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Michelle Chouinard  
*University of Massachusetts Boston*

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Gender in STEM: An Intersectional and Interdisciplinary Feminist Ethnography

Michelle Chouinard

University of Massachusetts Boston

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Undergraduate Senior Thesis advised by

Dr. Rosalyn Negrón, Anthropology Department

Dr. Amy Den Ouden, Women's and Gender Studies Department

Dr. Lynne Byall Benson, Women's and Gender Studies Department

## Chapter 1: Introduction

I used to be good at math. No, I was excellent at math in my pre-collegiate education. Starting in 2<sup>nd</sup> grade, I excelled at our yearly math examinations and won several awards for outstanding mathematical skills in elementary school. I loved solving problems, and occasionally found pleasure in correcting my teachers when they added or subtracted incorrectly on the whiteboard. In my senior year of high school, I was placed in AP statistics and advanced calculus. I was not the smartest nor most accomplished student in my school, but I loved to sit down and figure out long and complex problems under my yellowing desk lamp in the confines of my bedroom.

In my first semester as an undeclared freshman at the University of Massachusetts Boston, I was required to take a math placement test. I was placed into pre-calculus, a course that I had taken two years previously. The class was at 8 AM and attendance was not mandatory, so it is probably no surprise that I rarely felt the urge to attend. I received 100% on my first three tests, but when the professor began covering chapters that I had not learned in high school, my next three test scores were below 50%. I panicked, and spent three days cramming for my final exam, which I passed with enough proficiency to get a B overall for the course, but the damage was done. I was horrified by the prospect of spending the next four years in a constant state of panic and worry, and I did not sign up for another math class. I felt discouraged by my professor to continue in mathematics, and I often wondered if other women experienced similar obstacles in STEM academia.

Growing up, I was the youngest member of my extended family. I have one brother and no sisters, so I looked to my older cousins for female role models. The eldest of my female cousins is exactly ten years older than I am. We were always very similar growing up, and

family members constantly made comments regarding our identical looks and similar personality characteristics. Unlike myself, my cousin excelled academically in STEM fields (science, technology, engineering, and mathematics) well into college, and has earned both a Bachelor of Science as well as a Master's degree in mechanical engineering. As a woman, she has faced significant challenges throughout her education and into her professional career. Watching her struggle with issues of sexism and discrimination in a male-dominated field has sparked my interest in examining and helping dismantle the patriarchal and misogynistic power dynamics that exist in STEM academia and industry.

While contextualizing the history of women in educational spheres, it was no surprise to learn that women have faced significant obstacles in sciences and mathematics since the inception of higher education. In her revolutionary challenge of patriarchal historical narratives surrounding knowledge production, historian Londa Schiebinger's *Has Feminism Changed Science?* (1999) demonstrates that women have long been influential in the sciences. Christine de Pizan was documenting contributions made by women to the arts and sciences beginning in 1405, however, widespread acknowledgement of women in the sciences did not appear until the dawn of the 20<sup>th</sup> century, around the time of the first-wave feminist movement in Western contexts. In an era of oversimplified and primitive pseudoscientific explanations to reinforce sexist and racist themes in society, authors such as H. J. Mozans countered popular theories that assumed women's brains were in fact, "too small for scientific reasoning" (23), however, it was around this time that women were first allowed into the university (despite a few exceptions). The arrival of the second wave feminism movement in the 1960's and 1970's produced an immense amount of feminist literature and biographical pieces to provide female role models for

women in the sciences, as well as to “counter the notion that women simply cannot do science, that something in the constitution of their brains or bodies impedes progress in this field” (21).

Today, cultural and institutional barriers to STEM fields persist for women in higher education. My cousin and I are only two examples of what now seems to be an all too familiar story, but our experiences as white, suburban, middle class citizens have granted us unique privileges that not all women in STEM share. According to the National Science Foundation’s *Report on Women, Minorities, and Persons with Disabilities in Science and Engineering* (2015), women constitute 50.3% of the United States population between the ages of 18-64, and have earned about 57% of all bachelor degrees since the 1990’s. The report further states that women are considered minorities in STEM fields, however, the percentage of degrees awarded varies significantly by field. Nineteen percent of physics degrees were awarded to women, while 43.1% in mathematics and statistics, 19.2% in engineering and 18.2% in computer science (National Science Foundation, 2015, 6). These rates decrease significantly when considering racial and ethnic identity, as minority women receive even fewer degrees in engineering (3.1%), mathematics and statistics (5.8%), computer science (4.8%), and physical sciences (6.5%) (National Science Foundation, 2015, 6). Even more shocking is the statistical reality that these rates decrease once more to “3.6%, 2.5%, and 1.2% of all assistant, associate, and full professors” that identify as women of color in STEM fields (Mack et al., 2013, 24).

In its *Executive Report* to President Barak Obama in 2012, the President’s Council of Advisors on Science and Technology cites that lack of retention in STEM fields is also a major influence in the low numbers of members of minority groups such as women and/or racial and ethnic minorities who graduate with STEM degrees (i). The U.S. Congress Joint Economic Committee’s report on *STEM Education: Preparing for Jobs of the Future* notes that the needs

of STEM employers are not being met, largely due to substantial gaps in the number of racial and ethnic minorities as well as women employed in STEM fields as compared to their white, male counterparts (3). Upon close examination of these statistics, it is obvious that women and specifically women of color have the potential to aid in the decrease of this employment gap should their entrance and retention in STEM fields increase.

The purpose of this study is to enhance our understanding of women's experiences in STEM fields using a feminist inquiry and ethnographic methodologies, utilizing a discussion on intersectionality, barriers to long-term retention, as well as to provide suggestions for further intervention to address gender inequality in STEM fields. I have identified several key themes from ethnographic interviews with students at the University of Massachusetts Boston with regard to women in STEM academia. These themes include examining intersectionality and accumulated disadvantage, engendering of STEM fields and disassociation with femininity and feminism, STEM as a "boy's club" and the silencing of women's experiences, gender stereotyping as a barrier to female participation in STEM, fostering misogyny within the academy, influential role models, as well as gender performance through presentation. Although these themes are not exhaustive by any means to addressing women in STEM, they speak to the highly variable and locally specific experiences of women at the University of Massachusetts Boston.

## Chapter 2: Literature Review

### Definition of Terms

A masterful grasp of feminist anthropological terminology is essential to the examination and analysis of issues relating to power and exclusion based on gender. To quote Chimamanda Ngozi Adichí's powerful essay, *We Should All Be Feminists*, a feminist is "a person who believes in the social, political, and economic equality of the sexes" (2014, 47). Sexism is a culturally learned "belief in the inherent superiority of one sex over the other and thereby the right to dominance (Lorde, 1984, 240). Misogyny can be defined in similar terms to sexism, as it embodies the engrained prejudice against women. Gerda Lerner's *The Creation of Patriarchy* (1986) defines patriarchy as a system in which male dominance is reinforced through culture and the performance of everyday interactions and relationships. Social phenomena such as sexism, misogyny and patriarchy result in gender inequality, where male presence and contribution in any context is valued over the presence and contributions of women. 'Women of color' (WOC) is an umbrella term used to describe a woman who identifies as non-white in her racial/ethnic identification. For the purposes of this study, STEM is an acronym used to describe the fields of science, technology, engineering, and mathematics. Situating women's experiences in STEM is only valuable when contextualizing it within the body of knowledge that works to dismantle and grapple with interconnected issues of patriarchy, sexism, and misogyny.

### Intersectionality and Accumulated Disadvantage

Shanadeen Begay is a Navajo woman who recently completed her PhD in computational chemistry at Boston University. In spring 2016, she visited the University of Massachusetts Boston to speak in a Women's and Gender Studies class on native women in the sciences. She spoke at great lengths of the "accumulated disadvantage" that native women face in STEM

academia. By accumulated disadvantage, Shanadeen was speaking to the intersection of her status as a woman coupled with her cultural identity as a Navajo, both of which are considered minority statuses in STEM. As she stood before 30 UMass Boston students in her biking attire, she spoke about Navajo culture, where matriarchal norms permit women to attain equal or greater social status than men. “We already have feminism!” she proclaimed, and explained how it was challenging to work with a white male graduate student who expected to be the dominant researcher. For Shanadeen, collaborative work proved challenging due to the cultural differences between her and her male partner, as Navajo culture values female knowledge production whereas sexist and patriarchal views in white academia devalued her scientific contributions as a native woman.

Shanadeen is not the only WOC scholar who has noted the complexity of intersectional identities in STEM contexts. Lisette Torres, a self-identified woman of color, scientist, and doctoral candidate at Iowa State University (ISU), explores gender equity discourse in ISU’s ADVANCE program materials through critical discourse analysis. ISU ADVANCE is a gender equity program “...established by NSF to promote gender equity in STEM via program development and research that lead to changes in institutional policies and practices that enhance recruitment and retention of female scientists” (Torres, 2012, 34). Torres draws from feminist theorists such as Audrey Lorde and her work on intersectional feminism as a “theory of difference where the binary opposition between men and women is problematized via the intersection of multiple social identities and the relational nature of oppression”, as well as Sandra Harding’s work on challenging a lack of neutrality in the sciences based on trends of preferences for male knowledge production in STEM (Torres, 2012, 35). Of particular interest to this study is the use of Lorde’s intersectionality theory to holistically examine the experiences



like those of Shanadeen's and other women who experience accumulated disadvantages due to intersections of multiple minority statuses. For Torres, critical discourse analysis is essential to evaluating the ineffectiveness and extent to which ISU ADVANCE materials perpetuate gender inequity at the faculty level in academia through "scientific discourse [that] perpetuates and privileges the values and norms established by the dominant group while at the same time rendering the needs and contributions of women of color (in)visible" (Torres, 2012, 41).

### **Engendering STEM Fields and Disassociation with Femininity and Feminism**

In an psychological intersectional approach to *Ethnic Variation in Gender-STEM Stereotypes and STEM Participation*, O'Brien et al. (2014) argues that "stereotypes associating men and masculine traits, such as independence, with STEM fields are ubiquitous, exist at both explicit and implicit levels, and contribute to the gender gap in STEM outcomes through multiple pathways" (169). This research also approaches gender-STEM stereotypes through an intersectional lens to "emphasize that the dynamics of gender play out differently across different ethnic groups" and speaks to the self-reinforcing nature of stereotypes as they "shape the career goals, performance, and interests of women and men in ways that are consistent with the stereotypes" (170).

Torres also cites feminist Sandra Harding's works on feminist methodologies in science, where Harding states that there are "cultural stereotypes of science as being 'tough, rigorous, rational, impersonal, competitive, and unemotional – [which] is inextricably intertwined with issues of men's gender identities'" (2012, 37). These masculine stereotypes associated with the scientific processes are pervasive throughout the literature, and Torres offers a prediction that with increased female participation in STEM, these fields may be subjected to feminization and a certain "identity loss" with regard to the aforementioned male-associated gender characteristics.

Harding's work also concludes that in order to "fully participate" in STEM, women feel a loss of feminine characteristics and an acquisition of masculine traits (Torres, 2012, 37). This loss of "feminine identity" is not problematic as it actually serves to challenge gender stereotypes, however, in many cases it may contribute to the invisibility and silencing of women in STEM.

### **STEM as a "Boy's Club" and the Silencing of Women's Experiences**

When discussing women's historically situated experiences in the sciences, issues of silencing women and devaluing female knowledge production in comparison to their male counterparts have existed in the academy since its inception. As I previously explored in Torres' analysis of the ISU ADVANCE program's rhetoric through discourse analysis, it is clear that there is very specific discourse when describing the sciences that includes the imposition of gendered traits onto academic disciplines. An extension of the discussion of discourse includes the use of the phrase "boy's club", terminology that fosters an attitude of exclusion based on gender identity.

Eileen Pollack's memoir *The Only Woman in the Room: Why Science is Still a Boy's Club* (2015) follows her experiences as one of the first two women to graduate with a Bachelor of Sciences in physics at Yale in the mid 1970's. Her story is similar to many, where she struggled to continue past the undergraduate level in theoretical physics. Now an accomplished professor of creative writing and author to several novels, Pollack explores the structural and cultural barriers that contributed to her departure from physics and entrance into a more "socially appropriate" field for women. COME BACK TO THIS

### **Gender Stereotyping as a Barrier to Female Participation in STEM**

In his speech addressing the NBER Conference on Diversifying the Science & Engineering Workforce in 2005, then president of Harvard University Lawrence Summers stated

that women lack a specific “intrinsic aptitude” that contributes to the overall issue of low numbers of women in high-ranking STEM positions in the workplace (Summers, 2005). The ascription of this aptitude, so to speak, stems from pseudoscientific findings that inaccurately describe societal gender roles and norms associated with gender performance.

In their response to Summer’s poorly founded theory, the Women in Science & Engineering Leadership Institute (WISELI) at the University of Wisconsin-Madison has stated that “...it is highly unscientific to extrapolate from such research to conclude that genetics is also responsible for women’s disproportionate representation in the higher echelons of math and science. Our past experience with eugenics, the effort to apply simple genetic concepts to solve and explain complex socially constructed conditions, should warn us against such simplistic extrapolation” (WISELI, 2005). Without diving too deeply into a conversation of theories pertaining to assumed biological differences between the male and female sex and its historic legacy of reinforcing systematic patriarchy, it is noteworthy that such an antiquated, oversimplified, and blatant disregard for scholarly research remains valid to powerful individuals in the higher education setting.

In *Psychological Barriers to STEM Participation for Women over the Course of Development*, Saucerman and Vasquez (2014) explore overt and subtle messaging women experience over times of critical social development, which ultimately lead to belief and stereotype that women are “naturally” poor performers in STEM. Barriers that they highlight include but are not limited to over-interpretation of neuroscience findings, as well as socialization through parental and media influences. These findings also speak directly to challenging Summers’ remarks as “...it is a mistake to conclude that [biological differences between men and women] are the sole or major reason for women’s lack of participation in

STEM fields, particularly given all the demonstrable effects of gender-stereotyped socialization” (60).

### **Fostering Misogyny Within the Academy**

Despite advances in our knowledge and understanding of systematic oppression based on gender identity, persistent issues of institutionalized misogyny have created unaccommodating environments for women in the university setting. In an era of extreme sexual violence against women on college campuses, a positive institutional environment is a key factor in examining female persistence and participation. The award-winning documentary *It Happened Here* (2015) follows five college undergraduates who are survivors of stalking, harassment, rape, and sexual assaults on different campuses nationwide. The film follows the women in their pursuit of a lawsuit against the University of Connecticut for wrongfully handling the reports of gender and sexual violence. The significance of this film lies in the attention it has brought to campus environments and their historic dismissal of sexual violence and fostering of oppressive atmospheres in which female safety and security is not prioritized to the fullest extent. One quantifiable example of

In a study conducted by anthropologists at the University of Illinois titled *Survey of Academic Field Experiences (SAFE): Trainees Report Harassment and Assault* (2014) examining the presence and frequency of sexual assault and harassment at field sites during STEM field work, scholars have found that “gender was a significant predictor of having personally experienced sexual harassment, with women respondents 3.5 times more likely to report having experienced sexual harassment than men... 26% of women vs. 6% of men” (Clancy et al., 2014, 4). Of these experiences of assault, the vast majority of the women who are victim to sexual violence experienced the assault while they were trainees, which transcends

what is seen as traditionally “women’s issues” to a larger, more systemic issue within the “entire scientific community” (7).

Hope Jahren is a geobiologist at the University of Honolulu, and is the author of numerous articles and books on carbon isotopes of living and fossil organisms. In addition, she has written op-ed essays on the silenced issue of sexual assault and harassment experienced by women in the sciences. In an Op Ed piece she wrote for the *New York Times* in 2014 entitled “Science’s Sexual Assault Problem”, she states,

There is a fundamental and culturally learned power imbalance between men and women, and it follows us into the workplace. The violence born of this imbalance follows us also. We would like to believe that it stops short of following us into the laboratory and into the field — but it does not. I listen to my colleagues talk endlessly about recruiting more women into STEM (science, technology, engineering and mathematics) disciplines, and postulate what the barriers might be. Sexual assault is a pernicious and formidable barrier to women in science, partly because we have consistently gifted to it our silence. I have given it 18 years of my silence and I will not give it one day more (2014).

Jahren’s piece also reinforces the notion that within intersectionality, these issues are interdependent. Her attention to silencing as a pervasive issue to women in STEM reminds us that although the findings in this study are distinct, they often overlap, as instances of sexual violence in STEM fieldwork are an additional component to the systematic silencing of women’s experiences and issues. COME BACK TO THIS

### **Influence of Role Models**

Hope Jahren has attributed much of her devotion to geobiology to her father, and as a child he would bring her to his lab every night after dinner (*Hope Jahren, The “Lab Girl”,* 2016). A wide array of research has indicated that when a student has a mentor or role model of similar gender or racial/ethnic background, “[t]hese figures are believed to provide prototypes that facilitate students’ ability to envision themselves occupying these positions and instill a sense of academic self-efficacy” (Syed et al., 2011, 451). Mack et al. (2013) cites numerous

studies in which the existence of same-gender and same-race role models for students in minority groups often leads to greater “psychosocial support”, and that “widely accepted reasons to explain low levels of representation of women of color include a persistent lack of role models” (2013, 26). When women of color in STEM do not have sufficient role models (as exemplified in the low numbers of faculty members in STEM), an examination of the complexities of gender in relationships

The identification of this same-race, same-gender role model disparity has led to the development of many regional and national measures to identify and highlight mentors and women who have excelled in their fields. SciGirls, an initiative by the National Science Foundation, is a national program aimed at young girls interested in STEM fields. Each episode of the web show displays racially and ethnically diverse girls who are coached by diverse role models in the particular field of study highlighted in the episode (SciGirls at Sea). Gills Club, on the other hand, is a regional initiative in the New England area that focuses on marine biology and brings female role models to young girls (Scientists). Although this specific initiative is relatively new, it’s apparent lack of racial and ethnic diversity in terms of both membership and role models highlighted indicates that there are discrepancies in the understanding that addressing both gender and race/ethnicity may lead to greater retention in STEM.

### **Gender Performance Through Presentation.**

A quick Google search using the keywords “female meteorologist” and “male meteorologist” also shows the blatant gender role expectations for women in the field. “Female meteorologist” results show every single link to an article regarding why “all female meteorologists are wearing this dress!”, whereas “male meteorologist” results show rankings of important male meteorologists and contributions they have made to the field. The invalidation of

women's scientific contributions based on whether they present themselves according to gender norms is not explored in the literature, but has proven interesting to this study. In 2008, NASA recognized Katherine Johnson, an African American woman who made significant contributions to NASA's calculations in the years 1953 until 1986. She is quoted as saying that she was a "computer, when computers wore skirts" (Hodges 2008). Johnson's choice of words speaks volumes to the dehumanization of women in mathematics, as well as referencing a time period during which gender roles were strictly enforced and evaluated on the basis of physical appearance. Gender performance through physical presentation is also a theme that has proven to be discipline specific in the research, highlighting the variability of the experiences of women in STEM.

### Chapter 3: Methods

#### Methodology: Intersectional Feminist Ethnography

Anthropologist James Spradley provides a comprehensive introduction to detailed ethnographic methodologies in *The Ethnographic Interview* (1979). He defines ethnography as “rather than *studying people*, ethnography means *learning from people*” and attempting to understand cultural processes through interviewing (3). The methods of this research falls into the category of what he calls strategic research, which “begins with an interest in human problems” and aims to address problematic cultural phenomena (15). The present issue under investigation is the experiences of women in STEM fields, and while ethnographic methods reveal the inner workings of this phenomenon, a feminist inquiry is critical to dismantling the patriarchal power structures that allow this disparity to continue.

According to a roundtable discussion on Feminist Anthropology held by the American Anthropological Association in 2012, the definition of feminist research is “drawing on methodological strategies that embrace the everyday experiences of people, especially those forced to live on the margins, as epistemologically valid” that aim to stress “equality, intimacy, dialogue, and reciprocity between researchers and participants” (Checker et al., 2014, 408). Feminist activist ethnographer Dána-Ain Davis further comments that, “feminist knowledge production should unravel issues of power and include interventions that help move toward social justice” (Checker et al., 2014, 413).

Intersectionality provides a specific feminist framework by which the unique combination of race/ethnicity, class, gender, and other socially prescribed attributes combine in specific ways and form the basis for the varied experiences of women in STEM fields. Intersectionality theory, as first coined by Kimberlé Crenshaw in 1989 (140), was preceded by



Audre Lorde's examination of her multiple, intersecting identities. Without actually using the term intersectional, Lorde accurately describes the challenges and marginalization of black women during a time of White feminism, where identities other than gender binaries were often excluded from feminist analysis. She writes in her essay, *Age, Race, Class, and Sex: Women Redefining Difference*,

As a Black lesbian feminist comfortable with the many different ingredients of my identity, and a woman committed to racial and sexual freedom from oppression, I find I am constantly being encouraged to pluck out some one aspect of myself and present this as the meaningful whole, eclipsing or denying the other parts of self. But this is a destructive and fragmenting way to live. My fullest concentration of energy is available only to me when I integrate all the parts of who I am... (1984, 242).

These "ingredients" must be examined collectively, as research may contribute to the fragmentation and disregard the experiences of women of color. It is through a combination of ethnographic research methods, feminist analysis, and an intersectional lens that we may learn from women, and particularly women of color, about the experiences and barriers that contribute to underrepresentation in STEM fields.

Talk about this!

Sexism is a culturally learned "belief in the inherent superiority of one sex over the other and thereby the right to dominance (Lorde, 1984, 240). Gerda Lerner's *The Creation of Patriarchy* (1986) defines patriarchy as a system in which male dominance is reinforced through culture and the performance of everyday interactions and relationships. Social phenomena such as sexism and patriarchy result in gender inequality, where male presence and contribution in any context is valued over the presence and contributions of women.

## **Data Collection**

One interview was conducted with each subject, and interviews lasted between 30 minutes to an hour long. Interviews were conducted on campus and recorded for transcription. The UMass Boston Office of the Provost and the Office of the Vice Provost for Research and Strategic Initiatives provided funds for transcription. Interviewees were compensated with a \$15 Amazon gift card, and recruitment strategies were primarily focused on flyers hung around campus as well as an email blast to Honors College students. Interview questions used can be found in Appendix A and Appendix B, including one set of questions modified for student interviews and another set modified to professional/academic interviews. The Internal Review Board at UMass Boston declared this study exempt due to the anonymous nature of the survey questions and minimal risk associated with participation in the study. Interviews with female STEM students at the undergraduate level have been complemented with an interview with a female STEM professor in order to enhance and expand upon STEM experiences beyond the undergraduate level.

### **Situating the Research**

In the academic year 2014-2015, there were more than 16,000 students enrolled at the University of Massachusetts Boston, 58% of whom were women and 46% belonged to a minority group. UMB's Office of Institutional Research and Policy Studies cite that of the entire student body, 17% are African-American, 13% are Asian, and 13% are Hispanic.

The College of Science and Mathematics currently has close to 3,000 students enrolled in one of the sixteen majors that they offer

, and only 35% of the student populations lives in the Metro Boston area, indicating that the remaining 65% are commuting from throughout Massachusetts.

(Office of Institutional Research and Policy Studies, 2014). One would be inclined to believe that due to this degree of diversity, students would be provided with adequate structural resources and support for success, however, the Higher Education Research Institute at UCLA notes that, "...one in five Black students experiences some level of exclusion, and 30% of Latina/os feel some level of exclusion on the most diverse campuses" (2012, 3). Recognizing that this exclusion may have many sources, including stereotyping, or race and power relations in society, it is important to highlight that universities do not exist in a cultureless sphere and are subject to dynamic processes that shape the way in which students experience life on campus.

### **Situating the Researcher**

My identity as a fellow undergraduate student served to reduce power differences sometimes inherent in the researcher – research subject relationship. This is not necessarily to say that the power relations between my subjects and myself were nonexistent or unimportant, but rather **that peer examination provides insight to power dichotomies that exists between students and faculty or other institutional figures**. As a female student, a member of the Honors College, and a working student, I have found that I have much in common with these students. I was also able to learn and gain important insight into the experiences and specific challenges of women of color in STEM, experiences that, as a middle class, white woman in liberal arts studies, I did not have firsthand.

## Chapter 4: Results

When speaking with these intelligent and brave women, I was taken aback to hear repeatedly that they were not in love with their fields, yet were excelling academically and contributing to research in internships and lab positions almost universally. Even more shocking is that each and every student aspires to remain in her major field post-undergraduate, including graduate school and STEM industry. It is not the content of their studies that these students dislike, so what experiences have contributed to the dissatisfaction that many have in their respective fields? It is undeniable that the passion and drive to success exist in each of these students, and their stories are essential when facing systematic perpetuation of gender inequality.

### Demographic Information

For this study, I interviewed seven female undergraduate STEM students as well as one female STEM professor. Six out of the seven students currently attend the University of Massachusetts Boston, and one attends Plymouth State University in New Hampshire. The students' current majors include Biochemistry, Computer Science, Physics, Computer Engineering, and Meteorology and minors include Mathematics, Cognitive Science, Communications, and Creative Writing. Five of these students are also members of the University of Massachusetts Honors College, indicating advanced academic achievements and dedication to their studies. This interview sample is also racially and ethnically diverse, including women who identify as Indian, Vietnamese, Caucasian, Filipino, Venezuelan, Russian Jewish, and multiethnic. National statuses include United States citizens, international students, and noncitizens, and their age ranges are between 19-22 years old. All six of the students who attend the University of Massachusetts cited financial affordability as the primary reason that

they chose to attend the University, which introduces issues of class and socioeconomic standing as an added dimension to intersectional identities.

### **Intersectionality and Accumulated Disadvantage**

*Interviewer:* Do you feel like identifying as female and Indian, do you think that makes a special combination that is different than others?

*Interviewee:* Yes, definitely, because there are a lot of, I guess, additional or exaggerated roles I have as being an Indian female then just being a female.

*Interviewer:* Yes? Like what?

*Interviewee:* Oh, actually, there is another I guess “identity” or something. I am the eldest and my dad was the eldest. So, we have a lot of responsibility at home and things like that. That is a major part of my life, as well, just taking care of everyone else.

This study aims to highlight the danger isolating gender when examining “women in STEM” while simultaneously dismissing other aspects of identity, as the lack of attention to intersectional identity may disregard the variability of experiences and serve to falsely unify women in STEM as universally oppressed in similar ways. This action in itself, according to Torres (2012), “constructs a social imaginary of a ‘universal woman’ within the sciences” (p. 38). Audre Lorde (1984) states in her demand for intersectional feminism,

Certainly there are very real differences between us of race, age, and sex. But it is not those differences between us that are separating us. It is rather our refusal to recognize those differences, and to examine the distortions which result from our misnaming them and their effects upon human behavior and expectation” (240).

Returning to Shanadeen Begay and her use of the phrase “accumulated disadvantage”, the Navajo chemist, exemplifies the complexity of identifying with multiple minority statuses. By

ignoring intersections of minority identities, Lorde argues, (traditionally white) feminists actually oppress women of color by disregarding their experiences as valid and create a false sense of unification.

It cannot be overemphasized that gender, racial/ethnic identities, and other social identities are not mutually exclusive. Of the students interviewed, only one identified as Caucasian, and the remaining six identified as a woman of color or a minority woman. Several students mentioned concrete memories of facing discrimination based on both singular and a combination of social identities. While some of these instances of discrimination do not occur in a university setting and are seemingly unrelated to STEM experiences, they are experiences that nonetheless shape the ways in which students experience day-to-day interactions. It is crucial, when examining experiences within the academy (as the overall purpose of this study addresses issues that pertain to higher education as a specific site of inquiry), to speak to experiences outside the academy as well.

Of the students who did identify as a woman of color, one in particular faces issues associated with her gender identity in her enjoyment of everyday activities. While describing activities she engages with outside of academics, this student addressed her avid interest in biking and the sexism that prevails in her everyday life. She explained,

*Yesterday I went to the bike shop and I wanted rust remover and the guy thought I was asking for the restroom. He didn't think that I would bike and things like that. Or, like people don't take you as serious or they don't think that you know things about a certain topic.*

Daily encounters with sexism and instillments of patriarchy are foundational to examining how students are shaped by these encounters when they are situated as university-specific.

The student interviewed in the quote at the beginning of this section demonstrates that her experiences identifying as Indian, female, and a caretaker at home do combine to create a

complex identity, and these identifiers cannot be teased apart. The same student went on to elaborate on her biggest challenge in STEM, stating that,

*The thing about being a woman in STEM is along with just going along in your career, you also have to think about family. So, I don't know. Then, there were some professors I talk to and they were like, 'Oh, you don't have to worry about that. Those things will happen.' But, ignoring the problem doesn't make it go away rather than... I think they were not well-equipped to understand it, because they weren't in that situation.*

Frustrated that her professors did not understand the personal and cultural significance of a caretaker, this student struggles with the specific intersection of her obligations to familial duties while retaining a STEM identity.

As previously stated, the University of Massachusetts Boston is a commuter campus, and the student body is reflective of students of many age ranges, working statuses, and national statuses. Six out of the seven women I interviewed are working students, and cited having to juggle academic workload, part-time and full-time jobs, as well as domestic responsibilities. One student described significant challenges as a woman in STEM who also lacks citizenship, and due to lower socioeconomic standing that comes with this lack of citizenship, she is unable to access adequate scholarships. She explores her struggle in relating to and maintaining friendships with her peers, and explained to me,

*The group of friends I did meet that first year, they are all white. And they all have the Chancellor's Scholarship. So, if they work then all the money just goes to them or their parents pay for their rent here and stuff like that. Sometimes, I get that whole 'white privilege' kind of thing where they don't really work for their stuff. Sometimes they are just like, 'why don't we see you around anymore?'. I am just like, 'I am sorry, I have to work and I have to study.'"*

This student struggles with the intersection of her lack of national status as well as her class status, as her peers fail to appreciate the impact that the accumulation of her social disadvantages. The aforementioned challenges are unique in the sense that they are not

universally applicable to “women in STEM” as an underrepresented minority, and enhance our understanding of issues that women may face in STEM academia.

### **Engendering STEM Fields and Disassociation with Femininity and Feminism**

*I consider myself a feminist in that sense; not a crazy feminist, not like down man, and go woman, but equality, you don't know who you're talking to.... I don't think it's fair, but nothing too crazy, nothing too crazy, nothing overboard...I don't believe that I suffer from any discrimination just because I'm a woman, not really.*

In their study of *Ethnic Variation in Gender-STEM Stereotypes and STEM Participation: An Intersectional Approach*, O'Brien et al. (2014) cite numerous studies that conclude, “stereotypes that associate STEM with men and masculinity are one of the key culprits that contribute to the gender disparity in STEM participation” (169). Similarly, the inverse of these stereotypes is also pervasive, where hard sciences are associated with masculinity, liberal arts and social sciences are associated with femininity and the “image of woman as passive, inert, and blind” (Torres, 2012, 37). Torres (2012) draws on Sandra Harding's examination of gender equity programs, where she proposes that “equity recommendations, moreover, ask women to exchange major aspects of their gender identity for the masculine version – without prescribing a similar ‘degendering’ process for men” (37). Women's experiences disassociating from the socially constructed image of the passive woman and engendering of STEM fields are essential to our understanding of intersectional identities.

Two students in this study share a specific interest in creative writing, however, they each struggle to balance a liberal arts identity and a STEM identity simultaneously. One student declared that while she majors in Computer Science, her passion lies in video game development. She expressed concern of how she would fit in with other Computer Science majors while exhibiting an interest in reading and writing. She stated,



*Yeah, reading, writing is like my number one thing even though I feel like a lot of Computer Science majors aren't – are more technical, which kind of made me a little worried when I first got into it, because I enjoy writing so much, I enjoy reading. So, but it's just something that I like to do.*

The challenge of balancing a creative, and thus, feminine academic identity with a technical, thus masculine academic identity, prevents this student from pursuing more courses in creative writing in her undergraduate career. The second student differs from the first, as she has declared a minor in creative writing, but expressed explicitly that her interest in creative writing does not coincide with her STEM major. When asked why she studied writing, she responded,

*I have always enjoyed writing ever since I was a little kid. Mostly poetry and short stories. I came here [UMass Boston] and I figured I might as well have something to show for it.*

Instead of elaborating on creative writing as an outlet, this student exemplified a technical justification for her interest, as she demands formal recognition for her interest in creative writing, thus associating her pursuit of a stereotypically feminine academic discipline with a masculine characteristic. In this resistance to embodying stereotypical traits of femininity (i.e. an interest in the arts), these students are attempting to disassociate with

In the response to the question, “Is gender an important identity for you?”, only two out of seven students indicated that gender was an important identity for them, while the remaining five portrayed a consistent disassociation with identifying gender as a construct that influence their day-to-day activities. One student, when asked if gender was an important identity, stated that it was sometimes, but, “*for the most part I don't really think about it. 'People are just people' type of thing*”. Another student stated that she did not think that gender was an important identity and stated that she did not notice a specific ratio of male students to female students in her STEM classes. It is problematic when such a visible disparity is seemingly “unnoticed” by members of the non-dominant group. In an effort to tease out the importance of self-

identification with gender and race/ethnicity, I asked one student how she would introduce herself to someone who was unable to see her. Her immediate response was that she liked to play chess. This could be demonstrative of her wish to deviate not only from gender but all social identities all together when depicting her personhood.

The quote at the beginning of this section serves to exemplify one student's struggle to claim a feminist identity, and in the process, she disassociates herself from the identity altogether by equating "crazy feminism" with "man hating". In predominantly male-spheres, such as STEM fields, it is no surprise that feminism is often vilified and female students are left to grapple with the degree to which they can associate with feminism as well as femininity as a social construct. While portraying her interest in women's issues, this student displayed a fragmentation between her interests in feminism and her desire to also blend into a context that does not recognize or encourage interest in gender equality. This experience begs the question of what it means to be a feminist in male-dominated contexts when feminism and "man hating" are often regarded as synonymous.

Another student demonstrated a similar struggle, and expressed that gender was an important identity for her. She offered, "*Now that I've learned more about feminism it's become more important to me*". She noted that independently reading *The Second Sex* by feminist Simone de Beauvoir in high school influenced her identification with feminism, however, she was also extremely hesitant to approach the topic, and stopped the interview to ask if feminism "counted" as an identity that she associated with. Disassociating with not only feminism but femininity and reinforcing gender-STEM stereotypes is an active site of struggle for these women, and along with the dismantling of gender roles and stereotypes, the imposition of gender stereotypes upon academic disciplines must be deconstructed by feminists.

### STEM as a “Boy’s Club” and the Silencing of Women’s Experiences

*I had like a problem with one of my classes, my –\* class last semester, just being totally disorganized and then not giving us enough time or help or the tests and things, so I went to one of the higher ups in the –\* Department for a meeting. I just did not feel that I was being taken seriously at all even though it was clear that half the class seemed to be failing and things like that, which doesn’t make any sense because I knew these people from other classes and they all are intelligent so why are they – just the quizzes and the homework were not matching up. And then one of the first things he said was, he’s like, ‘Well, are you sure that it’s not just you? Are you sure, it’s like, you’re not understanding the material?’*

\*Department name has been removed to protect the identity of the student

Eileen Pollack’s memoir *The Only Woman in the Room: Why Science is Still a Boy’s Club* (2015) explores what it was like to be the first of two women to graduate from Yale with a Bachelor of Science in physics. In her senior year at Yale, Pollack wrote a column for *The Yale Scientific*, acknowledging issues that women face in male dominated spheres. She wrote about persistent barriers, and quotes her article as saying, “[t]hese incidents may seem trivial. They’re certainly not the stuff of which lawsuits are made. I think we’ve eliminated most of the concrete barriers that have kept women out of physics in the past – obstacles I faced were mainly psychological. But many women must still be prevented from giving in to unfounded anxieties about their ability to study science.’ That I was one of these women the essay neglects to mention” (Pollack, 2015, 129). She elaborates on these anxieties, including the development of an eating disorder, as they are related to her isolation and frustration in her newfound identity.

When speaking with a student who is particularly interested in pursuing a graduate degree in organic chemistry, she was told by her male professor to “*be careful, because it is very much of a boy’s club*”. However, according to the student, her organic chemistry courses usually have an even distribution of male to female students in them at the undergraduate level. She also

pointed out that from her observation, women tended to perform better academically in those classes, and that,

*I think because we tend to work harder, from what I have noticed. I am not sure why that is. Maybe we are just more determined to do really well and get the hell out.*

Pollack recalls responding to a fellow female student who would be graduating at the same time with the same degree, and she states, “[w]ell, if I couldn’t be the first, I would need to be the best” (2015, 106). The overcompensation on behalf of female students to outperform the rest of the class is indicative of more than just a “boy’s club”, it demonstrates that beyond the exceptional academic capabilities of these women, their contributions to the subject are consistently silenced and disregarded.

Another student, when raising a question to a higher department member regarding a professor’s teaching methods was asked, “are you sure it’s not just you?” in question of her academic capabilities, as she was the only individual in the course who raised the issue to the attention of the department. A third student remembers speaking to a male advisor through email, and doubting his advice on the basis of his response. She recounted,

*My first year I was talking to my major advisor and I was like, ‘listen I didn’t take any physics classes yet’. I was trying to finish my Gen Eds and stuff. I was like, ‘Do you think that I could actually be able to finish in four years?’ I don’t remember much of the email, but I did feel like he was saying, ‘Oh no, you need another four years to graduate’ and stuff. Like, ‘you won’t be able to do it’. From what I was reading it felt more like because I was a female more than because I was doing my classes. Like, ‘Oh, you won’t be able to do it, because not a lot of people have’.*

Five students were also eager to share stories of male professors who contributed to poor experiences within a classroom, often citing that they were sexist, racist, made students feel stupid, or did not actively engage with the students to foster an environment where they felt comfortable contributing to class discussion or asking questions. These experiences were

elaborated upon with attention to great detail, indicating the notability and impact of these interactions with male superiors. Four of the women interviewed also expressed distinct memories of feeling intimidated in STEM classes. One student noted,

*It's just sometimes, when I walk in the room, I would just kind of feel – you notice that you're the only one there so... in my bigger classes sometimes it was more intimidating I felt like, for there to be so few women there.*

When asked how they dealt with the intimidation they felt from being a minority in a classroom, many stated that they “just get used to it”. One student was clearly uncomfortable with the topic in general, and when asked about how she deals with discrimination based on her identities, she laughed nervously and said, “I just go about”. Instead of nourishing passion and providing mentorship to female students, male professors consistently question female students’ abilities to “keep up” with their male counterparts while simultaneously silencing female experiences. This attitude could be the greatest contribution to retention of masculine dominance in the field, which as Pollack explores in her memoir, eventually led to her specific discouragement in continuing her education in physics.

### **Gender Stereotyping as a Barrier to Female Participation in STEM**

*I think definitely there was a second where I was sitting down with my dad and we were looking at the list of courses that you have to take for the degree. He goes, ‘This is an Engineering degree. This is going to be really difficult. Are you sure that you want to do this?’ In the moment I was just like, ‘F- yeah, I want to do this!’ It was almost like in a way to prove him and everybody that I could do it. And I did... it kind of motivated to me to be like, ‘Not enough women do it because they think that it is just socially accepted to think that they can’t.’*

Larry Summers’ to the NBER Conference on Diversifying the Science and Engineering Workforce in 2005 demonstrated how a white male in a position of institutional power completely disregarded the work of feminist scholars as well as advancements made on behalf of biological anthropologists, geneticists, psychologists, and other areas of study that have

challenged oversimplifications of biological complexities. His statement on the lack of “intrinsic aptitude” of women contributing to the persistence of women as a minority in STEM positions also served to reinforce antiquated gender stereotypes of female inability to handle the rigor of scientific work, dating back to Mozan’s theory of female brains being “too small for scientific reasoning” at the turn of the 19<sup>th</sup> century (Summers, 2005; Schiebinger, 1999, 23). This statement is problematic for several reasons, however, the primary

Saucerman and Vasquez’s (2014) study on *the Psychological Barriers to STEM Participation for Women Over the Course of Development* identifies a barrier to female participation as the overinterpretation of neuroscience findings. The study concludes,

...although differences in physiology exist, to write off gender differences in STEM participation as an inevitable consequence of biology can be used as an excuse to justify the status quo and can allow members of society to avoid taking action to address social factors that are also significant influences on career choice” (p. 60).

They also state that from childhood to adulthood, overt messaging in socialization processes lead to the widespread belief that women are “naturally” poor performers in STEM fields as compared to their male counterparts (CITATION, 47).

What initially struck me from interviewing these students was their self-perception and valuation of extroverted behavior. Six of the seven young women with whom I spoke described themselves as being “naturally shy”, “withdrawn”, or introverted to varying degrees. Despite their self-identification as individualistic, they actually exhibit contradictory behavior, as the students voluntarily participated in intimate interviews with a researcher they have never met before. Five of the seven students interviewed also referenced having a moment during their academic careers where they acknowledged the difficulty of continuing in their particular field. When talking about an intermediate seminar she had taken with a female faculty member from the Honors College one student reflected upon her experiences in the course, stating,

*I took it last year while I was taking OrgCo [organic chemistry] and I was thinking, 'Oh my god. Can I actually do this?' Not even just as a woman, just like, 'This is hard! Do I really want to go through with this?' She talked a little bit about her struggles in her life. At the end of the day, she said, 'If you want something hard enough, if you work hard enough, you can do anything you want'. I think that really stuck with me, because I am thinking, 'Sure, why not?'*

In these instances, it is evident that to a certain degree, the socialization of gender stereotyping influences the way in which women situate themselves in STEM contexts, and serve to perpetuate a notion that is “normal” for women to have difficulty in STEM or to fulfill stereotypes associating femininity with quite, docile behavior.

The quote inserted in the beginning of this section demonstrates a deviance from typical responses in this study. This particular student acknowledges a stereotype associated with female gender and poor performance in math, and she actively counters this negative stereotyping. She recalls,

*I feel like when you are in middle school and high school it is just like the socially acceptable norm to say, 'Oh, I am not good at math. I hate math. I am not good at that'. And especially for girls, too. I feel like that is even more common for girls. It is almost like not cool in a way to be good at math and to be excited about it. Even for me, I really like physics, but I was never like, 'Oh! This is so awesome!' and getting pumped up about physics, because it is just kind of like a nerdy thing.... I just feel like it is less socially encouraged for girls to be good at math and physics and computer programming and stuff like that.*

Without any prior experience with gender studies or feminism, this student was able to accurately identify gender stereotyping as a barrier, and she later noted that challenging this stereotype was a large influence in impacting her decision to enter a STEM field.

In response to the biggest challenge in her academic and professional life thus far, the female STEM professor noted,

*I think it's the imposter syndrome. Like, I'm not really supposed to be here and I'm – eventually someone's going to see through me and realize that I'm this idiot kid from the reservation that really should never have gotten here. So then it's combating that and recognizing that it is true that sometimes my gender and race will open a door for me, but*

*it's not the thing that enables me to take over the room. And so that's – I have actually earned the right to be at the table. So that's hard, I think that's the biggest challenge is just reminding myself periodically that I do actually belong here.*

The professor reminds us that while she engages with herself and fulfilling gender stereotypes, there are also stereotyping that exists at the racial/ethnic level that may constitute obstacles for women in succeeding in STEM. These two women draw upon their gender identity as a source of empowerment to challenge stereotypes as a barrier to success in their fields, however, this is not a dominant frame of mind for the women in STEM in this research. Further research may elaborate on methods for deconstructing gender stereotyping through socialization as it persists in STEM contexts.

### **Fostering Misogyny Within the Academy**

*Well if you talk to our grad students they'll tell you that they look at people like me and they don't want that life... They don't want to be in academia, they don't want to give up their family, they don't want to – they don't want to make the sacrifices, and so they see academic positions, particularly for women, as something that they are not interested in... it happens at all universities that you know, I hope it's shifting but they're, you know, most women who are in the academic track, when they have a kid they have to stop the tenure track. I mean, it doesn't have to do that, right, and there's just more of a – I think there's still this 1960's 'oh, you've got kids, well we're not going to put you on that committee because you're not going to show up.' Or, 'we're not even going to invite you to go to dinner because you're just going to say you can't because you have babies.'*

There are several contributors to the creation of misogynistic atmosphere within academia. The astounding association between academic contexts and sexual violence and harassment is supported by Clancy et al.'s (2014) groundbreaking *Survey of Academic Field Experiences (SAFE): Trainees Report Harassment and Assault*, which documents the frequency and degree to which female trainees in field research experience sexual assault and harassment as being 3.5 more likely than male counterparts (4). Documentaries such as *It Happened Here* (2015) also highlight this issue, as it follows the stories of five women at the undergraduate level



who challenge their universities for failing to sufficiently punish perpetrators of sexual assault and harassment. Sexual and gender violence in the academy point to power dichotomies that exist in academia, and it's systematic perpetuation is reflected in the inability of the academy to ensure physical safety for its female members.

It is important to note that these themes are dynamic and speak to each other in many ways. As Hope Jahren points out in her Op Ed piece for the *New York Times* entitled "Science's Sexual Assault Problem" (2014), she felt that issues of sexual harassment and assault are perpetuated by the silencing of women's issues in the academy. Silencing, as previously explored, is a theme that proved pervasive to several of the women interviewed for this study, and its presence in academia serves to speak to this fostering of misogyny within the academy.

The lengthy excerpt at the beginning of this section speaks to issues women face as graduate students and faculty members in a university. Without explicitly taking ownership of these experiences, the professor demonstrated her knowledge of and witnessing to sexist behavior within the upper levels of university faculty, including exclusion and inability to maintain successful domestic and STEM identities. She notes that many graduate students also witness this institutionalized patriarchy, and it serves to discourage them from pursuing careers in STEM academia. When asked what can be done to make STEM and the academy a more female-friendly environment, the professor responded,

*There's some silly things, like we have no day care here for our students, like what? We have no breastfeeding and pumping rooms. That's disgusting to me, that you have to when you do that you have to sit in a bathroom and everybody's coming in, you know? So it's – some of it's just infrastructure, you don't even have the basic infrastructure for people to feel welcome.*

Infrastructural accommodations for female members of STEM, whether they be student or faculty, reflects an extremely visible attempt at fostering inclusion in university settings, and it

should be noted that these changes should be implemented along with mandatory training for male members of the academy to ensure principles of inclusion are institutionalized and regarded as necessary to even the highest ranking faculty and administration.

While three students mentioned aspirations to pursue graduate degrees, the remaining four students admitted that they preferred to seek employment within STEM industry and discontinue their studies post-undergraduate commencement. Although most desire employment outside the academy, it is promising that there is a consistent theme of desiring to remain within their respective fields, as female retention in STEM is often attributed to discouragement or “giving up” (CITE THIS?!).

### **Influence of Role Models**

*“You know we didn’t really get each other, so I think the whole time I was there he really wanted me to be someone I was not, and I really wanted him to be someone he was not. He was not – he was probably the most brilliant teacher I’ve ever seen, and he genuinely wanted the best for me, but he didn’t understand me... I don’t know if it came from the – just my family’s history, I don’t know if he just didn’t get me culturally... I know he wanted the very best from me but what he felt was the best for me was definitely not what I wanted.”*

– response from a professor when describing her relationship with her graduate advisor

The findings of this study have shown that there is a significant distinction in the means of support through role models and mentors in their STEM pursuits. The complexity of gender and racial/ethnic relations when in a mentor-mentee context is yet to be fully studied, as Mack et al. (2013) cites that “to date, no theory exists that fully describes the career or identity development of women of color as they relate to the uniqueness of the academic STEM disciplines” (28). To counter this issue, these scholars propose an Entropic Career Identity Development Model (EnCID), which attempts to address demographic factors (components to

intersectional identities), professional development activities, key factors (self, motivation, skills development, career development, and phases of career identity. This model serves to “provide a formative and multidisciplinary framework that holistically considers the intersectionality of multiple identities of women of color, and describes an energized process of career actualization” (Mack et al., 2013, 28). They note that same-sex and same-gender role models provide a tool for which women of color may visualize themselves in higher-ranking positions, aiding the reality of the advancement of women of color in STEM.

The students interviewed for this study displayed a clear distinction between two gendered aspects of mentoring. Male role models are noted consistently as contributing to overall academic success and professional development. Female role models, on the other hand, showed a distinct trend of prescribing to mentorship that corresponded with stereotypically feminine attributes. In reflection of one student’s main sources of mentorship, she stated,

*“So, for example, my mom, my grandma. In the workplace, my supervisor, she’s really nice. I don’t really see her as my supervisor so that’s great. She’s more like a friend and it’s great...She has been one of the persons I reach to...She’s always really there. We have talked about it, she says ‘I don’t pity you, because you’re here alone, by yourself, but I have to protect you in some sense’. So I think it’s great to have that kind of relationship. It’s really comforting to have that support, because I didn’t expect it at all.”*

While this student was able to develop a relationship with a professional in her field of interest, she elaborated not on the professional development, but the informal nature of their relationship.

Another student described her relationship with a former boss, and noted that,

*I did an internship last summer at Genzyme and my boss’ boss was female. She was a really good role model for me. I liked her views on science. She was just really good about it. She was like, ‘Even if you don’t like the work here, I don’t want you to be dissuaded from going into science because of us.’*

Although these students noted that these role models provide both professional and personal development, this model of “emotional support” complicates our understanding of what it means

to be a role model as well as what type of support is necessary to further the advancements of women of color in STEM.

Furthermore, five students responded that they had had fewer than two female professors thus far in their academic courses, and one student admitted that she has never taken a course with a female professor. Students spoke to the idea that female professors exhibited stereotypical gender roles as educators, where they gave off a “mom vibe” and are “more caring” than male professors. This continuation of the theme of “emotional support” may not necessarily be a bad thing in terms of mentorship, however, it may be problematic should “emotional support” become a norm and, thus, expected behavior in female-to-female mentor relationships. It is also noteworthy that three of the students interviewed are the first individuals in their family to attend college, which creates an added dimension of the examination of role models. These students see themselves as the role models for their siblings and noted that they often drive to succeed not only for themselves but also for their families.

### **Gender Performance through Presentation**

*“...people are often surprised to hear that I am a meteorology major. They usually have a big reaction to it, which I am not sure I they would have the same to men in that situation... Yes, they are positive, but they are like, ‘Oh! You are a meteorology major. You must be wicked smart!’ Stuff like that. It is positive, but they just seem so surprised. Like, they didn’t see that coming from a blonde chick that maybe isn’t outright nerdy looking”*

What separates broadcasting meteorology from other STEM fields, where women are often rendered invisible, there is an extremely visible and explicit ownership of a STEM identity. Situating a physical body in that sphere, it is clear that a specific application of the “male gaze” onto women’s bodies that is not apparent in other fields as explored in this study. This theme is of particular interest, as there is little to no existing scholarship on the examination of a STEM

identity as it transcribes to a physical body, and the validation of that STEM identity that is accompanied with the performance of gender. Gender performance theory, as argued by Judith Butler, XXX ( I have not been able to find Judith Butler's book anywhere – I am hoping to purchase it to include some theory).

The misapprehension about gender performativity is this: that gender is a choice, or that gender is a role, or that gender is a construction that one puts on, as one puts on clothes in the morning, that there is a 'one' who is prior to this gender, a one who goes to the wardrobe of gender and decides with deliberation which gender it will be today.

When we say gender is performed, we usually mean that we've taken on a role or we're acting in some way and that our acting or our role playing is crucial to the gender that we are and the gender that we present to the world.

Read more at: [http://www.brainyquote.com/quotes/authors/j/judith\\_butler.html](http://www.brainyquote.com/quotes/authors/j/judith_butler.html)

There is no gender identity behind the expressions of gender... identity is performatively constituted by the very 'expressions' that are said to be its results.

Read more at: [http://www.brainyquote.com/quotes/authors/j/judith\\_butler.html](http://www.brainyquote.com/quotes/authors/j/judith_butler.html)

When discussing a Facebook page dedicated to female broadcasting meteorologists and the unique struggles they face in the field, one woman posted a video of a new camera technique that pans across the set from behind the meteorologist. For men, this camera angle changes little in their performance on the job, however, with a larger emphasis on the individual's rear end, this change shifts the focus from the woman as the scientist to the woman as the object. Dress and proper attire in meteorology, according to this student, is also challenging for women in the field as they are expected to wear skirts and dresses associated with stereotypical female attire with the added burden of concealing a large, bulky microphone pack within tight-fitting clothes. When describing an internship this student completed at a local news station, she stated,

*“The guys have it easy, because they just strap it onto their belt or put it in their back pocket or what not. But, women oftentimes will clip it in the back, but in a lot of studio's you have a situation where you can see the meteorologist's back or they are turning or they are in a three dimensional space, so you see more of them. If you turn, sometimes you can see that they have a bump where their mic pack is underneath their dress. [Name*

*has been deleted for confidentiality purposes] was telling me if you get it in just the right spot, it can look good. It can accentuate your butt and make it look better, but a lot of times you can just tell it is a mic pack. So, she finally made this thing where it straps on in between her legs so that you can't see it at all. It makes you walk kind of funny, but when you are just standing there and taking the few steps in front of the green screen, it looks good."*

In relationship with her situated body, this student's mentor at the new station had to adapt her tight-fitted wardrobe to accommodate a large, bulky microphone pack, which she was able to conceal by strapping it between her legs.

Social expectations for women in this field are rigorous and focus specifically on the physical body through which they must present their findings. As for all female scientists, presentation and performance of gender, and in this case, the "successful" wardrobe, validates the woman's place in the television station, however, it is important to note that this particular situation is subject to "male gaze" expectations of what a woman's body "should" look like.

## Chapter 5: Limitations to the Study/Topics for Further Research and Conclusion

*“Refusing to recognize difference makes it impossible to see the different problems and pitfalls facing us as women” (Lorde, 1984, 241).*

### Limitations and Topics for Further Research

The exploration of the construction of an intersectional identity was limited due to the small-scale nature of the study. Of the undergraduate student body at the University of Massachusetts Boston, 53% of students are 22 and younger, however, 33% are between the ages of 23 and 30 (Office of Institutional Research and Policy Studies, 2014). One area of further research is to explore the experiences of students who do not attend a university directly after high school graduation, and to encompass an age range that is not reflected in the data of this study. The purpose of this study also does not specifically address an extensive exploration of class and socioeconomic standing, leaving yet another area of further exploration for future studies.

In her memoir, Eileen Pollack also documents have felt extreme competition with her female peers while studying at Yale. Although this theme did not prove pervasive in the interviews conducted, one student did state mention that a heightened sense of competition with other women influenced her studies, being one of two females in her major’s graduating class. An inquiry in the construction of the “smartest girl” versus the “smartest boy” may be beneficial in revealing the complexities of gender relationships between females in STEM fields.

Reubs Walsh is an openly transgender academic in the field of cognitive psychology. She states in an article arguing for intersectionality for the advancement of non-heteronormative and trans individuals that, “[b]y reclaiming our identities as marginalized people as a source of perspective and knowledge, and by refusing to separate our personal (‘woman’, ‘feminist’, etc.)

from our professional ('scientist', 'academic', etc.) identities, we disempower the use of the personal to invalidate the professional" (2015, 63). One limitation to this study is that the women interviewed are all cisgendered, whereas the topic of trans and gender fluid individuals in STEM is next to silent in academia. In their study of sexual harassment and assault during fieldwork, Clancy et al. states that "[o]ur results cannot adequately speak to the experiences of people of color or lesbian, gay, bisexual, transgender, or queer/questioning (LGBTQ) individuals because they are under-represented in our fields and therefore our dataset" (2014, 7). It is through the identification of these limitations and areas for further elaboration that the true purpose of research may have revealed itself, which is to generate questions and themes that have not been adequately address by previous research.

### **Conclusion**

In conclusion, the issue presented is that of women's experiences in STEM, and how they can be variable depending on social identities including but not limited to gender, race, class, age, sexuality, and more. There are several barriers to women in STEM, and through intersectional and interdisciplinary feminist ethnographic research, students at the University of Massachusetts Boston and Plymouth State University have provided insight into the contextual issues that women (and particularly, women of color) face in STEM academia. Specific barriers include the application of gender stereotypes to STEM disciplines and an intolerable environment where an association with women's issues and female identity is challenged, the creation of STEM as a "boy's club", silencing of women's experiences, gender stereotyping as it pertains to female experiences in STEM, the creation of the academy as a misogynistic environment, a lack of role models and the complexity of gender and race relations in mentorship, as well as STEM identity as it pertains to a successful presentation of gender. The



experiences highlighted in this research are highly variable and contextually specific, which notifies the reader of the danger of creating a misrepresented “women in STEM” umbrella term, which may serve to further discourage and foster oppressive behaviors against a non-uniform underrepresented minority.

(How in depth should this conclusion go? Should I be reflecting on the research I cited in the lit review thoroughly?)

**Appendix A**  
**Gender in STEM: Persistence at UMass Boston**  
**Student Interview Questions**

Background & Situating UMass Boston

1. How old are you?
2. Where do you live?
3. What is your major?
4. What year of your studies are you in (sophomore, junior, etc)?
5. Was UMass Boston your first choice for universities?
6. How did you choose to attend UMass?

Family Support/Childhood

7. Where did you grow up?
8. Do you have any brothers or sisters?
9. Describe your relationship with your parents/siblings/relatives.
10. What is the gender dynamic in your family?
11. Does your family provide support for your academic career?

Defining Gender

12. How do you define your gender?
13. Are there any other identities that you particularly associate with? (in terms of race/ethnicity)
14. Is gender an important identity for you? Why or why not?
15. Do you feel that you are treated differently because of your gender?
16. Describe any memories of when you were first made aware of your gender.
17. Describe any memories of when you were first made aware of or gender roles in society.
18. How did these memories make you feel?

Defining race/ethnicity

19. How do you identify your race and/or ethnicity?
20. Are there any identities that you associate more strongly with others?
21. How would you rank your identities in order of importance?
22. Do you feel any of these identities combine in specific ways?

Campus Social Support

23. What is your social life like here on campus?
24. What is your social life like off campus?
25. Are there particular people in your major that you have made connections with?
26. Describe your relationships with female students in your major.
27. Describe your relationships with male students in your major.

Academic/Institutional Support

28. Are you a part of any student success groups?
29. Are you a member of any clubs or groups on campus?
30. Describe a typical STEM class to me in terms of male/female ratio?

31. Have you ever been the only female in a class?
32. (if yes) What was that like?
33. Describe your relationships with male professors.
34. Describe your relationships with female professors.
35. Do you have any female role models in your field?
36. (if yes) Why do you look up to this individual?

#### Discrimination

37. Have you ever been discriminated against here on campus because of your gender? What was that like for you?
38. Have you ever felt discriminated against off campus because of your gender? What was that like for you?
39. If yes to above, how did you deal with this discrimination?

#### Concluding Questions

40. What do plan on doing with your degree?
41. What would you say has been the biggest obstacle in your academic career thus far?

**Appendix B**  
**Gender in STEM: Persistence at UMass Boston**  
**Professional/Scholar Interview Questions**

**Background**

1. What is your profession?
2. Where do you currently work?
3. Where do you currently live?
4. How did you choose this profession? – major influences
5. Where did you complete your undergraduate degree?
6. Where did you complete your graduate degree?

**Family Support/Childhood**

7. Where did you grow up?
8. What was that like?
9. Do you have any brothers or sisters?
10. What do your parents do?
11. Describe your relationship with your parents/siblings/relatives.
12. What is the gender dynamic in your family?
13. Does your family provide support for your academic career?

**Defining Gender**

14. Is gender an important identity for you? Why or why not?
15. Do you feel that you are treated differently because of your gender?
16. Describe any memories of when you were first made aware of your gender.
17. Describe any memories of when you were first made aware of or gender roles in society.
18. How did these memories make you feel?

**Defining race/ethnicity**

19. How do you identify your race and/or ethnicity?
20. Are there any identities that you associate more strongly with others?
21. How would you rank your identities in order of importance?
22. Do you feel any of these identities combine in specific ways?
23. How has your racial or ethnic identity impacted your STEM career?

**Transitioning from academia to profession**

24. What were the biggest differences between undergraduate and graduate education?
25. What are the biggest differences between being a female STEM student and a female STEM professional?

**Academic/Institutional Support**

26. Have you ever been the only female in a class?
27. (if yes) What was that like?
28. Describe your relationships with male/female students.
29. Describe your relationships with male/female professors.
30. Describe your relationships with male co-workers.

31. Describe your relationships with female co-workers.
32. Do you have any female role models in your field?
33. (if yes) Why do you look up to this individual?

#### Discrimination

34. Have you ever been discriminated against because of your gender? What was that like for you?
35. Have you ever felt discriminated against because of your racial/ethnic identity? What was that like for you?
36. If yes to above, how did you deal with this discrimination?

#### Concluding Questions

37. What you say has been the biggest challenge in your academic/professional life?
38. What would you say has been the biggest sources of support for your academic/professional life?

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