Young, 1993, p. 167). Multiple applications of the scale in both sexes, a variety of ages and ethnic groups with good reliability and validity are available (Aroian & Norris, 2000; Christopher, 2000; Heilemann, Lee, & Kury, 2002; Humphreys, 2003; Miller & Chandler, 2002; Monteith & Ford-Gilboe, 2002; Schachman, Lee, & Lederman, 2004; Felton & Hall, 2001; Wagnild, 2003). The authors of "The Resilience Scale report that the "potential use of the scale is as a measure of internal resources and of the positive

contribution of what one brings to a difficult life event" (Wagnild & Young, 1993, p.175). The scale items are scored on a seven-point scale from one (strongly disagree), to seven (strongly agree). They are worded positively and reflect statements made by participants in the initial study on resilience conducted by Wagnild and Young. Scores on the RS can range from 26 to 182 with higher scores mean greater resilience. Wagnild (2003) categorizes the scores into high (147-182), medium (121-146), and low (less than 121) levels of resilience.

The authors developed the items reflecting five themes (equanimity, perseverance, self-reliance, meaningfulness, and existential aloneness) of resilience which were selected from a review of the literature. These items were validated *a priori* by content experts and further by interviewing 24 American women who were judged to have successfully adapted to major life events (Wagnild & Young, 1993). Psychometric evaluation of the initial tool was conducted with a sample of 810 community-dwelling adults. A factor analysis was performed for the determination of internal consistency of the instrument. According to the authors, the factor analysis of "The Resilience Scale" in initial studies has validated that resilience is multidimensional. Subscales of this instrument include personal competence (factor one) and acceptance of self and life (factor two). Wagnild and Young report "high reliability with a coefficient alpha of .91, item-to-item correlation ranges from .37 to .75 at $p \leq .001$" (Wagnild & Young, p. 175). Although initially used with adults, this instrument has subsequently been used in a variety of adult populations including immigrants (Aroian & Norris, 2000; Christopher, 2000); women at-risk (Heilemann, Lee, & Kury, 2002; Humphreys, 2003; Miller &

Chandler, 2002); mothers (Monteith & Ford-Gilboe, 2002; Schachman, Lee, & Lederman, 2004); and older women (Felton & Hall, 2001; Wagnild, 2003).

Information from "The Resilience Scale" and grade point average in STEM courses obtained from Datatel were used to examine the relationship between grade point average and resiliency factors. I examined this relationship by using correlational analysis. In correlational research designs, investigators use the correlation statistical test to describe and measure the degree of association (or relationship) between two or more variables (Creswell, 2008). It aims to look at a relationship between two variables such that (1) changes in on are associated with changes in the other or (2) particular attributes of one variable are associated with particular attributes of the other (Babbie, 2007).

To calculate a numerical value of the correlation between RS scores and grade point average I used Pearson's product moment correlation coefficient or correlation coefficient (r). A correlation coefficient ranges from -1.0 to +1.0, with -1.0 indicating a perfect linear negative correlation and +1.0 indicated a perfect linear positive correlation (Creswell, 2008).

Qualitative Research Design and Analysis

Based on correlational analyses between resilience scores and grade point average, participants were then chosen to participate in small focus groups (three individuals per group). The focus groups were small so that participants would feel more comfortable. My committee chair, Dr. John Habel, suggested that I limit focus groups to three or four participants so that the transcription process would be manageable. The focus group categories included the following: (a) women who have earned a 2.70 GPA

or greater in an AS degree program and exhibit high resilience (this will be referred to as the high/high group); (b) women who have earned a GPA lower than 2.70 in an AS degree program and exhibit low resilience (this will be referred to as the low/low group); (c) women who have earned a 2.70 GPA or greater in an AS degree program and exhibit high resilience and women who have earned a GPA lower than 2.70 in an AS degree program and exhibit low resilience (this will be referred to as the mixed group). A GPA of 2.70 or higher was chosen as a measure of success because this corresponds to an overall GPA of slightly higher than a grade of C. Only courses in which students have earned a C or better are accepted as transfer credits to other colleges or universities.

All respondents that fell into the high/high category were assigned a number and six random numbers were chosen from an online random number generator, random.org. The respondents that corresponded to the six random numbers were then contacted via telephone or email (then requesting a usable telephone number) to be asked to participate in the small focus groups. Because of schedule conflicts only five of the six people contacted to participate in the small focus groups were actually present during the interview process.

All respondents that fell into the low/low category were assigned a number and six random numbers were chosen from an online random number generator, random.org. The respondents that corresponded to the six random numbers were then contacted via telephone or email (then requesting a usable telephone number) to be asked to participate in the small focus groups. Because of schedule conflicts only four of the six people

contacted to participate in the small focus groups were actually present during the interview process.

I contacted each participant via telephone and explained that they had been chosen for the small focus group interviews. After a brief conversation with each participant concerning the logistics of focus group interviews (i.e. time and place); with their permission, I then gathered more personal information from the women who participated in the study. While talking with the participants via speaker phone I used an eight question Post High School Graduation Activity Questionnaire (Appendix E) to determine participants' experiences they had after high school graduation until the time they enrolled in community college, their marital status, how many children they had and the ages of their children, and what their ultimate educational goals were after they obtained their AS degree. I took notes on participants' responses to the Post High School Graduation Activity Questionnaire and also digitally recorded phone conversations used as supporting documentation.

I led semi-structured conversations about their experiences concerning stereotype threat throughout their academic progression in their post-secondary studies by asking open-ended questions about their experiences. I used a Stereotype Threat Effect Questionnaire (Appendix F) adopted from Aronson and Steele's study performed in 1995 to accomplish this. The aim of the Aronson and Steele study was to determine if African American men felt pressures of stereotype threat while taking the Graduate Record Examination; and if so in what ways did this affect them. Spencer, Steele, and Quinn (1999) also used a similar version of the original Stereotype Threat Effect Questionnaire

to assess stereotype threat effect on math performance in women. I used an amended version of the Aronson and Steele Questionnaire because they were the first researchers to identify the phenomenon of stereotype threat effect and have performed numerous research studies with variations of the aforementioned questionnaire (Steele & Aronson, 1995; Steele, 1997; Spencer, Steele, & Quinn, 1999; Good, Aronson, & Inzlicht, 2003; Aronson, Fried, & Good, 2002; Aronson & Inzlicht, 2004). Several major changes that affect the design of the original questionnaire include the fact that this study involved interviewing females rather than male participants. In this study I interviewed females of many ethnicities that are underrepresented in STEM disciplines, including Hispanic, White, Asian, and American Indian. Also, the participants in this study were undergraduates rather than graduate students as in the Aronson and Steele study. In addition, this study addressed stereotype threat effect on the STEM program level in community college rather than one graduate level test as in the original Aronson and Steele questionnaire. The questionnaire contained a series of open-ended questions that addressed stereotype threat effect. Because the questions were open-ended it allowed for a wide range of responses by participants (Silverman, 2013). By using this questionnaire it was my intention to gather descriptive information that allowed me to determine if stereotype threat effect is a risk factor for women in STEM.

I used small focus groups because small focus groups produce data and insights that would be less accessible without interaction found in a group setting (Silverman, 2013). Frankfort-Nachmias and Nachmias (2008), report that listening to others' verbalized experiences stimulates memories, ideas, and experiences in participants. This

is also known as the group effect where group members engage in a 'kind of chaining' or 'cascading' effect; talk links to, or tumbles out of, the topics and expressions preceding it" (Lindlof & Taylor, 2002 p. 182). Focus groups also provide an opportunity for disclosure among similar others in a setting where participants are validated (Tracy, Lutgen-Sandvik, & Alberts, 2006).

Each focus group was arranged in a circle, an iPad with DejaVoice app, and a digital audio recorder were placed in the middle of the group on a table. Participants were identified by identity numbers, written on index card, and placed in front of the participants' chairs. I kept written notes of who was speaking by writing down the order of speakers by their identity numbers on a legal pad. I also made notes on observational data such as nonverbal communication, gestures, facial expressions and body language. Focus group interviews were transcribed by the DejaVoice app on an iPad and I used the digitally audio recorder interviews to add participant identity numbers and punctuation marks to the transcribed interviews.

I printed hard copies of transcripts from all focus groups interviews to be used for coding purposes. I used open coding during the first transcription attempt. Open coding allows the researcher to remain as open as possible in attempts to uncover what is in the data (Stringer, 2013). I highlighted similar words of phrases used by participants in response to interview questions with a highlighter pen. I then performed focused coding on the transcripts. Focused coding is a technique used by researchers to identify themes and look for associated data fitting under categories of interest (Stringer, 2013). To perform focused coding on transcripts I took five different pieces of legal paper, each

piece of paper corresponded to the five different questions asked during the focus group interviews. Common words of phrases highlighted during the open coding phase of the process were listed on the pieces of paper. I then cut and pasted responses from participants that contained those word or phrases onto the pieces of paper. Quotes from transcriptions that had similar words or phrases were put into categories. These categories were used to create the thematic categories discussed in the results chapter of this study.

The coding process described above enabled me to identify themes reported by participants. Some of the themes discovered from the coding process included the following: women in STEM courses have been stereotyped; because of negative stereotypes women in STEM feel isolated in male dominated courses; more resilient women are able to preserve under pressures associated with stereotype threat; less resilient women are not able to persist under pressures associated with stereotype threat. Themes discovered from the coding process were reported as risk factors related to stereotype threat.

Bracketing

Because the researcher in qualitative studies should have a personal interest in the subject being studied (Moustakas, 1994), the researcher must assure measures have been taken to separate a subjective worldview, to an extent, from the data collection process (Langdridge, 2008). Although one's personal experiences and cognitive responses cannot be fully set aside when conducting an investigation, most qualitative methods require bracketing, a process where one can create a distance from previously held

theories and assumptions in order to become a nonparticipating observer of conscious experiences of the world (Bertelsen, 2005). From the Husserlean philosophical stance, only from a point of suspended judgment can inquiry proceed unencumbered from assumptions about the nature of the conditions that are observed (Simon, 2011)

According to Stewart and Mickunas (1974) the researcher should not base insights on traditional or well-established theories, or prior conclusions reached through personal experiences, but only on immediate insights into the phenomena themselves. Bracketing is a process used to develop a non-judgmental study that will not impede the perception of the phenomenon at the heart of the study (Simon, 2011).

Drew (2004) posits bracketing as 'the task of sorting out the qualities that belong to the researcher's experience of the phenomenon' (p. 215). Gearing (2004) explains bracketing as a 'scientific process in which a researcher suspends or holds in abeyance his or her presuppositions, biases, assumptions, theories, or previous experiences to see and describe the phenomenon' (p. 1430). Starks and Trinidad (2007) note that the researcher

> must be honest and vigilant about her own perspective, pre-existing thoughts and beliefs, and developing hypotheses . . . engage in the self-reflective process of ''bracketing'', whereby they recognize and set aside (but do not abandon) their a priori knowledge and assumptions, with the analytic goal of attending to the participants' accounts with an open mind (p. 1376).

Within the grounded theory research tradition, Creswell and Miller (2000) note the importance of researchers' acknowledging their beliefs and biases early in the

research process to allow readers to understand their positions, and then 'bracket or suspend those researcher biases as the study proceeds . . . individuals reflect on the social, cultural, and historical forces that shape their interpretation' (p. 127).

Method of bracketing performed in this study. One method of bracketing is to engage in interviews with an outside source to improve interview skills (Rolls & Relf, 2006). Bracketing interviews held with a non-clinical and non-managerial colleague or research associate, constitute a negotiated, supportive relationship, which serves as an interface between the researcher and the research data (Tufford & Newman, 2012). Bracketing interviews conducted prior to, during, and following data collection can uncover themes that may hinder the researcher's ability to listen to respondents or trigger emotional responses in the researcher that may foreclose on further exploration (Ahern, 1999). Bracketing interviews can increase the researcher's clarity and engagement with participants' experiences by unearthing forgotten personal experiences; it also can protect researchers and participants in emotionally charged research topics, and simultaneously develop the researcher's capacity to understand the phenomena in question (Rolls and Relf, 2006).

Qualitative researchers often perform pilot interviews prior to data collection. In the case of this study, I conducted a bracket interview or pilot interview with three female faculty members in the Science Engineering and Mathematics Department at my institution. These women were not participants in this study. The interview helped me to improve my interview skills, and it allowed me to better comprehend the truth that my experiences were not associated with the experiences of other women in STEM.

The interview took place in this same location as the interviews given to participants in the focus groups. I asked these women the same questions that were used for the small focus group interviews. One major difference between the pilot group and the focus groups was the order in which I asked the questions listed on the stereotype threat effect questionnaire (Appendix F). In the pilot group interview I began by asking the following question: What are some common stereotypes about women, as far as their ability to succeed in science, technology, engineering, and math classes (question two in Appendix F)? The pilot group indicated that they thought this was a "leading" question. The women in the pilot group suggested that I should begin the interview with the following question instead: Think of a time when you were in a college class where you were in the small minority. What was that like for you (question one in Appendix F)? In other words, the pilot group felt that if I began the interviews with question two, participants would be thinking about common stereotypes of women in STEM and this would influence their answers to question one.

There were other suggestions made by the women in the pilot group that helped me to improve my interview skills. They suggested that I turn off the refrigerator that is located in the classroom where the interviews took place so that participants could hear questions more clearly and so that I could hear their response more clearly. They also suggested that I look at each participant while they were speaking, so they had the feeling that I was giving them my full respect and attention, rather than taking copious notes. They suggested that I provide lunch for the participants before the interview process as a means of increasing their comfort level with me and their comfort level with other

participants in the group. And finally, it was suggested that I allow more time between questions to so that each participant could formulate accurate and in-depth responses to questions.

CHAPTER FOUR: RESULTS

The purpose of this study was to determine success factors for women enrolled in STEM disciplines in rural community colleges in North Carolina. The study specifically sought to determine if low resilience factors are barriers to success and if stereotype threat effect additionally impedes success of these women. The predominant research questions this study sought to answer were (a) Is high resilience positively correlated to high grade point average for women enrolled in STEM disciplines in rural community colleges in North Carolina, and (b) is stereotype threat effect a risk factor for women who are enrolled in STEM disciplines in these community colleges? The subquestions were:

1. What are some of the experiences successful women enrolled in STEM disciplines have had?
2. What are some of the experiences unsuccessful women enrolled in STEM disciplines have had?
3. What are some common stereotypes that women are cognizant of regarding the ability of women to succeed in STEM disciplines?
4. How does knowledge of stereotypes based on gender affect performance of women enrolled in STEM disciplines?
5. How does knowledge of stereotypes based on gender influence career goals of women enrolled in STEM disciplines?
6. What are the strategies suggested by women enrolled in STEM disciplines that

instructors, advisors, and counselors could enact to ameliorate stereotype threat effect?

This chapter presents detailed findings for each research question. It is organized around research questions to ensure detailed and purposeful treatment to each. Due to their complexity, results of question (b) are organized by subquestions that describe major perceptions of the participants' experiences in STEM disciplines.

Research Question (a): Is High Resilience Correlated to High Grade Point Average

From the four rural community colleges included in this study, there were 187 women who submitted responses to "The Resilience Scale". Women chosen to complete "The Resilience Scale" were extracted from Datatel and were women who had 30 or more semester hours in an AS degree program. Sixteen of the respondents were eliminated from the data set because they did not provide responses to all 26 questions included in the questionnaire. Eight more respondents were then eliminated from the data set because they had not provided any contact information and, therefore, could not have been contacted to be asked to participate in the focus group interviews. Three more respondents were eliminated from the data set because there was no variability in their responses to the survey. As suggested by Shaftel, Nash, and Gilmore (2012), records for which there was no variability in response (e.g., the student answered every question with the highest value or the student answered every question with the lowest value) were removed. Two of the three women had provided "strongly agree" as the response to all 26 questions included in the questionnaire, and one of the three women had specified "strongly disagree" as the response to all 26 questions contained within the questionnaire.

The removal of the aforementioned respondents from the data set was done so to increase validity of the study. After removal of these respondents the number of participants used in this study to determine the correlation between resilience and grade point average included 160 women from four rural community colleges sampled.

Respondents specified their level of agreement or disagreement on a symmetric agree-disagree scale for the series of 26 statements included in "The Resilience Scale". The scale items were scored on a seven-point scale from one (strongly disagree), to seven (strongly agree). Resilience scores on "The Resilience Scale" can range from 26 to 182 with higher scores indicating greater resilience. Wagnild (2003) categorizes the scores into high (147-182), medium (121-146), and low (less than 121) levels of resilience.

There was a significant correlation between scores on "The Resilience Scale" and GPA, r (158) = .57, $p < .01$, indicating that more resilient participants had higher GPAs (see Figure 2). Furthermore, the coefficient of determination, $r^2 = .32$, indicating that 32 percent of the variance in participants' GPA can be explained by their level of resilience.

Statement number six, "I feel proud I have accomplished things in my life," received the highest score by the participants. The sum of all 160 scores for statement six was 992 with a mean resilience score of 6.20. The mean score of statement six for the five high-scoring women in the focus groups was 6.2. The mean score of statement six for the four low-scoring women in the focus groups was 3.5. Statement number 22, "I do not dwell on things that I can't do anything about," received the lowest score by the participants. The sum of all 160 scores for statement 22 was 661 with a mean resilience score of 4.1. The mean score of statement 22 for the five high-scoring women in the

focus groups was 5.0. The mean score of statement 22 for the four low-scoring women in the focus groups was 2.0.

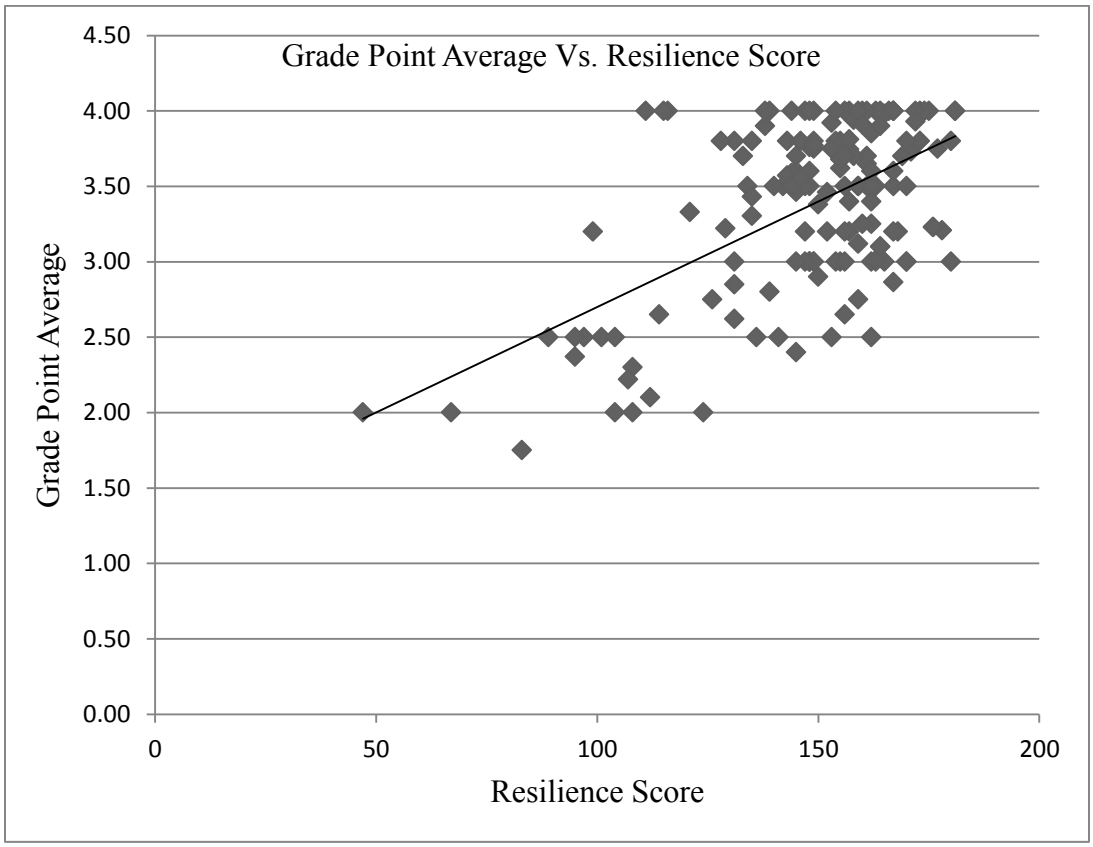

Figure 2. Scatter plot of grade point average versus resilience score. The figure illustrates the positive correlation between high grade point average resilience and high resilience.

Respondents chosen to participate in the high/high focus group (i.e. those women who reported resilience scores of 147 or higher and grade point averages of 2.70 or

higher) along with their scores for statement number six and statement number 22 are presented in Table 1. An average GPA of 2.70 or higher was chosen as the measure of success in this study because it corresponds to an average slightly above a C. Only courses in which students have earned a C or above will transfer as academic credit from community colleges in North Carolina to other institutions.

Table 1

Women included in the high/high focus group.

Participant	Age	Ethnicity	RS	GPA	Statement 6	Statement 22
1	36-40	Hispanic	149	3.77	6	5
2	19-24	American Indian	148	4.00	6	5
3	31-35	Asian	147	3.50	6	2

Participant 1 has been married for twenty years, she has three sons; ages 15, 12 and nine. She has lived in the United States for 16 years. She was born and lived in Costa Rica all of her life before moving to North Carolina. She has enrolled in community college three times in the past ten years and has withdrawn twice because of family issues. She has worked in retail on and off for the past twenty years and is currently working as a certified nursing assistant. She plans to complete her AS degree by December, 2014. After graduation she plans to transfer to Lenoir Rhyne University and enroll in the BS (Bachelor of Science) program in biology, with the ultimate goal of

becoming a Physician's Assistant through their partnership with Bowmen Gray School of Medicine located on the campus of Wake Forest University.

Participant 2 is engaged and has no children. She enrolled in community college immediately after graduating from high school. She has been working as a food server for three years. She plans on attaining her AS degree in spring, 2015 and then transferring to North Carolina State University where she plans on studying physics; with the ultimate goal of earning her Ph.D. in physics.

Participant 3 has been married for ten years and has two children; one daughter age 11 and one son age three. She was a stay at-home mom for ten years after graduating from high school. She has currently been working as a pharmacy technician for two years. She plans on earning her AS degree in fall, 2015. Her ultimate goal is to transfer to the University of North Carolina at Charlotte, where she plans on studying civil engineering.

Respondents chosen to participate in the low/low focus group (i.e. those women who reported resilience scores less than 121 and grade point averages lower than 2.70) along with their scores for statement number six and statement number 22 are reported in Table 2. Participant 4 is not married and has no children; although she did report that she is the major care-giver to her sister's daughter who is 18 months old. She lives at home with her father, two sisters, her sister's baby, and one younger brother. She enrolled in community college immediately after graduating from high school. She has been considering changing her program of study from an AS degree to an AA degree. She is currently working in retail. She is unsure of her transfer plans and goals at this point.

Participant 5 has been married for 21 years. She has two children; one son who is 21 years old, and one daughter who is 13 years old. She hopes to finish her AS degree in spring, 2016 and then transfer to the University of North Carolina at Charlotte where she plans to study environmental engineering. She is currently working as a certified nursing assistant.

Participant 6 has never been married and has a six year old son. She spent several years of her life addicted to drugs and alcohol. She has been enrolled in three different community colleges over the past 16 years. She is currently working in retail. She hopes to earn her AS degree in spring, 2016 and then transfer to the University of North Carolina at Asheville to study biology. Her ultimate goal is to complete dental school at the University of North Carolina at Chapel Hill.

Respondents chosen to participate in the mixed focus group (i.e. two women who reported high resilience scores and high grade point averages, and one person who reported low resilience and low grade point average) along with their scores for statement number six and statement number 22 are included in Table 3. Participant 7 has never been married and has no children. After graduating from high school she chose not to immediately enroll in community college so that she could care for her ailing father. She has been working as a food server for eight years. She plans on graduating with her AS degree in spring, 2015. She will be transferring to the University of North Carolina at Chapel Hill in fall, 2015. She plans on studying cell biology, with the ultimate goal of obtaining a Ph.D. in order to work as a clinical researcher with a focus on oncology.

Table 2

Women included in the low/low focus group.

Participant	Age	Ethnicity	RS	GPA	Statement 6	Statement 22
4	15-18	Asian	101	2.50	3	1
5	36-40	Asian	104	2.50	2	2
6	31-35	White	114	2.65	4	2

Participant 8 has never been married and has no children. She enrolled in community college immediately after earning her GED. This is her first time in a public educational institution as she was in a home school program from age six to age seventeen. She has never been employed. She plans on earning her AS degree in spring, 2016 and then to transfer to the University of Tennessee to study forensic anthropology. Her ultimate goal is to obtain her MD (doctorate of medicine) for employment as a pathologist.

Participant 9 was married for 25 years and has a 23 year old son. She has worked in either retail or the food service industry for 27 years. After her husband's death three years ago she enrolled in community college. She plans on completing her AS degree in fall, 2015 and then to transfer to the University of North Carolina at Charlotte to complete her BS degree in environmental science technology.

Table 3

Women included in the mixed focus group.

Participant	Age	Ethnicity	RS	GPA	Statement 6	Statement 22
7	25-30	White	155	3.62	6	6
8	15-18	White	170	3.50	7	4
9	41-45	White	95	2.37	5	3

Research Question (b): Is Stereotype Threat Effect a Risk Factor for Women Who are Enrolled in STEM Disciplines in Rural North Carolina Community Colleges

The following paragraphs contain information obtained from interview questions answered by nine women in three different small focus groups. The groups consisted of three women in a high/high group, three women in a low/low group, and three women in a mixed focus group (two high-scoring women and one low-scoring woman). The high/high and low/low focus groups were created in order to determine differences in response to stereotype threat of resilient women and non-resilient women. The mixed focus group was established in an effort to determine if differences in response to stereotype threat remain within the same group. The purpose of group interviews was to determine if stereotype threat effect is a risk factor for women. Focus group interview questions (Appendix F) were specifically designed to answer the following subquestions:

1. What are some of the experiences successful women enrolled in STEM disciplines have had?

2. What are some of the experiences unsuccessful women enrolled in STEM disciplines have had?
3. What are some common stereotypes that women are cognizant of regarding the ability of women to succeed in STEM disciplines?
4. How does knowledge of stereotypes based on gender affect performance of women enrolled in STEM disciplines?
5. How does knowledge of stereotypes based on gender influence career goals of women enrolled in STEM disciplines?
6. What are the strategies suggested by women enrolled in STEM disciplines that instructors, advisors, and counselors could enact to ameliorate stereotype threat effect?

Experiences of successful women in STEM. Information gathered from the high/high focus group interview (Appendix G) and from the two high-scoring women in the mixed focus group was used to answer the following question: What are some of the experiences successful women enrolled in STEM disciplines have had? Themes revealed through open coding and focused coding of interview transcripts by successful women are discussed in the following paragraphs.

Disconnection from STEM courses. When asked what it was like to be in the minority in a college class, a sense of remoteness or disconnection was a theme that was revealed by several participants. Participant 1 used the word "isolated" and the phrase "out of place" to describe her feeling of separation.

> Sometimes I feel… out of place as you would say because I am a woman in these science and math classes full of men, but also because I'm from Costa Rica. Sometimes being the only woman as in a male dominated class as in some of my science classes have been, I isolate myself from the rest of the class. I feel isolated.

The same participant also expressed her feeling of separation by using the word "barrier."

> I don't understand the questions because of the way they were asked or the English that's being used. It's not that I don't know the information it's just the language. It's the barrier.

Participant 2 described her experience by using words like "outnumbered" and "withdrawn" as well as the phrase "out of place."

> Now you wouldn't think that you would feel outnumbered. But you do you really do feel outnumbered, I mean. I felt kind of out of place… definitely like the minority. And just from feeling like the minority I felt very withdrawn.

Participant 8 also used the phrase "out of place" to describe her experience in a male dominated STEM class.

> I had one guy in my chemistry class that was pretty demanding, and asked me to help him. I thought this was my way into the guy group, but even then I still felt kind of out of place.

Participant 2 also used the phrase "kept to ourselves" to describe her experience.

> I think the other girls and I just kind of kept to ourselves… It seemed like the feeling was pretty much noticeable to all females in the class.

Participant 3 described her experience by using the word "bystander."

> I felt like a bystander…like watching other people do the work that I wanted to complete.

Participant 7 expressed she felt as though the majority was "progressing more" and she had a feeling of being "left behind".

> I felt like they progressed faster than I did. They were progressing more. That's basically it. I felt left behind in my math classes.

Displeasure in STEM courses. Another theme that was revealed by high-scoring women was the feeling of displeasure. Participant 1 used the words "frustrated" and "struggle" to express her unhappiness in STEM courses.

> I mean I know the information I've just been frustrated, a real struggle and sometimes I get mad and I feel very… sad.

Participant 2 used the words "intimidated" and "uncomfortable" the express her sense of displeasure with being in the minority.

> I felt completely intimidated. It was just a very different environment that I wasn't used to in my other classes, mostly like English or Psychology that are mostly girls. Overall… just, very uncomfortable from the first day until the end of the semester.

Participant 3 used the words "discouraged" and "hated" to express her feeling of displeasure.

> You know, it's like every time I tried to help they discouraged me from helping.

> I hated doing that project because I felt like I really didn't make any contributions that mattered.

Participant 7 described her experience of being in the minority as "overwhelming".

> I've always been the minority in all of my math classes. And it's kind of overwhelming at times.

Participant 8 explained her feeling of being in a male dominated STEM class as a "negative experience" and at times felt "hurt" by the behavior of the majority in regard to her.

> I have felt like guys were making fun of me in some of the classes I have had that were mostly men. I usually don't care how people think of me, but being… like it hurt. Honestly, it did. I have tried to ignore it, thinking they were just jealous. It was a pretty negative experience.

The same participant used the word "hate" to describe how she felt after working with a male classmate in one of her STEM classes.

> I had to help him because we were stuck together in a lab group and we had to turn in lab reports together… Argh, I hate group work, especially when my partner is a guy!

Participant 8 also stated she found a comment made by one of her male classmates in one of her STEM classes as "very offensive".

> I was walking by him and I heard him say "women shouldn't even go to college, they should just raise children". That was very offensive.

Insignificance in STEM courses. Another theme expressed by high-scoring women was the feeling of insignificance. Participant 3 used the word "worthless" to describe her experience in a male dominated STEM class.

> I felt as though none of the men wanted to hear any of my opinions. I felt worthless when it came to actually doing the work that needed to be done on our project.

The same participant also used the word "helpless" to express her feelings of insignificance.

> They made me feel helpless, even though most of the time I don't really feel that way in life. I know this doesn't sound politically correct now, but they expected me to do all of the women's work… making calls, organizing, mothering in other words. While the men got to do all of the fun work… building, constructing.

Participant 8 expressed she felt as though a male classmate was "using" her in one of her STEM classes.

> I knew he was just using me to get his homework finished correctly. I had to help him because we were stuck together in a lab group and we had to turn in lab reports together.

Additional obstacles. Several of the women in the high/high focus group revealed additional obstacles they encountered while in STEM courses. Additional obstacles they had to overcome in order to be successful were opposition from other people in their personal lives. Participant 1 described her father's disapproval of her educational undertakings.

> My daddy didn't believe in us going off to work. He didn't believe in women going off to work at all. He didn't support me going off to college. He doesn't support me going to college.

Participant 3 portrayed a very similar situation in her home environment. Not only did she report disapproval from her father, but from her husband as well.

> My culture is similar in that my father and my husband do not support the idea of me going to college or working. They think that I spend too much time working right now, and that I spend too much time doing my school work.

High resilience is a protective factor. Even though successful women enrolled in STEM have been stereotyped, they were all resilient enough to transcend pressures created by stereotype threat. Their high level of resilience was a protective factor used to negate the effects of stereotype threat. Participant 2 reported her reaction to stereotype threat was to create "competition" between herself and male classmates.

> It's good competition against the boys sometimes. I guess that's how I have survived in my classes… I just made it a big competition.

Participant 8 also felt a sense of competition between her male classmates in her STEM courses, and reported being motivated to show her male classmates she "could actually do better than them".

> Every time I hear any stereotypes, or hear guys making fun of me, it would push me to go… it would make me do better. I wanted to show them that I could actually do better than them.

Because successful women enrolled in STEM courses had higher resilience scores, they are, therefore able to use pressures associated with being in the minority as inspiration to persevere. Participant 2 described her resistance to these pressures by stating "I dug my heels in."

> At that point I dug my heels in and I was like if they are going to talk about me, it's not going to be about being one of the only girls. No, they are going to talk about me because I'm doing better than them in this class.

Participant 1 communicated her oppositions associated with being in the minority by stating that she "pushed right through" these obstacles.

> I'm going to do it and I'm going to do it even better. I have to just keep telling myself that I was… superior… and I pushed right through with good grades.

Similar to Participant 1, Participant 8 used the word "push" to describe how knowledge of how stereotypes affected her performance in a STEM course.

> Every time I hear any stereotypes, or hear guys making fun of me, it would push me to go… it would make me do better

Participant 7 managed to exploit the pressures associated with being in the minority as "motivation to succeed".

> I made me strive to do better. I was actually a benefiting factor in my life…I think. I used it as motivation to succeed.

Participant 3 increased the level of exactitude and consistency in her work as a response to the stresses of being in the minority. She confessed to performing math calculations "multiple times" to ensure accuracy.

> I was a little slower to derive answers because I definitely wanted to be correct. Of course my partner made a comment on how long it took me to solve problems … but I was like hey, it's a learning process, it might take me a little longer to get the answer, but does that not count? I actually believed I did better because I felt as though they were stereotyping, and I just had to get the problems right, so I would work them multiple times just to make sure.

Inspiration from other women. High-scoring women also reported being influenced by other women. Participant 1 and 3 both revealed having vehement support from their mothers. Participant 3 was influenced by a ''strong, independent" mother.

> My mother was always positive though. I definitely didn't hear things like women aren't good at math or science from her because my mom was always a very strong, independent person, and she supported my ideas.

Participant 1 stated that her mother was "influential" and always told her she could "succeed" and that she is "smart".

> My mom was also very influential on me. She… even though she only went to the 6th grade, she always kept telling me you have to work hard. You can work hard and you can succeed and you are smart. You are as smart as any man and you can do what you want to.

Participant 8 spoke about her grandmother. She stated her grandmother was encouraging because she realized "there was something there" that needed to be nurtured.

> She would give me little gifts to show me that I what I had been doing was really good. She realized that I had a learning disability, but she knew there was something there. So she was like I'm going to push her to try to get her there.

Participant 2 was influenced by one of her female instructors who she reported was very "encouraging" and changed her mind about quitting.

> I felt like the students were stereotyping me because I was the only girl, however my instructor was a woman… and she was very good, very encouraging. She used examples that women could relate to and she really changed my mind about quitting. That was a turning point.

Participant 7 stated she has been motivated by "strong women instructors" she has had while in community college, and feels as though they have had a "positive" influence on her performance in her STEM courses. She explained these positive influences have offset the displeasure of negative stereotypes she has been faced with.

> It does help when your instructors are motivating… like I have had some really strong women instructors that have had more of a positive effect on my performance… way more than the negative affects stereotypes have had on my performance.

Experiences of unsuccessful women in STEM. Information gathered from the low/low focus group interview (Appendix H) and from a low-scoring woman in the mixed focus group was used to answer the following question: What are some of the experiences unsuccessful women enrolled in STEM disciplines have had? Women in the

low-scoring group had GPAs less than 2.70 and resilience scores less than 121. Themes revealed by unsuccessful women are discussed in the following paragraphs.

Disconnection from STEM courses. When asked what it was like to be in the minority in a college class, a theme revealed by several participants was a sense as if they were encroaching on their male classmates. Participant 5 used the word "intruder" to describe her feelings and how she had the sense of interrupting her male classmates in a male dominated science class.

> There is just a vibe when you are one of the only women in a class full of men…like you are an intruder.

Participant 6 used the word "invading" to describe how she felt in a male dominated STEM course.

> It's like I'm a woman coming in and invading… and how dare I split up the good ole boys club.

Participants 4, 5, and 6 reported having the feeling that the men in their classes would "look" at them as if they were intruding. Participant 6 stated that the men would "look" at her as if she didn't "belong" which gave her the sense of imposing on their class.

> I look around for a place to sit, and it's just like… the look on some of their faces…like you said they look at you like you don't belong in there. That's how I feel too… sometimes like I don't belong.

Participant 4 admitted the way men would "look" at her made her feel "weird" and as if they didn't want her there.

They look at you like you shouldn't be in the same class with them.

Participant 5 used the word "sneer" to describe the way men would look at her in male dominated courses.

I've definitely felt like I was in the minority in some of my classes. I try not to let it bother me. Generally, I am an open minded person and I can't understand why certain people would treat other people like that. But they do give you funny looks… kind of… sneer I guess.

Participant 9 reported that her male classmates were "sexist" in one of her STEM courses. She admitted this made her feel "left out" and "sad".

Well you do feel left out. And you do feel like… it makes you feel sad. For example, if you are in a group with a lot of men and you have to break into groups… they will always stick together and just kind of leave you out. That is kind of sexist.

Too weak for STEM courses. Another theme reported by low-scoring women was the feeling that men perceive women to be too vulnerable and not resilient enough to be successful in a STEM course or STEM career. Participant 4 used the word "soft" to describe how she believes men perceive women in STEM careers.

Most guys think women are too soft to handle engineering.

The same participant also used the word "weak" to describe how she assumes men to view women in STEM careers.

They are very hard on women, and they think women can't do it. Like, we are too weak, and we need to be stronger.

Participant 5 reported feeling as though one of her male classmates did not think she was "capable enough" or "strong enough" to be successful in a STEM course.

> I guess he felt like I wasn't strong enough, or capable enough to do the work. I was really mad.

Insignificance in STEM courses. Another theme reported by low-scoring women was the idea that men had an elitist attitude about their abilities in STEM fields compared to those of women. Participant 4 used the word "better" to describe how men feel about their proficiencies in STEM courses compared to their female classmates.

> They look at you like you shouldn't be in the same class with them…like they are better than you are… sometimes.

Participant 4 also used the word "better" to describe how her advisor felt about his abilities compared to her own.

> My advisor is smug and thinks he is better than me… I can tell. I'm very disappointed with the advisor I've had.

Participant 4 also used the phrase "looking down on me" to describe actions her male classmates have had toward her.

> I felt like everyone was looking down on me in that class… because I was a woman. If I feel like people are looking down on me, it does affect my performance. I don't like being under that kind of pressure.

Participant 6 also used the phrase "look down on" to describe her perception of how men have treated women in STEM fields.

> Men have always gotten all of the credit… and usually a woman is behind him doing the work…and they still look down on women. That's really frustrating.

Participant 9 also used the phrase "look down on" to describe her perception of how she has been treated by instructors and advisors.

> Most of these people you are talking about… instructors, advisors… it seems as though they are critical of you because you are in community college and they began their college at a university of a four year college. It's like they look down on you or something. I hate that.

Stereotype threat from instructors. Low-scoring women expressed not only feeling as though their male classmates had treated them poorly because they were women, but also discussed their instructors had treated them unfavorably as well. These women expressed how the pressures associated with being ostracized by their instructors made their courses seem more arduous. Participant 4 commented that she felt as though one of her male instructors "didn't want" her to be part of his class, which made it particularly "hard" for her to succeed.

> My main objective is to just pass the class… sometimes it is hard when you feel like your instructor doesn't want you in the class either. That makes it really, really hard.

Participant 4 also stated she felt as though male instructors did not "care" about her aspirations and were "laughing" at her in regard to her abilities in STEM courses.

> They care that I am paying money… and that sort of thing… but they don't really care about my dreams. I feel like sometimes my male teachers are like… laughing at me.

Participant 6 reported that her instructor was "impersonal" with her, but seemed to be more personal with the male students. She also used the word "hard" to describe how being shunned by her male instructor made her feel.

> He was so impersonal, he didn't care. He was impersonal with me, that is…but seemed to be more personal with the other guys in the class. I finally did get a peer tutor, and guess what…my peer tutor was also an insulting type of… male person too. The instructor and the peer tutor had this attitude like… I don't know… like I was so… stupid. That was a hard time.

Participant 6 stated she also felt as though her advisor did not think she was "capable" of the STEM career she was working toward.

> It's like you can try to do a career a step below what you actually want to do because… you're not capable of that step above.

Participant 5 stated she felt as though her instructor's behavior toward her was "not fair" because of her gender.

> It's just like… if you don't give somebody a chance…because of their gender… it's just not fair. The instructor wasn't patient with me either. He didn't ask me any questions to get to know me, or anything like that.

Participant 9 reported that her instructor's behavior toward her was "upsetting" and she felt as though he had "stereotyped" her while being a student in one of his STEM courses.

> My environmental engineering class… it was upsetting. What made it wrong was the instructor didn't help… or associate with the women… he was more like a buddy to the other men. He discriminated against us that way… stereotyped us you could say.

Additional obstacles. Women with low/low scores reported that lack of support from their family members proved to be an additional impediment for a successful experience in some of their STEM courses. Participant 5 accused her brother and father of trying to "pull me down".

> My dad and my brother are at a point in their lives, where they are at their lowest. They called me last night, trying to pull me down.

Participant 5 also commented that her father expressed to her she would not be successful in community college because of her lack of "commitment" and because he felt as though she was "selfish".

> My dad… when I told him I wanted to go to community college, he asked me if I was ready for the commitment… and whatever challenges. He thought I was too selfish… and would never be ready for the challenges.

Not only did Participant 5 report lack of support from her father and brother in regard to her ability to succeed in STEM courses, she also commented that her grandfather felt as though she "couldn't do it".

> My brother thought I couldn't do it… my grandpa even thought I couldn't do it. The men in my family can be so cruel.

Participant 4 also reported uncooperativeness from her father and suggested his contretemps were due to differences in "culture".

> You can't change that really… not in our culture. My dad always tells me you are too pretty to be working so hard, you should just be staying at home.

Participant 6 also stated she felt derision from her father after she shared her hopes of pursing a STEM career with him. He told her that employers would not "hire" a woman to perform labor in a STEM career and suggested for her to modify her career plans.

> From a young age I had a lot of interest in engineering… mechanical engineering. My father told me that no one would hire a woman mechanical engineering… that I needed to go into nursing or something like that.

Participant 9 said her father told her she "wasn't smart enough" to pursue a career in a STEM field.

> He said you know there aren't a lot of female doctors out there. I told him women can be doctors. He said that might be so, but you certainly can't. He said no you can't because you aren't smart enough.

Participant 9 also reported that her late husband was unsupportive of her dream to work in a STEM career field, and admitted he was "mean".

> My husband didn't make things any better for me. He was just as mean as my daddy was… about women working, and having important careers. I would never have signed up for college if he was still alive.

Lack of resilience is a risk factor. Another theme reported by low-scoring women was a lack of resilience to pressures associated with stereotype threat effect. Unlike most of the high-scoring women who used indignations associated with stereotype threat effect as motivation for success, low-scoring women were unable to do so because of lack of resilience. Participant 4 used the phrase "closing myself off" to describe her response to threats.

> They look at you like you shouldn't be in the same class with them… like they are better than you are… sometimes. I cope by closing myself off to them

Participant 4 admitted she "skipped" class frequently and "didn't do well" due to lack of support for an instructor in one of her STEM courses.

> I felt weird about going to class too, and I did skip a lot. I didn't do well in that class… I skipped too much, and I wasn't interested in going because the instructor was not supportive.

Participant 5 expressed her frustrations with a group of men in one of her STEM courses who she believed were stereotyping her. She used the word "struggled" and admitted "it wasn't a good semester" when asked how this affected her performance.

> It wasn't a good semester, I struggled in that class. I didn't do well…I am a hands on learner, and if I don't have the opportunity to be hands on, then I can't

> succeed. I had one of the worst grades ever in that class… that's how it affected my performance.

Participant 6 reported pressures associated with stereotype threat effect were so severe it was "hard to learn and be successful" for her in one of her STEM courses. She ultimately "had to give up on that class, and withdraw" because of her low resilience.

> All I want to comment about that is to say… it is so hard to learn and be successful when you feel like nobody is on your side. I tried to learn on my own, but it was very difficult. I finally had to give up on that class, and withdraw.

Participant 9 also admitted she had to withdraw from one of her STEM courses. She used the phrase "drop out" to describe her action taken.

> My husband had passed… well, I had all that on me and going to school. I couldn't get none of my homework done… nothing like that. So I decided I had to drop out.

Participant 6 also confessed she had to withdraw from one of her STEM courses. This defeat led her to contemplate "quitting college" entirely.

> This put me down for a while. I thought about quitting college… totally quitting at that point. I wanted to hide. It's like the school of hard knocks.

Common stereotypes about women in STEM. Information gathered from interviews conducted with all three focus groups was used to answer the following question: What are some common stereotypes that women are cognizant of regarding the ability of women to succeed in STEM disciplines? Themes revealed from transcription analysis are discussed in the following paragraphs.

Women do not perform well in math. A theme reported by high-scoring women was that women do not perform as well as men do in math classes. Participant 1 from the high/high focus group stated that "math is not for women" and men manage to do better in areas such as "science and math." She recounted that this stereotype regarding the ability for women to be successful in math was embedded in her philosophies early in life.

> That math is not for women. Boys are much smarter in math than women, and also in science. You just always think that boys will be able to do better than girls in those areas; science and math especially. I mean we've heard it all our whole lives, boys are good at math, and girls are good in reading. This happens because we've all heard it in school.

Participant 2 from the high/high focus group described a similar stereotype about women and their ability to succeed in math courses. She testified her stereotype regarding women being poor math students was also "engrained" in her "thought process" at a very young age.

> Yes you're right they tell you… teachers do tell you at a very early age that boys are good at math and girls are good at reading and it's engrained in our thought process.

Participant 3 from the high/high focus group reported the same stereotype concerning success of women in math classes. She also stated having the mindset "stuck" in her head from early in life through her recent college experience by "teachers" and "media".

> I mean you start to think that it's true because that gets stuck in your head and the teachers that you've had keep telling you this, you even read about it in certain media sources it's like the *Charlotte Observer* of something like that. We pretty much understood that boys are good at science and math and girls are not. When you hear it again and again from when you're very young.

Participant 7, a high-scoring woman from the mixed focus group, also described a similar stereotype with respect to women's abilities to succeed in math, by noting women are "bad" at math.

> You always think women are pretty bad at math. I know math is not my strongest subject.

Women do not perform well in science. Another theme discovered was that women do not perform well in science. Participant 7, a high-scoring woman shared her thought that men are mentally sharper than women and attributed this phenomenon to the idea that men have more robust "reasoning skills and problem solving skills".

> And, I think mentally, at times, it seems as though men are stronger in those areas…science, engineering, and math. Their reasoning skills and problem solving skills, I believe at times are greater than women.

Participant 8, also a high-scoring woman felt the same as some of the other participants in the focus groups. She claimed women are "not good at science and math" when compared to men.

> Well you always think that girls are not good at science and math, and guys are good at math and science. I guess to compensate for this I wanted to be good at English…because you always think girls are good at English.

Women do not perform well in engineering. A theme reported by low-scoring women was the stereotype that women do not perform as well as men do in engineering courses. Participant 4 suggested most men assume "women are too soft to handle engineering" and ascribed this thought to cultural ideologies.

> Most guys think women are too soft to handle engineering. Lots of Asian guys do… it's just the way they were brought up. You can't change that really… not in our culture.

Participant 5 also reported women are less successful than men are in engineering courses. She attributed this difference to the idea that men "use their brain in a different way for doing jobs in engineering".

> Yeah, it's a big deal in engineering… I mean you hear about women, their brains don't function the same as men, so they won't be good at engineering.

Participant 6 mentioned her father had told her "no one would hire a woman mechanical engineering". This view led her to believe women are not as successful as men are in engineering courses as well.

> From a young age I had a lot of interest in engineering… mechanical engineering. My father told me that no one would hire a woman mechanical engineering… that I needed to go into nursing or something like that.

Participant 9, a low-scoring woman in the mixed focus group was also under the impression that women are not as efficacious as men are in engineering. She suggested men believe engineering to be a "guy's job".

> That women shouldn't study engineering… it's a guy's job. And that's what men think, it's a guy's job and women can't do that.

How knowledge of stereotypes affected performance. Information gathered from all three focus groups was used to answer the following question: How does knowledge of stereotypes based on gender affect performance of women enrolled in STEM disciplines? Women in all three focus groups reported feeling as though they were being stereotyped based on their gender in some of their college classes. Themes discovered from analysis of transcriptions are discussed in the following paragraphs.

High resilience is a protective factor. Women with high/high scores reacted by effectively functioning under the pressures of being stereotyped, and reported success regardless of the burdens associated with stereotype threat effect. High-scoring women had higher resilience and were able to use this as a protective factor to ameliorate the effects of stereotype threat. Participant 2 described her experience of being stereotyped by one of the male students in one of her college science classes. She confessed that this made her "really mad", but she was able to persist and reported receiving "better" grades than the male student she felt was stereotyping her based on her gender.

> I am being noticed as a girl and all eyes are on me. That made me really mad, which actually made me study really hard. At that point I dug my heels in and I was like if they are going to talk about me, it's not going to be about being one of

> the only girls. No, they are going to talk about me because I'm doing better than them in this class.

Participant 1 described a similar experience in several of her college classes. Like Participant 2, participant 1 was able to persevere under pressures created by stereotype threat effect to successfully complete her courses by using this pressure as motivation to thrive. She stated explicitly that she feels as though she "has been stereotyped in most" of her college classes "by the students". Even with stereotyping perceptible, she was able to not allow this knowledge to "upset" her. She stated she did not "care what the majority" thought of her, rather she used this as incentive to succeed and "to do it even better" than the male students.

> I feel I have been stereotyped in most of my classes for my program… by the students. And I've just decided instead of letting it upset me that… men in any of these classes… physics classes, in any of the chemistry classes, calculus classes… whatever, I don't care what the majority thinks. Because I am as good as everyone else and I can. I'm going to do it and I'm going to do it even better.

Participant 2 used an incident that occurred in one of her math classes to answer this question. She confessed it made her "get a little angry" and this "affected" her "performance because" a male student kept "second guessing" her. This, consequently made her "second guess" herself. Ultimately, the burdens associated with stereotype threat effect created a response wherein she became a more punctilious student.

> Sometimes I would get a little angry and I did have to keep my attitude in check … but it was really hard. This affected my performance because he was second

> guessing me… I started to second guess myself. I was a little slower to derive answers because I definitely wanted to be correct… so I would work them multiple times just to make sure.

Participant 8 also reported she used anger to drive her to triumph under the negative effects of being stereotyped. She stated that she was "so mad that it drove" her to succeed.

> I wanted to show them that I could actually do better than them, and I think the man that made fun of women, the one that said women should be at home taking care of children, I think he made me so mad that it drove me to do really well.

Participant 7 made an analogy between how the knowledge of being stereotyped has affected her performance to an endurance race filled with "obstacles" to overcome. Like a long distance race, she stated, "you have to be tough to get through it."

> Have you ever heard of the Spartan Race? Well it's a race, and people run in it. But you have to get through several obstacles. That race makes me think of how those stereotypes have affected my performance. You have to be tough to get through it… that makes you better.

Lack of resilience is a risk factor. Unlike high-scoring women who were resilient enough to negate the effects of stereotype threat, low-scoring women were less resilient and confessed that stereotype threat negatively impacted their performance in STEM courses. Their lack of resilience was therefore a risk factor and was not used to ameliorate the effects of stereotype threat. Participant 4 reported her performance in an

engineering course was “horrible” “under the kind of pressure” associated with stereotype threat effect.

> I skipped too much, and I wasn’t interested in going because the instructor was not supportive. It was horrible. I felt like everyone was looking down on me in that class… because I was a woman. If I feel like people are looking down on me, it does affect my performance. I don’t like being under that kind of pressure.

Participant 5 admitted she “had one of the worst grades ever” in a STEM course when felt like she was being stereotyped. She also reported this type of behavior positioned against her was “just not fair”.

> I had one of the worst grades ever in that class… that’s how it affected my performance.

Participant 6 stated “it was a very sexist thing” she went through in one of her STEM courses. For her, the burdens of stereotype threat effect proved to be exceedingly difficult to endure and she confessed she “finally had to give up on that class, and withdraw”.

> It was a very sexist thing that I went through… I do believe. I basically had to just watch and go through a lot of negative things. All I want to comment about that is to say…it is so hard to learn and be successful when you feel like nobody is on your side. I tried to learn on my own, but it was very difficult. I finally had to give up on that class, and withdraw.

Participant 9, a low-scoring woman in the mixed focus group believed an instructor in one of her STEM courses disliked her because she “was a woman”. Like the

aforementioned women in the low-scoring focus group, Participant 9 also submitted to the pressures associated with stereotype threat effect and decided she "had to drop that class", due to lack of resilience.

> I could tell he didn't like me… I guess because I was a woman… I know he didn't think I was smart enough. Well, I had to drop that class or I would have had an F on my transcript.

Influence of stereotype threat on career goals. Information obtained from focus group interviews was used to answer the following question: How does knowledge of stereotypes based on gender influence career goals of women enrolled in STEM disciplines? Women in all three focus groups reported that stereotypes have had some influence on their career goals.

Influence of stereotype threat on career goals of resilient women. Because of the negative influences placed on them by stereotype threat effect, some women with high/high scores did describe their circumstances of nearly being persuaded to not pursue an AS degree. Both participants 1 and 3 started non-AS degree programs when they first enrolled in community college. Eventually, both decided to pursue their aspirations by actively declaring themselves as AS majors. Participant 3 confessed that she "was afraid of all the math classes" she "had to take for the AS degree", but" got over it", and now enjoys most of her classes.

> When I first started here I actually wanted to do paralegal because I was afraid of all the math classes I had to take for the AS degree. I thought well, that is way

> too much math for me. So yes at the beginning it did … I thought I should go for paralegal. It did take me about half of a semester and then I got over it.

Participant 1 also admitted being "afraid to do that much math" and additionally of completing "a science sequence like physics or chemistry" that also require students to "use a lot of math." Ultimately her impetus to declare herself as an AS major was because she felt "unhappy" as an AA major.

> I started in business… also because of the math requirements for the Associate in Science degree. I was just afraid to do that much math, you also have to do a science sequence like physics or chemistry where you use a lot of math too. But I was unhappy in my businesses classes.

Participant 2 acknowledged being "very intimated at all of the math classes" required to attain an AS degree. She also admitted that an AA degree "seemed way easier than an AS degree", and the additional required laboratory hours for an AS degree "was not appealing" to her. Ultimately she decided to stay on "the AS path" to pursue a career she will "enjoy".

> When I first enrolled in _____I thought about going the AA route because the list of courses in the catalog seemed way easier than an AS degree. I was very intimidated at all of the math classes too. I was not looking forward to all of the extra time I would spend in the labs that go along with the classes either. That was not appealing. I was afraid the AS degree would take a lot more effort, and that was my main reason for considering an AS degree … but then I thought about what I enjoy and what kind of career I wanted, so I stuck to the AS path.

Participant 7 also felt as though an AS degree program was too difficult to attain because of the math requirements. Like several of the other women, she began in an AA degree program and eventually changed to an AS degree. She felt as though some of her classes required for an AA degree program were "easy" and made her "bored".

> Yes, at first, I decided on the Medical Assisting program. My first semester I took developmental math, and some of the medical assisting classes, and they were so easy, and I was so bored… I just knew after that semester I had to go with an AS.

Participant 8 reported she has been in an AS degree program upon first enrolling in community college, but admits she was "scared" when she became aware of the considerable amount of science and math classes required for an AS degree.

> I have been an AS major from the beginning. I will tell you, honestly… honestly, I was very scared when I looked in the catalog and saw all of the science and math classes required for the degree.

Influence of stereotype threat on career goals of women with low resilience. Participant 4, a low-scoring woman admitted she has thought about changing her program of study because she reported "an AS degree isn't right for me" especially "the concentration in engineering isn't right for me". She has considered this proposal because she has had "no support from my teachers" and other individuals in her life.

> When I first started I thought I knew exactly what I wanted to do…but now after taking some of my major classes, I feel like an AS degree isn't right for me…or just the concentration in engineering isn't right for me. I have no support from

> my teachers… I have no support from my family… I have no support from my advisor.

Participant 5, also a low-scoring woman, confessed she "had changed my major to AA". She attributed this decision to the heavy "math requirements" needed to complete an AS degree. She reported she had changed back to an AS degree program of study but admitted "it will take me longer to graduate" than it would have if she had remained an AA major.

> I am frustrated with my math skills, and it does make me feel limited… if anything. And, to add to that I had changed my major to AA, an art major once before, but did change it back. I changed my major once because of the math requirements. I've recently changed back, but it will take me longer to graduate than it would have if I would have continued as an art major.

Participant 6 stated she had enrolled in two community colleges previously, and upon enrollment in her current education institution declared herself as an AS major. As far as her decision to remain in a STEM career, she stated "we don't even know what's out there", and admitted a strong curiosity for discovering alternative opportunities.

> And for women… there are a lot of opportunities to do many different careers… but we don't even know what's out there. We don't even know what there is, and I'm questioning… why is that?

Participant 9 had aspirations of becoming a doctor but decided to pursue "what I thought I could possibly do" as a sensible alternative.

> I just went with what I thought I could possibly do. It does hurt. I wish I could use it as motivation, but it created a lot of doubt… about my abilities.

Suggested strategies to ameliorate stereotype threat effect. Information collected from interviews of all three focus groups was used to answer the following question: What are the strategies suggested by women enrolled in STEM disciplines that instructors, advisors, and counselors could enact to ameliorate stereotype threat effect?

Instructors and advisors should be more positive. Although most of the women with high/high scores reported stereotype threat has not encumbered their pursuit of certain career paths, nonetheless they provided strategies to prevent this from happening to other less resilient students. One of the themes high-scoring women addressed what advisors could do to ameliorate the effects of stereotype threat effect on female students was to remain positive with their interactions with new female students in AS degree programs. Participant 1 reported that her academic advisor focused on "how hard it was going to be" for her. She recommended advisors "should be more optimistic when they meet with you". Her advisor caused her to be "very worried" about completing her AS degree.

> I think advisors should be more… optimistic when they meet with you. I mean it's okay to warn somebody about how hard the classes will be, but follow it up with something positive… like it's very hard but you're going to be able to do it. He just made it sound like it's very hard and I really doubt that you're going to be able to do it. He didn't say that, but that's just how our conversation made me feel… very worried.

Participant 3, a high-scoring woman revealed having a similar interaction with her advisor. She advocates "advisors could be more positive and don't dwell on how difficult" it will be for students. She goes so far as to declare feeling as though her advisor was "stereotyping" her.

> So they are really stereotyping by some of their comments that they make and they don't even realize it. Advisors could be more positive and don't dwell on how difficult it will be for me.

Participant 2, also a high-scoring woman shared a solution parallel to Participants 1 and 3. Participant 2 suggested for "advisors to put aside your negativity" and to show "more respect for" advisees, affirming if "advisors are positive then you are more likely to be positive".

> I would also say for advisors put aside your negativity. There needs to be more respect for the person… and then that will give them an internal respect for themselves. If your advisors are positive then you are more likely to be positive.

Participant 7, a high-scoring woman also mentioned advisors need to make "positive comments" to students and should not "criticize" students. She also made a recommendation for advisors to "really listen" to students and to be more encouraging.

> I would tell them to acknowledge more positive comments made to students…and negative criticism is irrelevant. Advisors need to really listen to what students are saying they want to do with their lives, and not to criticize their plans or goals.

Participant 9, a low-scoring woman in the mixed group, had the impression her advisor was very negative in regard to her educational aspirations as well. She expressed her advisor "was worried" about her success and has provided inauspicious advice to her.

> I feel like my advisor has convinced me one too many times to take less hours than I thought I should have been taking because he was worried.

Instructors and advisors should increase communication. Participant 8, a high-scoring woman suggested advisors and counselors ask more detailed questions of women in an attempt to uncover instances in which they had been stereotyped. She claimed "there is no real interaction made between student and advisor" and stressed the need for greater "communication" between students and advisors.

> When counseling, they should ask if students are doing what they want to do, or is something pushing you back from doing this? Advisors and counselors could be more motivating by asking more questions about how women students are feeling or being treated. There is no real interaction made between student and advisor. Some people just need the communication to see they can go further than they think they can.

Participant 4, a low-scoring woman suggested advisors need to "listen" to students, establish personal relationships with advisees, and "there needs to be an open line of communication between students and advisors".

> They need to listen to us… and we need to tell them things like what we want. There needs to be an open line of communication between students and advisors.

> I mean I see my advisor a couple of times a year… we don't really know each other. I don't think he would know me outside of his office.

Instructors and advisors should be more supportive. Another theme revealed through analysis of interview transcriptions was that instructors and advisors should be more supportive of female students' aspirations and goals. Participant 4, a low-scoring woman suggested STEM advisors should be "supportive and open minded" when advising female students.

> I guess that what advisors need to do is to be more open minded. Because it's a new generation, women are able to do new things and different things… a woman doesn't simply have to be an assistant to a man anymore. They should be more supportive and open minded to things.

Participant 5, a low-scoring woman reported her advisor presented a negative standpoint to her as well. She felt as though she was being "judged" by him and felt as though he didn't think she was "capable of taking certain classes" because of his disapproving attitude. If her advisor had been more encouraging she would have, in turn, had more of a progressive approach with respect to her success in STEM courses.

> I feel like I'm being judged a lot by my advisor when I meet with him. He doesn't give me the attitude that he thinks I'm capable of taking certain classes…and he basically tells me that.

Participant 6, a low-scoring woman suggested advisors "need to be more knowledgeable about the different degree programs within their college, but also outside of their college" in regard to resources available for female advisees in STEM disciplines.

> They need to be more knowledgeable about the different degree programs within their college, but also outside of their college would be very helpful.

Instructors and advisors should build relationships. Another theme shared was that STEM instructors could curtail stresses associated with stereotype threat effect by simply developing rapport with students. Participant 3, a high-scoring woman suggested that STEM instructors should "build a relationship" with students and to be "more encouraging."

> I think science and math instructors should also provide positive encouragement. Like, help to try and build a relationship with your students… just be more … encouraging.

Participant 2, a high-scoring woman reported that STEM "instructors need to build a relationship" with students, be "encouraging" when interacting with students, and to "care" about their students.

> I also think this goes along with being encouraging, but more specifically instructors need to act like they care. I went to my instructor for help, because I couldn't access the homework. He totally flipped me off like he didn't care. It's like you said, instructors need to build a relationship… act like you care.

Participant 1, also a high-scoring woman reported that STEM instructors should to be more "approachable" and not convey a perception of being "too important" or "too busy" to encourage building connections with students.

> Instructors need to be more approachable. It's almost like they are too important to talk with their students beyond the boundaries of the classroom. They always seem to be too busy, or think they are too important.

Participant 4, a low-scoring woman suggested that STEM instructors need to "actually spend some time" with their female students to build effectual relationships. She reported an instructor felt "bothered" by her when she approached him for additional help in a STEM course.

> My teacher needs to actually spend some time with me… getting to know me… what I want to do. It's almost like I am bothering him. I try to go into his office with my questions ready… he acts bothered when I explain to him that I have to miss class.

Participant 5, also a low-scoring woman, accused STEM advisors of showing "favor" to male students. She suggested all advisors should "stick to certain standards" and advise all students consistently and efficaciously.

> I know they favor certain kids… guys. I wish they would all stick to certain standards… stick to the rules. Everybody needs to know the rules and they need to stick to the rules. Not play favorites with certain people.

Instructors and advisors should help students establish relationships with successful women in STEM. Another theme revealed through analysis of transcriptions was that instructors and advisors should help students establish relationships with successful women in STEM fields. Participant 8, a high-scoring woman suggested for female instructors in STEM courses to build relationships with female students. She

described this would be a “powerful” way to help women who might be burdened by stereotype threat effect.

> Women instructors could tell women students not to listen to other people, or the negative stereotypes, but do what you want to do in life. This would be a powerful way to influence women who might be discouraged by these stereotypes.

Participant 7, a high-scoring woman also suggested for female instructors to build relationships with women students by trying to “communicate” with them. By sharing their stories, female students would realize women instructors may have had “similar” experiences to their own. In turn this could be a way to “encourage” women to remain in a STEM discipline regardless of stereotype threat effect; or as a means to be “inspired” by their “success”.

> You’re right, because women like to communicate with other women. And, just sitting there and talking to someone, instructors could figure out that they want to do this, which is similar to me, so I could encourage them by telling them about my experiences. For example one of my instructors that is a women shared with us at the beginning of the semester some of her personal experiences and what she had done before teaching… and that inspired me to push further.

Participant 5, a low-scoring woman suggested for community college leaders to host “women in science day” on campus. She proclaimed “hearing the stories of other women could be inspirational and motivate women to stay in the sciences”.

> They need to have some sort of… session… I don't know… not really a lecture… women in science day or something. They need to have something where successful women come to campus to share their stories and their experiences. Hearing the stories of other women could be inspirational and motivate women to stay in the sciences. Knowing that other women have been through some similar situations as me, could be very encouraging for me… it would help me.

Participants 2 and 3, both high-scoring women reported they would rather have female instructors for their STEM courses. Participant 2 stated having a preference for female instructors in her STEM courses.

> I like to take have female instructors for science… for all my classes. They use examples that we can relate to… I prefer taking classes from female instructors.

Participant 3, a high-scoring woman also prefers female instructors because she "can identify with" and feels they are "sympathetic to family issues" are more "understanding" of commitments that require her to miss class time.

> I would also rather take classes that have female instructors… I can identify with. I prefer taking classes from female instructors as far as all the science, engineering and math classes. They are more… ah sympathetic to family issues, or being absent because of children or family. They are just more, understanding.

Instructors should use learning paradigms women can identify with. An additional theme discovered was the proposal for STEM instructors to utilize more learning paradigms women are able to associate with. Participant 2, a high-scoring woman made the proposal for STEM instructors "to use more examples that females can

identify with". She further explained, on the occasion her instructor did use an example she could identify with enabled her to be "more connected" with the imparted information.

> I would tell the instructors to use more examples that females can identify with. The one thing that I remember from my biology class… you know some of the information I've totally forgot, but something that really sticks out in my mind was the story about Rosalind Franklin. It was just really touching… her story. I did further reading on her, and it just got me more interested in the topic of DNA… and when we were talking about it in class I really felt more interested in it… more connected to what we were learning.

Participant 3, a high-scoring woman shared a comparable recommendation for STEM instructors to "use more examples" that women "actually care about" and are "interested in", not purely "examples that only men" are interested in.

> I would tell the instructor do the same for me… use more examples that I actually care about or am interested in. Our instructor used examples that only men would care about. Umm… like trying to explain trajectories with guns… or vectors with cars… and I couldn't picture anything in my mind about any of it.

Participant 2, also a high-scoring woman reported being inspired by information presented to her by a STEM instructor regarding contributions women have made to scientific knowledge. Participant 2 stated that hearing features of "personal" accounts from women involved in scientific pursuit allowed her to "care more about" science.

> …my instructor went into a big discussion about… Henrietta Lacks. She was a minority woman and just talking about her life… seeing pictures of her…even though aspects of her personal life aren't scientific… it just helped you to relate to the topic and you can care more about it.

Community colleges should offer same sex STEM courses. Another theme expressed was the idea of offering STEM courses separated by gender. Participant 2, a high-scoring woman reported that she would feel less "threatened" and less "isolated" in an all-female class, and believes she would feel more "comfortable" as well.

> I would absolutely love to take sciences and math classes… well all classes we have mentioned… technology and engineering with only female students. You would have small study groups that you could feel comfortable in.

Participant 9, a low-scoring woman confessed her abhorrence for being in STEM courses with high school males. She suggested separating high school students from adult college students in STEM courses. She felt as though she was stereotyped by male high school students because of her gender and her age. She confessed this made "things a lot more difficult", and noted she would have had a more pleasurable experience by "not mixing high school students with older college students" in her STEM courses.

> It just creates an atmosphere… that's just not fun. I would suggest not mixing high school students with older college students, like myself. It makes things a lot more difficult, in terms of dealing with stereotypes and that sort of thing.

Build resilience of women in STEM. Lastly, a theme shared by Participants 1, 2 and 3, all high-scoring women, was the concept of enhancing or developing heightened

resilience of women enrolled in STEM courses. Participant 3 suggested providing "opportunities or classes" to students on how to "build resistance".

> …counselors could provide opportunities or classes on how students could build resistance…um I mean resilience. I don't know maybe… or do some activities in a theater class or psychology class… ways to practice skills for resilience.

Participant 1 recommended offering "more strategies" for developing resilience.

> Give us more strategies so that we won't give up… you know I did almost give up several times… I didn't know if I was strong enough to continue… I agree we need to learn or be taught how to be more resilient.

Participant 2 suggested the concept of establishing a "support group" for women in STEM to assist with "overcoming some of the barriers" placed on them by stereotype threat effect.

> Maybe we could start a STEM support group… where we share our strategies for overcoming some of the barriers we have faced. This would be great for girls that have just started… but also good for women who might be coming back to college.

Conclusion

This chapter is a synopsis of both quantitative and qualitative data that were collected in relation to the study's overarching research question and subquestions. Research questions and subquestions were designed to determine: (1) whether high resilience is positively correlated to high grade point average for women enrolled in

STEM disciplines in rural community colleges in North Carolina, (2) if stereotype threat effect is a risk factor for these women.

Quantitative data indicate high resilience is positively correlated to high grade point average for participants enrolled in STEM disciplines in rural community colleges in North Carolina, and stereotype threat effect presents a higher risk factor for low-scoring women because of their lack of resilience, than it did for high-scoring women. Collected data focus on information obtained from Datatel, information from participants' replies to "The Resilience Scale" and to participants' lived experiences in STEM courses. Participants chosen for focus group interviews provided a wealth of qualitative data showing that they are aware of stereotypes in regard to their ability to succeed in STEM courses. Overall, findings reveal participants are affected by stereotype threat effect, however, low-scoring participants are negatively impacted by stereotype threat effect and high-scoring women are able to use pressures associated with stereotype threat effect as motivation for success.

CHAPTER FIVE: DISCUSSION

This chapter will synthesize the model of the research design, the findings of the study, and will provide a discussion of how these findings might have implications for future practice and research. In addition, it will synopsize the study's strengths and weaknesses, and will include recommendations for next steps related to empirical study of factors that promote success of women in STEM disciplines.

The purpose of this study was to determine success factors for women enrolled in STEM disciplines in rural community colleges in North Carolina. The study specifically sought to determine if low resilience factors are barriers to success and if stereotype threat effect additionally impedes success of these women. This study included quantitative data collected from Datatel for 160 women enrolled in STEM disciplines in four rural community colleges and their responses to "The Resilience Scale". This study also investigated the lived experiences of nine of these women enrolled in STEM disciplines. From detailed analysis of focus group interviews, it described, from the viewpoint of these nine participants, the challenges associated with being the minority in male dominated disciplines. Furthermore, this study described the common stereotypes women are cognizant of in regard to their position in STEM disciplines and how knowledge of these stereotypes have affected their performance in STEM courses and how, if at all these stereotypes have influenced their career goals. Finally, it probed strategies suggested by the nine participants that instructors, advisors, and counselors could utilize in an effort to ameliorate stereotype threat effect.

This chapter discusses the study's findings, with focus on the study's overarching research questions (a) Is high resilience positively correlated to high grade point average for women enrolled in STEM disciplines in rural community colleges in North Carolina, and (b) Is stereotype threat a risk factor for women who are enrolled in STEM disciplines in these community colleges, as well as the following subquestions:

1. What are some of the experiences successful women enrolled in STEM disciplines have had?
2. What are some of the experiences unsuccessful women enrolled in STEM disciplines have had?
3. What are some common stereotypes women are cognizant of regarding the ability of women to succeed in STEM disciplines?
4. How does knowledge of stereotypes based on gender affect performance of women enrolled in STEM disciplines?
5. How does knowledge of stereotypes based on gender influence career goals of women enrolled in STEM disciplines?
6. What are the strategies suggested by women enrolled in STEM disciplines that instructors, advisors, and counselors could enact to ameliorate stereotype threat effect?

This study's findings were determined through analysis of data that were collected in relation to the study's predominant research questions and subquestions. For the purpose of trustworthiness, it was important that all participants had certain similar

characteristics, so that interviews would accurately embody the experiences of women enrolled in STEM disciplines. It was a requirement that each participant:

1. Had enrolled in one of four rural community colleges chosen for the study that were located in the foothills of the Appalachian Mountains.
2. Had declared their program of study to be one included within an AS degree program at one of the four community colleges.
3. Had completed or had enrolled in at least 30 semester credit hours at one of the four community colleges.
4. Had completed "The Resilience Scale", and had provided contact information for the researcher.

The main justification for setting these parameters were so that collected data would represent women participants that had (a) significant involvement in STEM courses within a rural community college setting and could share their lived experiences and (b) submitted responses to "The Resilience Scale" so as to compare their grade point average to resilience score in regression analysis. Part of the rationale was that such participants would likely have a grasp on whether or not they had experienced stereotypes in STEM courses, and if so, how they had managed these labels.

Model of Research Design

Figure 2 is a model of the research design used in this study. The quantitative data collected in this study was done so in the reverse order from the conceptual model outlined in chapter 2. The researcher began by looking at performance, represented by GPA. A high GPA indicated no performance impairment, and a low GPA indicated

performance impairment. The researcher then measured resilience of the participants using "The Resilience Scale". GPA and resilience were then plotted to show a positive correlation between the two variables. Qualitative data was than collected from focus group interviews. Interviews indicated that both groups were aware of stereotypes about women in STEM and that both groups considered this a stressor in their STEM courses. Quantitative data was then used to enhance qualitative data. By using information obtained from both quantitative and qualitative research methods, the researcher made the conclusion that women with high resilience were able to use this as a protective factor to ameliorate the negative effects of stereotype threat and that low resilience was a risk factor for unsuccessful women as they were unable to moderate the effects of stereotype threat.

Results of "The Resilience Scale"

Upon investigation of Datatel information women students included in this study were asked to complete "The Resilience Scale". Grade point average of participants versus resilience scores were plotted on a scatter plot. Regression analysis showed a positive correlation between grade point average and resilience with an R^2 value of 0.3229. Therefore, according to these results from the 160 respondents in this study, women who were more resilient had higher grade point averages and women who were less resilient had lower grade point averages. Slightly more than 32 percent of the proportion of variation in grade point average can be attributed to resilience score. Based on data collected from focus group interviews, stereotype threat effect was a risk factor for less resilient women and could possibly be one of many factors to account for the

other 68 percent of variation in grade point average not explained by resilience scores alone.

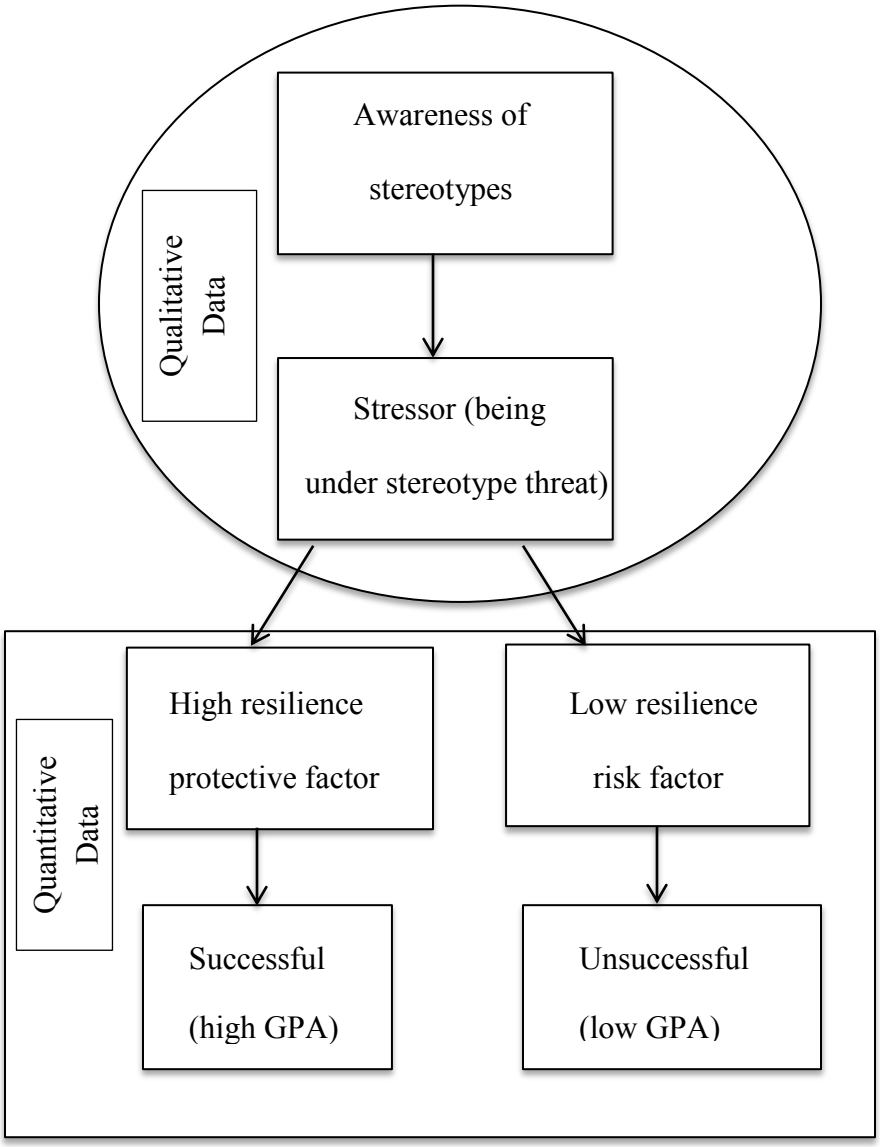

Figure 3. Model of research design used in this study.

An early qualitative study by Wagnild and Young (1990) sought to understand why some women adjusted successfully to adversity, while others became defeated. Wagnild and Young (1990) conducted interviews with 24 well-adapted women who exhibited a high level of morale and were fully engaged in their lives despite having experienced a recent and major loss (e.g., loss of a spouse, health, or employment). The researchers identified five essential characteristics underlying their successful adaptation constituting the core construct of resilience. The five characteristics were Purpose, Equanimity, Self-Reliance, Perseverance, and Existential Aloneness. These are considered the "resilience core" and strengthening the core will enable a person to exhibit a very healthy resilience response to adversity (Wagnild, 2009). The stronger the core, the healthier one's response is to adversity and setbacks (Wagnild, 2003).

Wagnild (2003) categorizes results of "The Resilience Scale" into high (147-182), medium (121-146), and low (less than 121) levels of resilience. Participants 1, 2, 3, 7, & 8, had resilience scores of 149, 148, 147, 155, and 170 respectively. High-scoring women have a healthier "resilience core". The stronger the core, the healthier one's response is to adversity and setbacks (Wagnild, 2003). High resilience scores indicate that a person has a positive view of their own value, of their capabilities, and their self-worth; that a person has positive expectations about how things will turn out; that a person has a strong sense of purpose, that they are able to focus effectively and act appropriately in most situations and that they make clear decisions that enable them to achieve their goals; that a person believes their style to be systematic, precise and efficient without being overly fussy or pedantic; that a person sees themselves as open

and non-defensive which allows them to be generous, welcoming and forgiving towards others; and that they have a strong underlying confidence and belief in themselves (Childs, Gosling, & Parkinson, 2011).

Participants 4, 5, 6, & 9 considered to be low-scoring women because they reported resilience scores less than 121. Low-scoring women did not have a robust "resilience core". Low resilience scores indicate the following: that a person may not currently see themselves in such a positive way; that a person has a more pessimistic view of things and may expect things not to turn out as well as they might hope; that a person has a less clearly defined sense of purpose and may be more easily distracted, making it difficult for them to maintain their motivation and achieve their goals; that a person has a tendency to react spontaneously but that this may result in losing control or becoming disorganized; that a person sees themselves as defensive and perhaps suspicious and prone to blaming others; and they have a more negative view of themselves (Childs, Gosling, & Parkinson, 2011).

Sense of purpose in life. Statement number six, "I feel proud I have accomplished things in my life," received the highest score by the participants. The sum of all 160 scores for statement six was 992 with a mean resilience score of 6.2. Statement six addresses the concept of purpose. According to Wagnild, 2003

> To have a purposeful life is to have a life full of meaning and direction. It may be the most important characteristic of resilience because it provides the foundation for the other four characteristics.

A score of 6.2 indicated a response between 7, “strongly agree” and 6, “agree”. The mean score of statement six for the four low-scoring women in the focus groups was 3.5. A score of 3.5 revealed a response between 4, “neither agree nor disagree”, and 3, “slightly disagree”. The major theme determined from data collected on statement six was that women who were more resilient felt as though their lives had purpose and meaning, and women who were less resilient tended to consider their lives purposeless and meaningless. Resilient women with purposeful lives have learned to derive meaning from their experiences (Wagnild, 2003). Major adversities, such as stereotype threat effect, were transformed into opportunities for personal growth and life satisfaction for resilient women (Wagnild, 2003). Less resilient women have not learned to lead purposeful lives, so hardships, such as those associated with stereotype threat effect were risk factors for these women.

Equanimity in life. Statement number 22, “I do not dwell on things that I can't do anything about,” received the lowest score by the participants. The sum of all 160 scores for statement 22 was 661 with a mean resilience score of 4.0. Statement 22 addresses the concept of equanimity. According to Wagnild, 2003

> To live with equanimity is to have a sense of balance and harmony. Resilient people have learned to avoid extreme responses to stress and adversity and “sit loose in the saddle.”

The mean score of statement 22 for the five high-scoring women in the focus groups was 5.0. The mean score of statement 22 for the four low-scoring women in the focus groups was 2.0. A score of 5 correlated to the response, “slightly agree”. A mean score of 2.0

correlated to the response, “disagree”. The major theme determined from data collected on statement 22 was that women who were more resilient were able to calm their emotions when dealing with problems or pressures. Resilient women with equanimity have learned to draw on their own and others’ experiences and wisdom to use this to guide their responses (Wagnild, 2003). Less resilient women have not learned this skill. Therefore, less resilient women presented a state of psychological instability and lack of composure when exposed to emotions, pain, or other phenomena, such as stereotype threat effect (Wagnild, 1999). Based on results from “The Resilience Scale”, lack of equanimity was also a risk factor for women with low resilience.

Overall, findings from this study in regard to quantitative data collected from Datatel files and resilience scores generated from “The Resilience Scale” indicated a positive correlation between grade point average and resilience scores. Resilient women have higher grade point averages in STEM courses and believe their lives have purpose and equanimity. Less resilient women have lower grade point averages in STEM courses and feel as though their lives are meaningless and unbalanced.

Results of Focus Group Interviews

This synthesis will synopsize the major themes that collected data from small focus group interviews revealed in relation to stereotype threat effect and the influences it had on participants’ experiences in STEM courses.

Common stereotypes regarding the ability of women to succeed in STEM. When women perform in STEM courses, unlike men, they risk being judged by the negative stereotype that women have weaker abilities (Spencer, et al., 1999). This

apprehension, often attributed to the effects of negative gender-based stereotypes may disrupt women's performance in STEM courses (Reuben, Sapienza, & Zingales, 2014). Participants reported knowledge of stereotypes when asked the question "What are some common stereotypes about women, as far as their ability to succeed in science, technology, engineering, and math classes?" High-achieving participants reported they were aware of the common stereotype that women do not perform as well in math as men do. Low-achieving participants reported they were aware of the common stereotype that women do not perform as well in engineering courses as men do.

Gunderson, Ramirez, Levine, and Beilock (2011) detail how negative stereotypes about women's math abilities are transmitted to girls by their parents and teachers, ultimately undermining performance and interest in STEM fields. High-achieving participants recounted this stereotype was embedded in their philosophies at a young age from parents, teachers, and social media, thus shaping their attitudes about math courses.

According to stereotype threat research, broad situational cues can communicate gender-relevant attitudes in engineering. Specifically, the transfer of gender-related attitudes to women can put them at risk for self-as-source stereotype threats, stereotype threats rooted in the concern that a performance could confirm in one's own mind that the stereotypes are indeed true of oneself or the group (Shapiro & Williams, 2011). Low-scoring women in this study described how pressures placed on them by male classmates and male instructors, interpreted as stereotype threat, negatively impacted performance in engineering courses. Some participants were so discouraged by these situational cues exhibited by male classmates and instructors that they felt obligated to drop out of some

of their engineering classes. Low-scoring women were so dissuaded by these negative experiences they decided against pursuing an AS degree with a concentration in engineering in favor on an AS degree with a focus in general science.

Stereotype threat was likely to have emerged during every day experiences' of participants. Inzlicht and Ben-Zeev (2000) found that the performance decrements associated with stereotype threat arise when a women takes a test in a room with two male test-takers rather than two other women. Davies, Spencer, and Steele (2005) found similar reductions in text performance among women who, before taking a difficult test, are asked to watch television commercials that depict women in a trivializing way.

Knowledge of gender based stereotypes influence on career goals. Accumulating experimental evidence suggests that the experience of stereotype threat effect contributes to women's lowered success in STEM courses (Guiso, Sapienza, & Zingales, 2006; Hyde & Mertz, 2009), and can lead to a reduction in the number of women choosing to specialize in these fields (Spencer, et al., 1999). Women in all three focus groups reported stereotypes have had some influence on their career goals. Because of the negative influences placed on them by stereotype threat effect, some high-scoring women described circumstances of nearly being persuaded to not pursue an AS degree, and did admit to being frightened by the considerable amount of math courses required for their AS degree programs of study. However, high-scoring women were resilient enough to maintain their original intentions of AS degree pursuit and had not yet abandoned their primary STEM career goals during time of interview. Low-scoring women were not as resilient and reported deviating from their original STEM career

goals. The overall trend reported by low-achieving was that they modified their original plans by changing from a concentration in a specific subset of STEM, for example engineering, to an AS degree with a more general focus on science. Findings from this study help to illuminate the reach of gender-related stereotypes and their role in undermining women's interest and performance in STEM domains. Specifically, considering the phenomenon of stereotype threat can lead to an understanding of how stereotypes can undermine women's performance and interest in STEM careers.

Suggested strategies to ameliorate stereotype threat effect. The value of an effective academic advisor or counselor is irreplaceable (Wang, 2012). Student interaction with faculty and academic advisors positively influences numerous student outcomes (Astin, 1993; Chang, 2005; Lamport, 1993; Terenzini, Pascarella, & Blimling, 1999). One of the common themes participants affirmed advisors could do to ameliorate the effects of stereotype threat effect on female students was to remain positive with their interactions with new female students when advising in AS degree programs. Another theme revealed by participants was for advisors and counselors to establish open lines of communication between students, and to really listen and be responsive to students' academic plans and career aspirations. Participants also suggested advisors should advise all students consistently and efficaciously and to not present themselves with a condescending manner or superior attitude, but rather be supportive and respectful. And finally, participants recommended for advisors to increase their knowledge in regard to AS degree programs within and outside of their community colleges. Teaming with an effective advisor is a strategy that can bring huge benefits, especially to women in

unbalanced disciplines like STEM (Ganapathy, Olson, Davis, Fraser, Kantor, Fimbres, Robinson, Babb, & Gerstain, 2014). Given the focus of this study, such interactions may provide necessary support for women to confirm their choice of major field of study within a STEM discipline.

The type of experiences students have with their instructors in STEM classes may play a large role in who decides to remain and who leaves STEM (Cleaves, 2005; Munro & Elsom, 2000; Oakes, 1990; Ware, Steckler, & Leserman, 1985); however, these studies shed little light on what classroom experiences impact student persistence. Participants in this study suggested that STEM instructors could curtail stresses associated with stereotype threat effect. One of the common themes uncovered by small focus group interviews was for instructors to develop effectual rapport with students. Participants stressed instructors need to be more approachable and take time out of their busy schedules to listen to women students and to address struggles they may have encountered in the classroom. Participants also recommended instructors should stay connected to women's interests. Participants urged STEM instructors to use classroom examples that women could relate to and identify with. A study performed by Maltese and Tai (2011) examined nearly 5,000 students from a nationally representative longitudinal data set that tracked students through college and found that positive classroom experiences, such as relating the content to students' lives, were strongly associated with the completion of a college degree in STEM.

Proponents of single-sex education argue that it improves learning and performance by allowing a better match for teaching and learning (Eisenkopf, Hessami,

Fischbacher, & Ursprung, 2011). That is, as with other forms of homogenous grouping, establishing separate classes for men and women are seen as enabling teaching and learning and reducing achievement gaps in STEM (Park, Behrman & Choi, 2013). Participants in this study expressed their desire for separating STEM courses by gender and reported they would feel less threatened, less isolated, and more comfortable in all-female courses. Not only did the participants in this study suggest offering single-sex courses for women, they also supported the idea of offering STEM courses exclusively taught by female instructors. It was assumed female STEM instructors would utilize more learning paradigms with which female students could more closely identify, thus increasing students' success in these courses. For women, single-sex education is viewed as a way to enable them to do better in STEM as they may feel more comfortable studying and taking leadership roles in male dominated areas like STEM.

Participants in this study also suggested community colleges should host a women in science conference or women in science exposition. Participants expressed this could be a way to encourage women to pursue careers in STEM fields, by showing students that STEM careers can be exciting, attainable, and rewarding. This would be a good chance to show women all of the possibilities that exist for them in the various STEM fields and to highlight some of the important work already being done, and can serve as a chance to help build the STEM community on campus.

Presumably, women students enrolled in STEM courses face multiple risk factors that could potentially prevent them from achieving academic success and ultimately from graduating. When students demonstrate academic achievement despite facing numerous

obstacles or risk factors, these students can be viewed as "academically resilient" (Rivera & Waxman, 2007). Prior studies have shown that although students enter college with varying degrees of resilience related to individual and family characteristics, academic institutions can and do play a role in fostering the academic resilience of these students (Benard, 2004; Rivera & Waxman, 2007; Gordon & Wang, 1994). Participants in this study suggested that community colleges should offer seminars on ways to effectively increase resilience. Another proposition supported by participants in this study was to establish support groups for women in STEM disciplines in order to increase resilience. These recommendations could be valuable methods for fostering academic resilience in women students enrolled in STEM disciplines.

Comparison of focus group interview responses of high-scoring women to low-scoring women. Both high-scoring women and low-scoring women reported they were aware of common stereotypes regarding women's ability to succeed in STEM classes. High-scoring participants reported they were aware of the common stereotype that women do not perform as well in math as men do and low-scoring participants reported they were aware of the common stereotype that women do not perform as well in engineering courses as men do. Upon analysis of participants' academic records from Datatel, low-scoring women on average had taken more engineering classes than high-scoring women. High-scoring women, in contrast, had taken more math classes and higher level math classes.

Both high-scoring women and low-scoring women described being stereotyped by male classmates in STEM courses. Low-scoring women, unlike high-scoring women,

stated being stereotyped by male instructors in STEM courses. High-scoring women affirmed they had not modified original education plans or career goals, while low-scoring women reported they had modified original education plans and career goals due to gender-specific stereotypes.

Both high-scoring women and low-scoring women stated male family members had tried to dissuade their efforts to pursue AS degrees in STEM related fields. High-scoring women mentioned they had strong female influences, a mother, or female instructor, perhaps, who inspired them to pursue AS degrees in STEM related fields. Low-scoring women, in contrast, made no references to any other persons who had influenced them to pursue their education in STEM disciplines.

All participants had reported being stereotyped in STEM courses. High-scoring women claimed these occurrences had actually motivated them to succeed in STEM courses. Low-scoring women, in comparison, were negatively affected and exhibited behaviors common for stereotype threat effect. As such, low-scoring women experienced heightened levels of anxiety that affected academic performance in STEM courses. High-scoring women were resilient enough to conquer anxieties associated with stereotype threat effect. Therefore, high-scoring women reported they were able to persevere in STEM courses, with no impairment in academic performance. Low-scoring women, in contrast were not resilient enough to vanquish these apprehensions. Thus, low-scoring women were negatively affected by stereotype threat effect, evidenced by impairment in academic performance.

Implications for Practice

Since the publication of Steele and Aronson's (1995) study, researchers have identified stereotype threat as a risk factor that can impede success of women in STEM. High resilience is a protective factor that enables an individual to cope in ways that buffer against risk factors (Center for Mental Health in Schools at UCLA, 2008). By eliminating stereotype threat and the risks associated with the phenomenon, and by increasing protective factors, like resilience, success of women in STEM is likely to increase. Evidence gathered from this study indicate that eliminating stereotype threat from STEM courses and promoting resilience are potential ways to increase success of women in STEM. Additional findings to be discussed that could increase success of women in STEM are to increase female-gender representation on community college campuses and to develop positive instructor-student and advisor-students relationships. These implications for practice also are recommendations for further study.

Elimination of stereotype threat to promote success. One important way to increase success of women in STEM is to create environments without stereotype threat, environments in which females are not concerned about being judged according to negative stereotypes. Researchers (Johns et al., 2005; Vogt, Hocevar & Hagedorn, 2007; Martens, Johns, Greenberg, & Schimel, 2006; Marx, Stapel, & Muller, 2005) have staged interventions to reduce the negative effects of stereotype threat including changing educational environments so women feel less concern that they will be viewed stereotypically. Huguet and Regner (2007) report that negative effects associated with stereotype threat in a mixed-gender setting was eliminated in a same-gender setting.

Johns, Schmader, and Martens (2005) found that teaching college women about stereotype threat and its effect on performance was sufficient to eliminate the predicted gender gap on a difficult math test. Making female students aware of the fact that they will not necessarily perform worse simply due to the existence of a stereotype, can boost their performance. Other interventions include self-affirmation and changing one's susceptibility of responses to stereotype threat through self-awareness (Bell, Spencer, Iserman, & Logel, 2003). Martens, Johns, & Greenberg (2006) found that women under stereotype threat who were induced to affirm one of their most valued characteristics before taking a difficult math test were able to correctly answer as many questions as non-threatened men. In another study Aronson (2002) demonstrated that when giving students the impression that intelligence was not fixed but could be changed, students showed a significant improvement in their grades as well as greater enjoyment and engagement in their studies. If instructors convey to female students that they can improve their performance based on effort, students are more likely to believe that they can overcome negative stereotypes and perform well.

Other strategies instructors could implement to reduce stereotype threat in the classroom is to maintain positive student/faculty interactions by treating all students with respect and avoid labeling some students as "brighter" than others; they may simply be more self-assured and have high self-efficacy. Expect that all students have strengths and will succeed. Aronson, Fried, and Good (2002) have emphasized the importance of stressing the "expandability" of intelligence: that is, stressing that intellectual ability is not something that one has a finite amount of, but that it can be increased with experience

and training. Reassure students frequently, as this could reduce students' insecurities about their abilities in STEM (Vogt et al., 2007) and express that determination is the most important component of success and that all students will have to work hard to succeed. Encourage female students to take a "how to learn" course and when possible teach students effective study and self-regulation strategies by promoting realistic expectations about the time to learn and master challenging concepts in spite of one's supposed ability (Schunk, 2001). And lastly, help female students to combat anxieties associated with stereotype threat by creating a classroom which minimizes competition (Osborne, 2001).

Build resilience to improve performance. Resilience skills are valuable for all students, and are absolutely critical for students who possess at-risk characteristics, such as women in STEM. Proven strategies can help students develop the resilience to ensure risk factors do not result in academic failure (Baltes, 2006; Sander & Sanders, 2009; Chui, 2010; Sood, Prasad, Schroeder, & Varkey, 2011). Resilience skills critical to women in STEM include the following: high academic confidence, creating strong connections with others, and effective stress management.

Increasing academic confidence can result in an increase in academic resilience. The concept of academic confidence, as defined by Sander and Sanders (2009), is the degree to which a student feels capable of successfully performing school-related tasks. Individuals who possess high academic self-efficacy beliefs are more likely to persist when challenged with difficult academic material. These students perform better during tests, and perceive negative performance evaluations as challenges to overcome rather

than threats to avoid. STEM instructors should focus on increasing experiences that positively impact confidence and decreasing experiences that negatively impact confidence.

Forming connections with others is also a way to enhance resilience of women in STEM. Research shows that when students feel connected to their instructor, they are less likely to drop out of (Chui, 2010). Students work harder for instructors they favor. Also students' perceived availability of social support consistently provides health benefits, especially during times of stress. STEM instructors should show women students they care about them and respect them through their words and actions.

Effectively managing stress can also lead to an increase in resilience (Sood et al., 2011). One's ability to conserve emotional, psychological, and behavioral resources efficiently, can lead to a decrease in stress. While female students may possess the skills needed to perform activities in STEM courses, stress associated with stereotype threat is often the superseding factor that dampens the emotional resources needed to successfully perform these activities. Advisors and counselors could discuss healthy and unhealthy ways of coping with stress, and discuss consequence of unhealthy reactions. Thinking and talking about stress reactions and consequences can lead to a better understanding of improved ways to handle stress. Also, helping students understand the importance of establishing priorities and balancing them could reduce stress and in turn increase resilience.

Additionally, Steele (1997) has advocated several situational strategies that he contends will build resilience and reduce stereotype threat. Terming his proposal "wise

schooling theory," Steele suggested six specific strategies that can be used in the classroom in order to improve academic achievement of stereotype-threatened groups. In his discussion of these strategies, Steele (1997) defined his first strategy, "wise" critical feedback, as instructor feedback conveying that high academic standards have been set as well as a sincere belief that the student is capable of meeting the set standards. He defined the second strategy, stressing the expandability of intelligence, as instructor comments indicating that academic ability is a dynamic rather than a static entity, which can be changed with training and experience. Steele maintained the third and fourth wise schooling strategies, providing challenging work within a supportive teacher/student relationship and affirming student belongingness operated by conveying a belief in students' future academic potential, rather than suspicions of their possible intellectual limitations. Varied teaching methods and diverse course content, the fifth wise schooling strategy, shows sensitivity to different cultural learning styles and perspectives, creating an academic environment where students feel less likely to be negatively judged. Finally, the sixth wise strategy, providing students from stigmatized groups with educators from stereotype-threatened groups provides concrete evidence to minority students that it is possible to overcome negative stereotypes in the college setting. As is evident from the descriptions above, Steele's wise schooling strategies attempt to change some of the daily interactions between teachers and students in order to reduce stereotype threat in their educational environment and enhance resilience of these students.

Increase female gender representation. Increases in female gender representation are likely to, in themselves, lead to further increases of women in STEM

courses (Shapiro & Williams, 2011). The more STEM students are exposed to women role models, role models who can show them not only that women can "do STEM" but also that their feminine identities need not be viewed as a liability - the more they are likely to view STEM environments as places where they belong and can succeed.

One way to increase female gender representation is to increase the number of female faculty in STEM. This could prove to be a daunting undertaking as researchers predict that gender representation in science faculties will not reach equality for another century (Hill & Rogers, 2012). The American Association of University Women (2010) blame causes as varied as cultural bias, innate female affinity for "people" versus male affinity for "things", lack of early encouragement, the conflicts of motherhood, and biological differences in intellectual abilities. STEM faculty at the four community colleges included in this study had, on average 85 percent male STEM faculty compared to only 15 percent female STEM faculty. Women represent 18 percent of full-time STEM professors at public four-year colleges and universities (Association of American Colleges and Universities, 2013) and only 13.7 percent of full-time STEM instructors at public two-year institutions (American Society of Engineering Education, 2011). Only one out of the four community colleges sampled in this study had one full-time female engineering instructor, and two of the four community colleges sampled had two full-time female math instructors.

Another way to increase female gender representation on community college campuses could be accomplished by bringing influential women from the community in to interact with women STEM students. Mentorship is key to increasing and keeping

women engaged in STEM careers. By connecting established women role models with nascent STEM professionals, mentoring works to address the preconceived notions of these careers as inflexible or male-dominated that may discourage many women from participating in STEM fields (United Stated Department of Commerce, Economics, and Statistics Administration, 2011). Along these same lines, it would be helpful to find meaningful, long-term ways to weave women into the STEM community by creating professional relationships with female mentors that blend the lines between college and real life, and that provide professional development opportunities.

Develop positive instructor-student and advisor-student relationships. Students often rely on their relationships with college faculty and staff to help them develop educational goals and make the transition from community college to four-year institutions and future careers (Gándara & Bial, 2001). This is particularly true for underrepresented populations, such as women in STEM, who may lack external support from family.

Community college faculty cannot control the characteristics of their students. However, they can control how they interact with students (Tinto & Engstrom, 2002). One concern expressed by students in the focus groups was that instructors and advisors pre-judge their ability to succeed in STEM classes. That is, if a student is told by an instructor that a class is really hard, and they probably will struggle. Thus, the instructor may be creating a self-fulfilling prophecy. If, on the other hand, an instructor creates an environment in which students believe that they can succeed, then students are more likely to persist and do well. Often what appears to be lack of motivation is really

evidence of students' family and work obligations, lack of self-confidence, or poor study skills.

Strengths and Limitations

It is appropriate to acknowledge strengths of this study in order to highlight the ways in which it meaningfully contributes to the body of existing knowledge about factors that promote success of women in STEM disciplines (Creswell, 2008). One of the strengths of the study is that the researcher utilized a mixed method research approach. Mixed method research is defined as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts, or language into a single study (Johnson & Onwuegbuzie, 2004). Its logic of inquiry includes the use of induction (or discovery of patterns), deduction (testing of theories and hypotheses) and abduction (uncovering and relying on the best of a set of explanations for understanding one's results) (de Waal, 2001). One of the strengths of mixed method research is that it is can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach (Creswell, 2003). An additional strength of mixed method design is that is can add insights and understanding that might be missed when only a single method is used (Tashakkori & Teddlie, 2003). And finally qualitative and quantitative research used together can increase the generalizability of the results and produce more complete knowledge necessary to inform theory and practice (Maxwell & Loomis, 2003).

Although the researcher had ready access to needed data from Datatel, appropriate protocol was followed regarding the use of data extracted and was done so under the

supervision of the Director of Planning and Research at one of the four community colleges sampled. The research proposal was outlined and presented to the appropriate committee members for review and approval. Stake (1995) reminds researchers that when conducting studies in educational settings, the school, and instructors should be informed of "the nature of the case study, the sponsor, the activity intended, the primary issues, the time span, and burden to the parties" (p. 47). He adds that plans to anonymize should be shared as well as plans to distribute the final report. These suggestions were regarded through the use of informed consent documents approved by the Western Carolina University Institutional Review Board. In addition, interviewees were reminded of the anonymity inherent in the study and the researcher's personal commitment and academic requirement to maintain confidentiality.

Another strength of the study is that is it fills a gap in the literature designed to understand the mechanisms that underlie the performance deficits that occur as a result of stereotype threat effect in women enrolled in STEM disciplines in rural community colleges. In addition, the study illustrates the relationship between grade point average (a measure of success) and resilience of women enrolled in STEM disciplines in rural community colleges as well.

There are clear limitations in this study that need to be addressed in order to inform judgments about transferability of results and recommendations for future research (Creswell, 2008). During the course of this study the researcher ensured accuracy and validity to the fullest extent possible, however some limitations did nevertheless arise. Stake (1995) points out some limitations to the interview process

itself in that "interviewees will select their words with care; they may have incomplete knowledge and/or faulty memory" (p. 90). Walford (2001) and Stake (1995) also point out the simple reality that interviewees can lie. Walford (2001) further notes the possibility of an interviewer effect, wherein the behavior of the interviewer could influence the responses of the interviewee, and while he asserted that tape-recording interviews certainly increases accuracy, he also points out the reluctance of some interviewees to be tape-recorded. To counter these limitations, every effort was made to develop a sense of trust and to ensure the comfort of the interviewees before, during, and after the interviews.

Researcher bias is another potential limitation of the study. Because the researcher was a female STEM instructor at a rural community college in North Carolina within which the study took place, there could have been challenges in maintaining objectivity during the data analysis phase of the project. The researcher used open coding following by focused coding for analysis of focus group interviews. The use of coding in qualitative research is most often a word or short phrase that symbolically assigns an attribute for a portion of language-based data (Saldana, 2009). Open coding refers to the initial phase of the coding process in the grounded theory approach to qualitative research (generating theory from data) (Strauss & Corbin, 1997). This is the "opening up" process of the text in order to uncover ideas and meanings it holds. Focused coding it the second, selective and conceptual, phase of the coding process. In focused coding, the purpose is to build and clarify a category by examining all the data it covers and variations from it (Charmaz, 2006). The Director of Research and Planning at

one of the four rural community colleges sampled was asked to review interview transcripts after the coding process was complete. By allowing peer review of the coded transcripts by a suitably experienced researcher, the researcher intended to guard against the potential for researcher bias (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008). Inter-rate reliability, whereby data are independently coded and the codings compared for agreement was not assessed. However, some qualitative researchers argue that assessing inter-rate reliability is an important method for ensuring rigor, others that it is unimportant (Armstrong, Goslin, Weinman & Marteau, 1997).

Another limitation of the study is the status and gender of the researcher. The researcher is a female science instructor at one of the four community colleges sampled. Because the researcher is a female STEM instructor at one of the four rural community colleges sampled, there could have been challenges in maintaining objectivity during the data analysis phase of the project. Also, because of the status of the researcher, respondents could have intentionally or unintentionally completed "The Resilience Scale" to please the researcher. However, it is important to note that the researcher neither had been an instructor of, nor had been acquainted with any of the participants in the focus groups before the interviews were conducted.

An additional limitation of the study was the use of the amended Stereotype Threat Effect Questionnaire. The original questionnaire designed by Steele and Aronson (1995) was intended to address stereotype threat effect in African American men taking the Graduate Record Examination. Although the researcher used the questionnaire designed by Steele and Aronson as the model for creating the questionnaire intended to

be used in this study, many changes were made to address the specific participants in this study. Several major changes that affected the design of the original questionnaire included the fact that this study involved interviewing female participants rather than male participants. In this study the researcher interviewed women of several ethnicities. Also, the participants in this study were undergraduates rather than potential graduate students as in the Aronson and Steele study. In addition, this study addressed stereotype threat effect on the STEM program level in community college rather than one graduate level test as in the original Aronson and Steele questionnaire.

Lastly, lack of sample size, the convenient nature of the sample, and geographical limitations reduce the generalization of these results. The study could have been improved if participants from all rural community colleges within and outside of North Carolina had been sampled.

Further Research

Future research could explore the effects of stereotype threat in a specific class, such as using a community college math or engineering class. Another possible extension could include the effects of alleviation. Future studies could explore the effects of alleviation of stereotype threat effect. For example, is alleviation effective with the person who initiated it alone? Is it effective in an academic environment alone? Under what circumstances would repeated alleviation be needed? In addition, researching the effects of stereotype threat with regard to children and adolescents, and the age when stereotype threat initially affects performance would be important steps in understanding

the psychological experiences that cause gender differences in STEM and the underperformance of stereotyped groups within any academic domain.

Other potential research possibility would be to measure learning outcomes and attitudes of women in online STEM courses and compare those to women in fully-seated STEM courses. Because students in online courses rarely interact with each other, outside of online discussions, stereotype threat from male students may be less of a risk factor for women in such classes. Another research possibility would involve quantifying the focus group interviews and using those data to corroborate qualitative data as well as to establish the degree to which the participants felt as though they were being stereotyped. Other possibilities include sampling men in STEM, or women in an AA program of study to be used as a control to compare data collected in this study to.

Additional research possibilities include measuring the effects of implementing resilience enhancing methods as a means to increase success of women in STEM. How effective resilience building strategies are, and to what degree should these strategies be implemented for varying levels of resilience among women in STEM?

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LIST OF APPENDICES

APPENDIX A: LIST OF ALL RURAL COMMUNITY COLLEGES IN NORTH CAROLINA

1. Beaufort County Community College
2. Bladen Community College
3. Blue Ridge Community College
4. Brunswick Community College
5. Caldwell Community College & Technical Institute
6. Cape Fear Community College
7. Carteret Community College
8. Central Carolina Community College
9. Coastal Carolina Community College
10. College of the Albemarle
11. Craven Community College
12. Edgecombe Community College
13. Halifax Community College
14. Haywood Community College
15. Isothermal Community College
16. James Sprunt Community College
17. Johnston Community College
18. Lenoir Community College
19. Martin Community College
20. Mayland Community College
21. McDowell Technical Community College
22. Mitchell Community College
23. Montgomery Community College
24. Nash Community College
25. Pamlico Community College
26. Piedmont Community College
27. Pitt Community College
28. Randolph Community College
29. Richmond Community College
30. Roanoke-Chowan Community College
31. Robeson Community College
32. Rockingham Community College
33. Sampson Community College
34. Sandhills Community College
35. South Piedmont Community College
36. Southeastern Community College
37. Southwestern Community College
38. Stanly Community College
39. Surry Community College

40. Tri-County Community College
41. Vance-Granville Community College
42. Wayne Community College
43. Western Piedmont Community College
44. Wilkes Community College
45. Wilson Community College

APPENDIX B: LETTER OF INTRODUCTION TO DEANS

[date]

Dear [name of Dean]:

I am writing to ask that you consider advocating your students to participate in my dissertation study, "Factors that Promote Success in Women Enrolled in STEM Disciplines in Rural North Carolina Community Colleges." I will briefly outline the proposal.

Research finds that there is a gender gap in STEM disciplines. The gap is even more pronounced for underrepresented women, or in this context, minority women in STEM areas. Underrepresented female students in STEM make unique choices based on their past experiences, and their situation at hand in attempts to be resilient and successful, these choices may be further impacted by stereotype threat effect. This research will focus on the resilience behaviors demonstrated by women in STEM and the contexts that frame these behaviors.

There is little research to describe resilience in women in STEM and to understand how they utilize these behaviors to be successful. Therefore, the purpose of this study is to describe resilience and the effects of resilience on female students' success made over time. The findings of this study could lead to a better understanding of the female's experience in STEM courses. This understanding, in turn, could strengthen efforts by administrators and instructors to promote success of women in STEM courses, and, therefore increase these students' enrollment and retention rates.

I am a female biology instructor at a rural community college. My dissertation is a case study involving interview, observation and document review. It is one of the requirements of an Ed. D. at Western Carolina University and is undertaken with the knowledge and support of my dissertation committee chaired by Dr. John Habel in the Department of Psychology. My dissertation is a product of my long-standing interests in the topics surrounding the success of women in STEM.

Please help me by supporting this study and encouraging the participation of students on your campus. Please do not hesitate to contact me via email, skinciad@wpcc.edu, or by phone (828)-438-3524, if any further information is needed.

Sincerely,

Shannon Kincaid

APPENDIX C: “THE RESILIENCE SCALE”

Date: _____

Please read the following statements. To the right of each you will find seven numbers, ranging from "1" (Strongly Disagree) on the left to "7" (Strongly Agree) on the right. Circle the number which best indicates your feelings about that statement. For example, if you strongly disagree with a statement, circle "1". If you are neutral, circle "4", and if you strongly agree, circle "7", etc.

	Strongly Disagree						**Strongly Agree**
1. When I make plans, I follow through with them.	1	2	3	4	5	6	7
2. I usually manage one way or another.	1	2	3	4	5	6	7
3. I am able to depend on myself more than anyone else.	1	2	3	4	5	6	7
4. Keeping interested in things is important to me.	1	2	3	4	5	6	7
5. I can be on my own if I have to.	1	2	3	4	5	6	7
6. I feel proud that I have accomplished things in life.	1	2	3	4	5	6	7
7. I usually take things in stride.	1	2	3	4	5	6	7
8. I am friends with myself.	1	2	3	4	5	6	7
9. I feel that I can handle many things at a time.	1	2	3	4	5	6	7
10. I am determined.	1	2	3	4	5	6	7
11. I seldom wonder what the point of it all is.	1	2	3	4	5	6	7
12. I take things one day at a time.	1	2	3	4	5	6	7
13. I can get through difficult times because I've experienced difficulty before.	1	2	3	4	5	6	7
14. I have self-discipline.	1	2	3	4	5	6	7
15. I keep interested in things.	1	2	3	4	5	6	7
16. I can usually find something to laugh about.	1	2	3	4	5	6	7
17. My belief in myself gets me through hard times.	1	2	3	4	5	6	7
18. In an emergency, I'm someone people can generally rely on.	1	2	3	4	5	6	7
19. I can usually look at a situation in a number of ways.	1	2	3	4	5	6	7
20. Sometimes I make myself do things whether I want to or not.	1	2	3	4	5	6	7
21. My life has meaning.	1	2	3	4	5	6	7
22. I do not dwell on things that I can't do anything about.	1	2	3	4	5	6	7
23. When I'm in a difficult situation, I can usually find my way out of it.	1	2	3	4	5	6	7
24. I have enough energy to do what I have to do.	1	2	3	4	5	6	7
25. It's okay if there are people who don't like me.	1	2	3	4	5	6	7
26. I am resilient.	1	2	3	4	5	6	7

APPENDIX D: INTRODUCTION EMAIL TO POTENTIAL PARTICIPANTS

[date]

Dear [research participant]:

This correspondence is to request your participation in an educational research study. I, along with my graduate advisor and committee of professors, solicit your help. The purpose of the study is to explore success factors of women in science, technology, engineering and math (STEM) fields of study. I believe that this awareness can lead to new ways of promoting these programs to other underrepresented women who may feel reluctant to pursue STEM areas of study.

There is limited research on the resilience of women in STEM. One of the goals of this study is to provide an account of those experiences. If you are interested in participating, please complete the brief Resilience Scale Survey attached to this email and return it to me within the next several weeks. An additional interview may be warranted for the purpose of exploring key life experiences. Participants that are chosen for interviews will receive a $50.00 stipend.

I do hope that you will choose to assist me with this project. Sharing your experiences will be a valuable part of this research. Along with your consent to participate you can be assured that extreme confidentiality will be maintained. Please contact me if you have questions or concerns regarding my request.

Respectfully,

Shannon Kincaid
Doctoral Candidate
Western Carolina University
Daytime: (828) 448-3524/ Evenings: 443-3607

APPENDIX E: POST HIGH SCHOOL GRADUATION ACTIVITY QUESTIONNAIRE

1. How long after graduating from high school did you enroll in community college?

2. What did you do during that time?

3. Have you been enrolled in any other institutions of higher education or vocational training?

4. Are you employed? If no skip to question 6, if yes, where are you employed?

5. Briefly describe your responsibilities at your place of employment?

6. Are you married? If no skip to question 7, if yes, how long have you been married?

7. Do you have children? If no skip to questions 8, if yes, what is/are the age(s) of your child/children?

8. What is your ultimate goal after completing your AS degree?

APPENDIX F: STEREOTYPE THREAT EFFECT QUESTIONNAIRE

1. Think of a time when you were in a college class where you were in the small minority. What was that like for you?

2. What are some common stereotypes about women, as far as their ability to succeed in science, technology, engineering, and math classes?

3. Can you think of a time when you felt as though you were being stereotyped based on your gender in a college class. How did that knowledge affect your performance?

4. How have these stereotypes that you mentioned earlier influenced your career goals?

5. If feeling stereotyped in your class held you back from pursuing certain careers, what are some strategies instructors, advisors, or counselors could do to stop this from happening?

APPENDIX G: TRANSCRIPTION OF HIGH/HIGH FOCUS GROUP INTERVIEW

Date: September 26, 2014 Start Time: 11 am End Time: 11:56 am

Interviewer: Think of a time when you were in a college class where you were in the small minority. What was that like for you?

Participant 1: It was just very intimidating especially with the language barrier. Because sometimes you would try to communicate and people would be looking at you like, no... I don't want to talk. I don't know if it's your accent or how you look. But you try to express yourself sometimes and,… you just can't. It has become such a huge challenge to be in college especially in my major classes with other people who are always looking at you like you don't belong here or you need to go back to where you came from. Especially when I take a test you know because it's always hard to communicate and ask questions sometimes I don't understand the questions because of the way they were asked or the English that's being used. It's not that I don't know the information it's just the language. It's the barrier. I mean I know the information I've just been frustrated, a real struggle and sometimes I get mad and I feel very…sad, like I cann**ot** (with emphasis on not) continue this anymore. It's just been very hard sometimes.

Participant 2: I am thinking of a physics class that I had one time. It was predominantly boys in my class. I think there were only about…. four girls and the rest were boys, probably …um about 15 people total in the class. Now you wouldn't think that you would feel outnumbered. But you do you really do feel outnumbered, I mean. I felt kind of out of place …definitely like the minority. And just from feeling like the minority I

felt very withdrawn. (several second pause) I felt completely intimidated. It was just a very different environment that I wasn't used to in my other classes mostly like English or Psychology that are mostly girls. (long pause) Overall… just, very uncomfortable from the first day until the end of the semester. I think the other girls and I just kind of kept to ourselves… It seemed like the feeling was pretty much noticeable to all females in the class. We didn't interact with the guys and the guys didn't interact with us. Well anyway, all of us girls felt completely intimidated and we did stick together. We worked on our projects together, we had our own little group and we actually became quite competitive with the guys. Any group projects we had our homework assignments we had, we would always do ours together and stick together and for the most part I think we did better work actually. You would never hear our other male classmates commenting on our work, but they were definitely proud of their own work. I always felt as though there was some big competition between the girls and the guys. That was the main undertone of the experience… And a lot of these science classes are… you know, a lot of competition between girls and guys.

Participant 1: Sometimes I feel… out of place as you would say because I am a woman in these science and math classes full of men, but also because I'm from Costa Rica. Sometimes being the only woman as in a male dominated class as in some of my science classes have been, I isolate myself from the rest of the class. I feel isolated.

Participant 3: Oh my gosh, all of my engineering classes have mostly men in them, the same with physics and … so have my upper level math classes like calculus one and two. The men aren't necessarily rude, but you do feel very out of place. I know one time we

were working on a project… making a small structure, cabin type dwelling that was supposed to be totally dependent on solar energy. We were actually working on this for a competition that my class was entering. I was working with five other men and the instructor, who was also a man. Well, they put me in charge of tasks like calling everyone to let them know when we would meet, or emailing everyone to let them know what our progress looked like. My job was to also make reports to the group about our projected tasks that needed to be done, along with some sort of timeline. They treated me like I was totally their secretary. I felt as though none of the men wanted to hear any of my opinions. I felt worthless when it came to actually doing the work that needed to be one on our project. I felt like a bystander… like watching other people do the work that I wanted to complete. When I did try to help with the labor and construction, most of the time I would hear comments like… oh let me get that for you so you don't drop it, or oh let me screw that in because it needs to be really tight, or let me start that for you because we need to make sure the measurements are done correctly. They made me feel helpless, even though most of the time I don't really feel that way in life. I know this doesn't sound politically correct now, but they expected me to do all of the women's work… making calls, organizing, mothering in other words. While the men got to do all of the fun work…building, constructing.

Interviewer: What are some common stereotypes about women as far as their ability to succeed in science technology engineering and math classes?

Participant 1: That math is not for women. Boys are much smarter in math than women, and also in science. Boys are always answering the questions and… actually talking

constantly and… answering all the questions before any else gets a chance to think. The girls might know the answers but seem to be more, quiet. You just always think that boys will be able to do better than girls in those areas; science and math especially. I mean we've heard it all our whole lives, boys are good at math, and girls are good in reading. This happens because we've all heard it in school. My boys are hearing it now… the boys are good at math and girls are not. Because we don't hear that we are good at math, we just start to think that we're not good at math. Even telling the boys they're good at math and not saying this to the girls can be harmful, and they're only eleven years old. I just went to a meeting for my little boy he is eleven and you know the teacher she said boys are always better at math and I was thinking well did you know my boy is good at reading too. He's also good at math. So I think we all just need some positive encouragement.

Participant 2: Yes you're right they tell you… teachers do tell you at a very early age that boys are good at math and girls are good at reading and it's ingrained in our thought process. I remember hearing that too and I still think the same thing because I heard it over and over again. But they never give you a valid reason… so what is the reason? You do always hear that and I agree with you that there should be some positive reinforcement. That seems easy enough, just telling girls "you are good at math", and not starting out as more of a negative hurdle to overcome. Well I'm not as good a math, so I know I'm going to struggle, so that means you probably will struggle, right?

Participant 3: I mean you start to think that it's true because that gets stuck in your head and the teachers that you've had keep telling you this, you even read about it in certain

media sources it's like the *Charlotte Observer* of something like that. It's just everywhere and you really start to think that way even if you have good grades in math, or seem to understand science. In the back of your mind you're thinking the guys in here are getting this much easier or more deeply than I am. And I know what you mean. It was the common theme in elementary, middle school, high school. We pretty much understood that boys are good at science and math and girls are not. When you hear it again and again from when you're very young… learning math up until you graduate from high school… by the time you get into college it's stuck in your head. Because you're a woman you're not going to be good in math and you're not going to be good in science.

Participant 1: For women, just another common stereotype is that they aren't as smart as men in general, in any of those areas that you mentioned, not just in science and math but technology and engineering, all of the STEM areas.

Participant 2: We're just under the impression that men are smarter than women in all four of those areas. But that's just not something that you want to hear. I've also heard things like, well you make up for it in other areas, which this doesn't lessen the blow of hearing that you aren't good at something. I mean what are they really trying to say, women are good at child rearing?

Participant 1: Women are creative and good at artist things… and cooking.

Participant 3: Yes, but men are taking that over now. I mean it's like all of the good chefs are men, or they think they are good.

Participant 1 & 2 : (join in with laughter and agree by shaking their heads)

Participant 3: I know what you mean though. It's not a big ego booster to hear that you might not be good at some things, but you do make up for it in other ways. (long pause) My mother was always positive though. I definitely didn't hear things like women aren't good at math or science from her because my mom was always a very strong, independent person, and she supported my ideas. She has always supported my ideas. She has always told me that I could succeed at anything I tried, and I believed it.

Participant 1: My mom was also very influential on me. She… even though she only went to the 6th grade, she always kept telling me you have to work hard. You can work hard and you can succeed and you are smart. You are as smart as any man and you can do what you want to. And this is really against our culture because we're taught that women are supposed to be at home with the kids. My daddy didn't believe in us going off to work. He didn't believe in women going off to work at all. He didn't support me going off to college. He doesn't support me going to college. He doesn't think that I should be outside of the house doing anything; not going to school, not working, not anything.

Participant 3: My culture is similar in that my father and my husband do not support the idea of me going to college or working. They think that I spend too much time working right now, and that I spend too much time doing my school work. I have to do my homework during the times my husband isn't around, because he just complains about it. My father never wants to hear about anything that I am doing in college. If I start talking to my sister about something that I learned that day, my father and husband both leave the room. (very long pause) They do that same thing when anything gets brought up

about school or what my plans are… you know as far as continuing and finding a job. (long pause) My mother is very proud of me though. She can't wait until I graduate from _____ (community college). My sister is proud too, but in my culture that can't really get too excited …you know or the men might complain about that too.

Interviewer: Can you think of a time when you felt as though you were being stereotyped based on your gender in a college class. How did that knowledge affect your performance?

Participant 2: (after a very long pause) I do have a story to tell about um …a person in one of my college classes… a guy. It was in a chemistry class and this guy made a comment about my hair and it being so long and " it is probably really hard to deal with", and, am I not "afraid it might catch on fire when we do our organic labs"? I was just like, what?… thinking to myself, why would you make a comment about my hair? And this was pretty loud, what he was saying. I mean it all happened right before class started, so everyone in the class was listening to this conversation. I was one of the only girls in the class, and him to talk to me like that…it just made me feel really different. I mean it's like, okay let's all take a moment to notice the girl that has invaded our class. I am being noticed as a girl and all eyes on me. That made me really mad, which actually made me study really hard. At that point I dug my heels in and I was like if they are going to talk about me, it's not going to be about being one of the only girls. No, they are going to talk about me because I'm doing better than them in this class.

Participant 1: I feel I have been stereotyped in most of my classes for my program… by the students. And I've just decided instead of letting it upset me that… men in any of

these classes… physics classes, in any of the chemistry classes, calculus classes… whatever, I don't care what the majority thinks. Because I am as good as everyone else and I can… I can go to medical school, I can earn my doctorate… I can go to whatever school I want to. I'm going to do it and I'm going to do it even better. I have to just keep telling myself that I was… superior… and I pushed right through with good grades.

Participant 3: (after a long pause) I am thinking of my math class, my calculus class. We always had to partner up, and of course I was the girl… and no one wanted to partner up with me. I remember one of my partners wasn't very good at math, but he thought he was. He didn't want to listen to me. He always thought he was right, but most of the time he was wrong. It was really hard to work with someone like that and … just very frustrating. Sometimes I would get really mad at him and in my mind was questioning his intellectual ability. Sometimes I would get a little angry and I did have to keep my attitude in check… but it was really hard. This affected my performance because he was second guessing me… I started to second guess myself. I was a little slower to derive answers because I definitely wanted to be correct. Of course my partner made a comment on how long it took me to solve problems… but I was like hey, it's a learning process, it might take me a little longer to get the answer, but does that not count? I actually believed I did better because I felt as though they were stereotyping, and I just had to get the problems right, so I would work them multiple times just to make sure. Although, that whole experience did help me to succeed… but I did have this huge attitude problem all semester.

Participant 1: I also get the stereotype that all Hispanic people must come from Mexico. There are all kinds of people that come from all different countries, but they all think they're all Mexican. But I'm not Mexican, I am from Costa Rica. Even on my transcripts from Costa Rica to here they put lots of mistakes like Mexico, Mexico, Mexico. When you're Hispanic, here in the United States, everyone thinks you're Mexican. And there's more than just that country, I mean there's a lot of different people from a lot of different countries that are Hispanic. So, not only do I feel that sort of … pressure from that… I do feel they put these stereotypes on you because you're a woman. It makes you feel very insulted when they second guess your physical abilities, or when they question your intellectual abilities. It affects your performance because you feel isolated. I can tell that they think I don't know as much and I think that they're surprised that I've gotten this far. I've actually wanted to quit… you know when I let all of this get to me… the feelings of isolation.

Participant 2: I have also felt very intimidated and I didn't think I could continue in one of my waste water classes. I felt like the students were stereotyping me because I was the only girl. However my instructor was a woman… and she was very good, very encouraging. She used examples that women could relate to and she really changed my mind about quitting. That was a turning point. I wanted to do it for myself, but also to show those boys that I could do it like they could. It's good competition against the boys sometimes. I guess that's how I have survived in my classes… I just made it a big competition. (pause) I'm very competitive. That's how I've gotten good grades. I'm just very competitive.

Interviewer: How have these stereotypes that you mentioned earlier influenced your career goals?

Participant 3: When I first started here I actually wanted to do paralegal because I was afraid of all the math classes I had to take for the AS degree. I thought well, that is way too much math for me. So yes at the beginning it did… I thought I should go for paralegal. It did take me about half of a semester and then I got over it. Now I'm an AS and I'm doing lots of math and loving most of my classes. Yes, but I did start out as paralegal because of the stereotypes that I had felt before.

Participant 1: I have been trying to get through college… it seems like ever since I moved to the United Stated I have been trying to get through college. I also started out on a different career path. I started in business… also because of the math requirements for the Associate in Science degree. I was just afraid to do that much math, you also have to do a science sequence like physics or chemistry where you use a lot of math too. Being Hispanic, and having the language barrier on top of being a girl and thinking I'm not good enough was actually less discouraging than the thought of taking all the math classes that are required… ha… seriously. But I was unhappy in my businesses classes. Now it's taken me years and years of going back and stopping, and going back…I have had three children in the process, three boys… and now I am determined to finish my program this time. This most recent time that I enrolled back in school I found out that some of my classes were getting too old to count. These included a math, a biology, and a chemistry… when I found out I thought to myself I just can't put myself through this again. I said this earlier… women are just not for math, and I'm not for chemistry either,

so I thought about switching back, but I stopped. I was on the verge of switching out of science, I almost did, I was on the verge of just getting an AA degree and just getting this over with, but I stuck with it and I'll be finished at Christmas time.

Participant 2: When I first enrolled in _____I thought about going the AA route because the list of courses in the catalog seemed way easier than an AS degree. I was very intimated at all of the math classes too. I was not looking forward to all of the extra time I would spend in the labs that go along with the classes either. I didn't like the thought of spending six hours in class and lab to only earn four hours of credit. That was not appealing. I was afraid the AS degree would take a lot more effort, and that was my main reason for considering an AS degree… but then I thought about what I enjoy and what kind of career I wanted, so I stuck to the AS path.

Interviewer: If feeling stereotyped against in your class held you back from pursuing certain careers, what are some strategies instructors, advisors, or counselors could do to stop this from happening?

Participant 1: When I went to my advisor after being out for so many years and coming back to school he told me just how hard it was going be. He said "are you sure you don't want to pursue your AA degree. You have such high hopes." So I started thinking maybe I have hopes that are too high and maybe this is going to be too hard for me. He told me how hard it was for him, so I started thinking, well maybe he's right, maybe I can't do it… it's going to be too hard. I think advisors should be more… optimistic when they meet with you. I mean it's okay to warn somebody about how hard the classes will be, but follow it up with something positive… like it's very hard but you're going to be

able to do it. He just made it sound like it's very hard and I really doubt that you're going to be able to do it. He didn't say that, but that's just how our conversation made me feel… very worried.

Participant 3: I know it does start with your advisor. It's like they're stereotyping you too. I've had an advisor say to me before that a certain class is going to be unusually hard, and I've even heard, mostly men are going to be in your classes. They plant these ideas in your head from the beginning, like it's going to be so hard and you're not going to succeed. So they are really stereotyping by some of their comments that they make and they don't even realize it. Advisors could be more positive and don't dwell on how difficult it will be for me. They should try to build you up a little and give you the courage you need to succeed.

Participant 2: I would also say for advisors put aside your negativity. Instead of all the negativity that goes along with conveying how hard your classes are going to be, or how much studying time it's going to take… or saying things like you shouldn't have a job. Yes, there needs to be more respect for the person… and then that will give them an internal respect for themselves. If your advisors are positive then you are more likely to be positive. When your advisor is negative then it makes you feel negative about yourself and the whole college experience seems negative.

Participant 1: I was also told you shouldn't have a job with that many hours. I was told it was going to be especially difficult with having young children. I have been told before, that I have signed up for too many hours and that I might want to consider signing up for less hours, especially because you have children and a family to consider.

Participant 3: That's exactly the same things that I've heard… it's going to be a lot for you take to that many hours with a job and a family. You're right, your interactions with your advisor should be positive and encouraging. (pause) I think science and math instructors should also provide positive encouragement. Like, help to try and build a relationship with your students… just be more encouraging.

Participant 2: I also think this goes along with being encouraging, but more specifically instructors need to act like they care. Some of them, they act like they don't care. If you go to them for help during their office hours it's like you're bothering them. I couldn't get some of the files to open from my chemistry class, to be able to the homework. I went to my instructor for help, because I couldn't access the homework. He totally flipped me off like he didn't care. With a smug attitude he was like "have you tried to right click and save it to your desktop first, well try that and then come talk to" and then he just kept right on walking. It's like you said, instructors need to build a relationship…act like you care.

Participant 1: Instructors need to be more approachable. My instructors need to be more approachable. It's almost like they are too important to talk with their students beyond the boundaries of the classroom. They always seem to be too busy, or think they are too important… like they are one of the untouchables… that's how I would describe it.

Participant 2: I would tell the instructors to use more examples that females can identify with. The one thing that I remember from my biology class… you know some of the information I've totally forgot, but something that really sticks out in my mind was the story about Rosalind Franklin. She helped discover the structure of DNA and I was so

intrigued by her. It was just really touching… her story. I did further reading on her, and it just got me more interested in the topic of DNA… and when we were talking about it in class I really felt more interested in it… more connected to what we were learning.

Participant 3: I am thinking of my physics class… I would tell the instructor do the same for me… use more examples that I actually care about or am interested in. Our instructor used examples that only men would care about. Umm… like trying to explain trajectories with guns… or vectors with cars…and I couldn't picture anything in my mind about any of it. I finally ended up going to a different instructor… not a physics teacher… but someone very knowledgeable about all science… a chemistry instructor I have had her for several other science classes. She helped to explain certain topics by using examples that I could identify with… like explaining centripetal and centrifugal forces with comparing it to riding bikes… and velocity and momentum with using a carnival ride. Because I know those examples and could use those examples… it was more for my thought process, definitely.

Participant 1: I know in my cell biology class my instructor went into a big discussion about… ah oh gosh… Henrietta Lacks and read some… ah sentences or paragraphs from a book about her and her… HeLa cells. She was a minority woman and just talking about her life… seeing pictures of her… even though aspects of her personal life aren't scientific… it just helped you to relate to the topic and you can care more about it. I think my instructor focused more on her personal life because she was also a woman.

Participant 2: (long pause) I like to take have female instructors for science… for all my classes. They use examples that we can relate to… I prefer taking classes from female instructors.

Participant 3: I would also rather take classes that have female instructors… I can identify with. I prefer taking classes from female instructors as far as all the science, engineering and math classes. I would rather take those classes with a female instructor because of that reason, they keep my attention… they have the same things that we care about and that we love. They are more… ah sympathetic to family issues, or being absent because of children or family. They are just more, understanding… I guess because they are wives and mothers too… I guess.

Participant 2: I would absolutely love to take sciences and math classes… well all classes we have mentioned… technology and engineering with only female students. I would like to see segregation happen again… gender segregation… ha, ha, ha. Students would not feel threatened or isolated. You would have small study groups that you could feel comfortable in.

Participant 1: Yes, I agree that would be a good idea. (very long pause, looked as if she wanted to say more) I'm thinking back to the questions we answered about being resilient… maybe counselors could offer guidance or…. um seminars to instructors on how to make their students more resilient.

Participant 3: Or counselors could provide opportunities or classes on how students could build resistance… um I mean resilience. I don't know maybe… or do some activities in a theater class or psychology class… ways to practice skills for resilience.

Participant 1: Yes, I agree. Give us more strategies so that we won't give up… you know I did almost give up several times… I didn't know if I was strong enough to continue… I agree we need to learn or be taught how to be more resilient.

Participant 2: I agree with that too. Maybe we could start a STEM support group… where we share our strategies for overcoming some of the barriers we have faced. This would be great for girls that have just started… but also good for women who might be coming back to college… you know, after years of not doing any type of school.

APPENDIX H: TRANSCRIPTION OF LOW/LOW FOCUS GROUP INTERVIEW

Date: October 10, 2014 Start Time: 11 am End Time: 11:57 am

Interviewer: Think of a time when you were in a college class where you were in the small minority. What was that like for you?

Participant 5: I've definitely felt like I was in the minority in some of my classes. I try not to let it bother me. Generally, I am an open minded person and I can't understand why certain people would treat other people like that. But they do give you funny looks… kind of … sneer I guess. There is just a vibe when you are one of the only women in a class full of men… like you are an intruder. It's like some boys club…they are trying to learn and keep everything else a mystery to women. They are just afraid we are smarter.

Participant 4: Guys do mature a lot more slowly than women do. I've noticed their maturity level isn't as high… and that's one reason why they might do that… but a lot of these men are over 18 so you would expect them to be less… silly. It does make you feel weird. They look at you like you shouldn't be in the same class with them… like they are better than you are… sometimes. I cope by closing myself off to them… I guess pretending like it doesn't bother me. My main objective is to just pass the class… sometimes it is hard when you feel like your instructor doesn't want you in the class either. That makes it really, really hard.

Participant 6: The main time I have felt like the minority has been in math classes. You definitely notice there aren't any other women in there. It made me feel like I need to get

one of these boys to help me with math… which I hated that feeling, because it was like… I'm dependent on these jerks to help me, even though at times they seem pretty nasty. That is, actually, usually when I go into a math class… I notice that a lot more than in any other classes. I look around for a place to sit, and it's just like… the look on some of their faces… like you said they look at you like you don't belong in there. That's how I feel too… sometimes like I don't belong. One of math instructor's was a real jerk too. When I asked him for help, he actually suggested me getting help from one of the guys in the class… my instructor, he said "ask one of your peers, they get it, you sure don't". At that point I wanted to shout at him and tell him well this is your fault too because you are not a very good teacher. He was so impersonal, he didn't care. He was impersonal with me, that is… but seemed to be more personal with the other guys in the class. I finally did get a peer tutor, and guess what…my peer tutor was also an insulting type of… male person too. The instructor and the peer tutor had this attitude like… I don't know… like I was so… stupid. That was a hard time… I'm definitely glad I'm done with math.

Interviewer: What are some common stereotypes about women as far as their ability to succeed in science technology engineering and math classes?

Participant 5: Yeah, it's a big deal in engineering… I mean you hear about women, their brains don't function the same as men, so they won't be good at engineering. The stereotype I think of is in the engineering field… it is men think differently, or use their brain in a different way for doing jobs in engineering… and developing. They are very

hard on women, and they think women can't do it. Like, we are too weak, and we need to be stronger.

Participant 4: Yeah, like we can't handle the pressure. You know engineering is really important, and we couldn't possibly be able to do a job like that.

Participant 5: Yes, you think women can't handle the pressure of having a career like that. I think that is very common in that field. It's kind of… it's really degrading… because you know, we're not stupid, we are smart. Men don't give girls a chance to show that they can do it. It's tough, especially if you want to go into engineering… I know that for sure. At first, this is what I wanted to do… and my grandpa, he's an engineer, he told me that a career like that would be very hard on a woman, so I decided to not concentrate in engineering at community college… but just stay more general science... that way I always have more options. I mean what's the point of going to all that trouble to finish if you're just going to be looked down on. (pause) I can't talk to my parents at all about education. If I try to it turns into some lecture about life lessons… and I just don't want to hear it.

Participant 4: That's Asian parents for you.

Participant 5: Yeah, they don't really talk to you about that sort of thing. They never ask me how I'm doing in school. So yeah… my dad and my brother are at a point in their lives, where they are at their lowest. They called me last night, trying to pull me down. I told them I had the dream… and the resources to succeed, and I don't need you pulling me down… not right now. I told them I can't keep going backwards, I need to go forward. You can't stop me anymore. I'm tired of being stopped. I'm going to keep

going and I'm not going to stop. My husband, luckily, does support me all the way. Yeah…he supports me. I felt like he would be the type to tell me stop and just go to work, but he wants me to go to school and finish. He's the only man in my life that supports me. My dad… when I told him I wanted to go to community college, he asked me if I was ready for the commitment… and whatever challenges. He thought I was too selfish…and would never be ready for the challenges. My brother thought I couldn't do it… my grandpa even thought I couldn't do it. The men in my family can be so cruel. I mean it's cool… now, I'm almost done. So I am really ready to prove everybody wrong. I am just so tired of guys thinking girls just can't do it. Just keep going, don't stop… if you hit a wall climb over it or walk around it, just don't stop. Just keep going.

Participant 4: Most guys think women are too soft to handle engineering. Lots of Asian guys do… it's just the way they were brought up. You can't change that really… not in our culture. My dad always tells me you are too pretty to be working so hard, you should just be staying at home. He said women who stay at home and raise children have an easier time and stay prettier longer, but women who work hard and stay at work long hours away from their family will get dark circles under their eyes, and start to look old sooner. I mean how screwed up is that?

Participant 6: From a young age I had a lot of interest in engineering… mechanical engineering. My father told me that no one would hire a woman mechanical engineering… that I needed to go into nursing or something like that. But, I do have a fascination with science. Even though my math skills are poor… and I've never been able to gain those skills in school. Anyway, I started talking to my advisor and told them

that I was interested in the medical field. I told them I was interested in becoming a dentist and I thought I would love the medical field. I actually talked to about to two different advisors and they both told me that … essentially I should start small, and try to become a nurse. But I disagreed with that, and I said I can be a dentist. Even in that, when I spoke with my advisors they took one look at my tattoos and I could tell what they were thinking…they told me that I was too old to pursue my dental degree and that I should go be a nurse. I am very interested in the medical field, I do plan to continue in science… the classes I have taken have exceled my interested in science and I can't stop that hunger for knowledge that I have. I don't think you should be identified by what your gender is… your mind is something different.

Interviewer: Can you think of a time when you felt as though you were being stereotyped based on your gender in a college class. How did that knowledge affect your performance?

Participant 5: When I was in an engineering class. There was like… I think there were three guys in my class and we were cutting some metal. Well, we weren't all doing it… I offered to help, to make some cuts. One of the guys was really rude. He was like no. But then he let the other two guys do it too. I guess he felt like I wasn't strong enough, or capable enough to do the work. I was really mad. I told my instructor… what had happened that day. I wanted him to switch me to a different group, but he didn't. My instructor told me I just needed to be more assertive… like it was my fault of something. He gave me this speech about working with groups in the real world, or at a job site and I couldn't be afraid to get my hands dirty… like I 'm afraid to get my hands dirty because I

am a woman or something. Well, I really wanted to be in a different group. I thought if he would put me in a different group… that would actually let me participate I would learn more… or better. I would be more capable of learning… especially because the class was so hands on... but I had no hands on… because my group was just… so difficult to work with. It wasn't a good semester, I struggled in that class. I didn't do well…I am a hands on learner, and if I don't have the opportunity to be hands on, then I can't succeed. I had one of the worst grades ever in that class… that's how it affected my performance. I hated that instructor too, and never wanted to take any more classes under him. Yeah…I mean what's the point of being in a program like that if they aren't going to teach you. It's just like… if you don't give somebody a chance… because of their gender… it's just not fair. The instructor wasn't patient with me either. He didn't ask me any questions to get to know me, or anything like that. My aunt had a similar experience with the same instructor. She was lucky because she was able to withdraw and then take a different instructor who was more helpful, and she did much better than I did… because her instructor was supportive. And she said she was glad she didn't have to go through what I did.

Participant 4: Along with that, I was in an engineering class with about ten… ten other males, and the instructor was a male. There was a classmate, a male that I was working with. We had to lift some materials up to our site where we were working on designing and constructing a windmill. Some of the materials were very heavy… but nothing I thought I couldn't handle. Well anyway me and this classmate tried to lift the stuff out of the truck and when we did I almost lost half of the load. I knew there was no way I could

do it without some help. I thought about sitting back down on the truck to get a better hold, you know… then I thought about setting the load down, but I knew I was going to drop it if I did that. I tried hard to hold it up, but I just couldn't do it with my size. I tried so hard but I just couldn't do it. My instructor came running over at me and gave me the look like, what do you think you're doing. He gave me a stern lecture about being able to realize my limitations as a woman. From then on he just looked down on me, and after that he just kept looking down on me. I finally at one point in the semester go made and said to him you don't have to look down on me just because I am a woman, and I'm small, and I'm still learning. I'm trying my best, I'm trying to learn. After that it was very awkward. I think he was… on the surface nicer to me after that because he probably felt like he might get in trouble for some of the comments he made to me, but he never took an interest in helping me to learn. It was like my presence in the class really bothered him. I felt weird about going to class too, and I did skip a lot. I didn't do well in that class… I skipped too much, and I wasn't interested in going because the instructor was not supportive. It was horrible. I felt like everyone was looking down on me in that class… because I was a woman. If I feel like people are looking down on me, it does affect my performance. I don't like being under that kind of pressure.

Participant 6: I think a lot of science and math and engineering class are very competitive. It's like women are still kind of rising. I have felt kind of self-taught in a couple of my engineering classes, because the instructor didn't help me out either. I think it was because I was a woman. It's like I'm a woman coming in and invading … and how dare I split up the good ole boys club… and you are going to pay for this, so my

instructor didn't really teach me anything. He just let me sink or swim, as they say. He didn't really care how I did… but he did seem to care about all of the guys. It was a very sexist thing that I went through… I do believe. I basically had to just watch and go through a lot of negative things. (getting pretty upset, very long pause) All I want to comment about that is to say… it is so hard to learn and be successful when you feel like nobody is on your side. I tried to learn on my own, but it was very difficult. I finally had to give up on that class, and withdraw. I really felt like I could do better, with more guidance and encouragement… that I wasn't getting in that class… not from the instructor. I still hate that I basically quit… but I had no other option… I would have failed that class if I wouldn't have dropped it. So there is a limit to what somebody can take. My advisor was like maybe you should give this up because there are some very talented people that excel in these classes and some people who don't. I was thinking well if I just had someone to actually teach me, I could do it. This put me down for a while. I thought about quitting college… totally quitting at that point. I wanted to hide. It's like the school of hard knocks.

Interviewer: How have these stereotypes that you mentioned earlier influenced your career goals?

Participant 4: When I first started I thought I knew exactly what I wanted to do… but now after taking some of my major classes, I feel like an AS degree isn't right for me… or just the concentration in engineering isn't right for me. I have no support from my teachers… I have no support from my family… I have no support from my advisor. Sometimes it makes me want to cry… or scream… sometimes punch. (pause) I know if

I change I have to follow the current catalog… and this and that… the math requirement has changed… and some of my other classes won't count for an AA degree. After being in some of my classes where my male classmates… who would be my co-workers eventually… right? It has been so hard to work with some of my male classmates… it has also been hard to work with some of my male instructors. It makes you feel… bad. I don't want to feel bad in a career… or at my job. I don't know what to do at this point. I don't want to be in community college any longer than I have to... if I switch it will put me even farther behind. (pause) I don't know what to do. I wish I could just start over…have a different advisor… different instructors. I have heard that _____is better than _____as far as instructors and advisors helping you. At _____, it's like they don't care if you fail or not. I wish I would have gone there to begin with… but _____ is much closer to where I live.

Participant 5: I am frustrated with my math skills, and it does make me feel limited… if anything. And, to add to that I had changed my major to AA, an art's major once before, but did change it back. I changed my major once because of the math requirements. I have recently changed back, but it will take me longer to graduate than it would have if I would have continued as an art's major. So, my math skills… they are lacking. If anything… math was so frustrating. I just didn't know if I could take it.

Participant 6: Well it kind of became habit for me to second guess myself… I do this thing where I micromanage everything and I kept looking toward others for advice and things like that and I kind of put this into a little file of what am I going to do. So I really looked to that's other advisors… to help me decide what am going to do. What would

you do? What is the wisest thing you should do? And I kept noticing everyone kept telling me this is what you should do… and what they kept telling me was not what I wanted… you know. I realized that I am talented and a smart person… it put me to this point where I was making mistakes… about decisions for myself. So I had to ask myself, what do I really want? And so I… I kind of started thinking about what I really wanted, and I started making choices for me, and it put me off track a little bit… and it's kind of what's me gotten me where I am now. But now I'm really starting to try and consider where I want to be. Even though I don't excel in some of my classes, I think I am where I want to be…as far as pursuing my associate's degree. I'm really thinking towards the future and I like where that's going. I really have discovered a lot about myself… as far as my abilities. I think that I will be very successful…no matter what I do. But I kind of do wish people wouldn't look at me and keep saying you should do this, this would be better for you. (pause) One of my best friends is a nurse, and she introduced me to a histologist… who is also a women. My friend who is a nurse said, everybody wants us… women, to be nurses, and the histologist said, no one knows what my career is. And here I am, I thinking I want to know more about science, and the careers we have. Here these careers are, and I don't really know much about them. There are all these careers out there in science… and I love science. And for women… there are a lot of opportunities to do many different careers… but we don't even know what's out there. We don't even know what there is, and I'm questioning… why is that? All of us our intelligent enough to do what we want to… why do we not have the knowledge to make these decisions. I just wish that would change more rapidly. I think the world is changing… so much every

day for us. Maybe it is up to us as women to put that knowledge out there now. Maybe we could start taking steps towards that.

Interviewer: If feeling stereotyped against in your class held you back from pursuing certain careers, what are some strategies instructors, advisors, or counselors could do to stop this from happening?

Participant 6: It's a growing experience… I mean I had to stick to my path. And um… when we talk with our advisors and they give us advice, we don't know if that's going to be… what we should take and keep… I mean it's advice. So, I've learned you do kind of have to toughen up your hide in this experience. So, take from what people say… and I call it taking the diamond out of the trashcan… so take what people say and take from it what advice you need to listen and derive… from that advise. And sometimes you have to make your own decisions… wise or not, especially during this time in our lives. And there are going to be hardships, but that's just part of life. It toughens you, you know. This is the time… to be an adult. We are becoming adults now… always. Does that make sense?

Participant 5: I guess that what advisors need to do is to be more open minded. Because it's a new generation, women are able to do new things and different things… and it's just not secretarial work, or old fashioned work anymore… a woman doesn't simply have to be an assistant to a man anymore. They should be more supportive and open minded to things. They need to listen to us… and we need to tell them things like what we want. There needs to be an open line of communication between students and advisors. I mean

I see my advisor a couple of times a year… we don't really know each other. I don't think he would know me outside of his office.

Participant 4: I feel like teachers favor male students. They favor a lot. I know most of my male teachers that I've had will help other male students… and really talk with them and spend time with them… and me it's just get me in and out as quickly as possible. My teacher needs to actually spend some time with me… getting to know me… what I want to do. It's almost like I am bothering him. I try to go into his office with my questions ready… he acts bothered when I explain to him that I have to miss class… because of work or something like that… and he is like well, you do need to prioritize your time. I know college is important, and I do need to prioritize my time… but I have other things to worry about… probably things that those young guys who are getting loads of his time and attention don't have to worry about. I feel like teachers at _____ don't really care about me. They care that I am paying money… and that sort of thing… but they don't really care about my dreams. I feel like sometimes my male teachers are like… laughing at me.

Participant 5: I know they favor certain kids… guys. Letting them in front of you to discuss their schedules… and for us it's like… just sit there and wait and I will give you about 30 seconds of my time… later… after I have helped these guys who are more important than you and will have more important career goals and plans than you. I wish they would all stick to certain standards… stick to the rules. Everybody needs to know the rules and they need to stick to the rules. Not play favorites with certain people. I feel like I'm being judged a lot by my advisor when I meet with him. He doesn't give me the

attitude that he thinks I'm capable of taking certain classes… and he basically tells me that… you know well, according to your test scores I believe this math will be way over your head… and then it's like if I don't take that math I can't take that math… I can't get this degree… I can't graduate with what I really want to. It's like this big nasty, muddy snowball that starts rolling… picks ups momentum… and by the end it smashes my plans… like my advisor… smashing my plans.

Participant 6: They need to be more knowledgeable about the different degree programs within their college, but also outside of their college would be very helpful. There are some resources online, but it seems like no one knows how to use them, or direct you to know how to use them. Maybe if they could learn more about CFNC… or something. Instead of just saying, you can look this up on line. They don't know how to use them, and we have never used them… You know it's just hard to get the correct information. Just like how I was asking ok I'm interested in a pre-dental program… but there's only maybe one advisor who might know something about it but he's saying ok let me check on this and… I need to look into what colleges you need to go to, but then he forgets and there's a few days… and if he forgets to call me… another few days have gone by. If I have a deadline or something, then I've missed the deadline waiting for his response. If they could direct us to find out this information ourselves… it would help. Do you see my point? And then also, if I go my another advisor and I say I'm interested in this pre-dental program as a woman and he says well my wife does nursing, and she's great at that… and you should… you would probably be great at that, or something. Do you see how that is kind of conditioning me to start thinking that way… well, his wife does it…

and that is more like a career for a woman, not a dentist. First of all, I would like to tell him that I don't want to get married. It's like you can try to do a career a step below what you actually want to do because… you're not capable of that step above. Do you see what I'm saying? In other words, you're really not good enough to be a dentist, so why don't you just be a nurse instead. He doesn't care what my career goals are, or why I would like to be a dentist, or why I'm asking so many questions about different programs. And to see past me gender and to see what the question truly is. I understand why that is working out for him and his wife… for his life. But please see past my gender and provide me with the proper information. _____is an excellent college and of the other schools I have been enrolled in is the best, by far the best college I have been enrolled in. But if they had more resources… I think I would have been better guided. That would be better. And then there were some situations where I had asked about classes and my advisor had tried to sign me up for the wrong ones… and that would just be more helpful… for us.

Participant 4: Advisors need to listen, before they start giving advice on the classes you need to take. They all assume that you would probably be better off in an AA program… and that is offensive. I think they are stereotyping me by suggesting that I should go into an AA program. I don't want to go into an AA program… if I wanted to then I would. It makes you feel like you can't handle a science program… because you are a girl. I wish I didn't have to speak with my advisor before signing up for classes… I wish we had the freedom to just sign up for classes when it was time. It's like you are a little kid checking with your mommy about what you can and can't take. They need to be more

supportive… treat us like adults. If I have declared a science major, then that is what I will be doing… don't try to convince me that I am only capable of an AA program. My advisor is smug and thinks he is better than me… I can tell. I'm very disappointed with the advisor I've had. I guess I should have taken more control of our meetings… but it shouldn't be all me… although I've blamed myself for it… for not being more assertive. I've taken classes that I don't even need… I've paid for classes that don't really help me because I advisor suggested those classes for me to take. I would say my advisor overall was terrible and I wish I could have switched advisors somehow… I'm sure that was my right… again I am taking some of the blame for not looking out for myself more… but you trust that they know what they are doing.

Participant 5: They need to have some sort of… session… I don't know… not really a lecture… women in science day or something. They need to have something where successful women come to campus to share their stories and their experiences. Hearing the stories of other women could be inspirational and motivate women to stay in the sciences. Knowing that other women have been through some similar situations as me, could be very encouraging for me… it would help me. You don't hear that as much… successful women sharing their stories. Men come and speak at our campus all of the time. You hear about this man did this, and he studied here, and blah, blah, blah. I would like to hear some stories about women, hurdles they have had to overcome… I could really relate to that more.

Participant 6: I would like to hear more about women in science too. I know what you are saying…when a woman makes a discovery or does something important in science,

they don't really get the same credit that a male scientist receives… I've noticed. They don't really get their fame for it. Although, it probably isn't a requirement for them… like it is for a man… they need constant praise, and positive reinforcement. Stuff like that bothers me. Men have always gotten all of the credit… and usually a woman is behind him doing the work… and they still look down on women. That's really frustrating.

Participant 4: It's like you do something, you're almost there and someone bends down and picks it right up from you, and takes all of the credit for it. Maybe science teachers could actively decide to incorporate more discoveries made by women scientists… or women engineers in their classes. Make it a campus initiative in STEM courses to include more information about women in those fields and the contributions that have been made. Teachers could come together and share ideas on this topic. The men would probably complain though.