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Women Not Welcome:
A Study of Gender Inequality and Leadership in STEM
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Abstract

Despite societal advancements in gender equality within the workplace, the science, technology, engineering and mathematics fields continue to be male-dominated today. Not only is there a disparity between women and men in these workplaces, women have been made to feel unwelcome in the STEM industries by the masculinized culture that characterizes these companies and organizations. This masculinized culture brings negative gender ideologies about the female gender which includes stereotypes that doubt the competence and abilities of women. When this masculinized culture is threatened by the presence of women, male employees have the tendency to respond emotionally in ways that alienate their female colleagues. Women in these environments cope with this culture in four different ways: minimizing their feminine traits, altering the way they converse with and behave around their male counterparts, sticking to women-only groups in which they feel safe and comfortable, or leaving the STEM industries altogether and opting for a different profession. Through using the authentic leadership and integral leadership theories, women may be able to confront this issue and make the STEM world a better place for current and future female leaders. This research design proposes a mixed-methods study to gauge participants' responses to their experience with gender inequality in STEM.

Introduction

Discrimination of women in the workplace is not a new phenomenon. In American society, women as a whole have made significant strides in their ability to work, vote, and even earn equal pay as men in some industries. Female leaders hold high-level positions in companies, organizations, academic institutions, and within the government proving that the glass ceiling can be broken. Despite the improvement, gender inequality continues to remain a problem in American society today. 95% of fortune 500 companies are run by men, and women earn 72% of what men earn in the same jobs (Keith, 2017). Studies estimate that the average salary for men in management in the United States is \$70,148 per year while female managers earn \$50,598 per year (Keith, 2017). The discrepancy is even more significant in the science, technology, engineering and mathematics (STEM) industries. Studies show that female employees make up 17% of engineers (Banchevsky & Park, 2018), 24% of computer scientists (Howard, 2017), and 43% of the workforce at major tech companies (Richter, 2018). When it comes to leadership, the numbers are even smaller. In 2015, women held 25% of executive, senior-level and management positions in S&P 300 tech companies (Richter, 2018). In recent years, executive positions in Silicon Valley tech companies have been held by only 11% of women (Howard, 2017). At the entry and middle-management levels, women account for only 19% of tech roles (Cheesman, 2018). In all efforts to increase equity in STEM industries, it is vital that more female and feminine identified people are encouraged to enter these fields.

Literature Review

The topic of gender disparity in the STEM industries cannot be discussed without first laying the foundation for when and how the problem began in American society, and then in the STEM fields specifically. The patriarchal structure of American society is one of the major

culprits. Feminist theory describes patriarchy as a power structure whereby one group of people, men, controls another group of people, women, by holding financial power over the controlled group. The idea of patriarchy draws from Marxist theory and posits that the control men have over women is directly tied to capitalism. In Marxist theory, the division of labor in the household is understood as men being responsible for providing sustenance and shelter for their families while women are responsible for birthing children, raising children, and tending to housework. Thus, men were given the instruments of labor and their position of breadwinners in the household has historically been seen as more important. Additionally, because the responsibilities of women do not directly contribute to the capitalist economy, the role women play is not valued under the capitalist structure of economics. Radical feminist theory rejects the notion that reproductive labor should be considered unpaid labor and that this notion represents the fundamental inequality between women and men regardless of the component of capitalism (Keith, 2017, p. 4). Dual systems feminism argues that the economic system of capitalism and the gender system of patriarchy are interrelated and that the domestic division of labor, discussed above, restricts a women's ability to receive pay when her time and energy is devoted to childbearing and childrearing. Furthermore, this works within the patriarchal structure to keep women economically dependent on men (Keith, 2017, p. 4).

In 2019, women make up a large part of the modern day workforce, however, patriarchal systems can still be seen in the masculinized cultures of male-dominated workplaces wherein attitudes, behaviors, workplace interactions and policies cause women to feel like they do not belong or can be less successful than their male counterparts (Banchevsky & Park, 2018). These masculinized cultures often hold implicit biases about gender that perpetuates stereotypes about women and men. For instance, a common negative stereotype caused by implicit bias is that

women are bad at math and science. Men, on the other hand, have positive stereotypes that their implicitly masculine features of directness and decisiveness make them naturally good leaders. These implicit biases, in turn, lead to gender ideologies which are “prescriptive sociopolitical beliefs about how to approach gender differences in order to avoid intergroup conflict and hostility (Banchefsky & Park, 2018, p. 2).” Since men are depicted as more powerful or capable of handling positions of power, they will typically have the ability to make hiring decisions. As a result of the negative gender ideologies previously described, women may feel forced to downplay their abilities to reduce threatening the man’s roles and ensure her employment. Studies on negative gender ideologies show that the two prevailing approaches to gender diversity in male-dominated environments are “assimilationism or segregationism- the idea that women should assimilate to the masculine culture if they wish to be included, or not join at all (Banchefsky & Park, 2018, p. 4).” However, as seen across time, even when women play into these expectations they still aren’t perceived as positively as men for the mere fact they had to alter their being in order to be accepted.

The representation of women in STEM has ebbed and flowed throughout the decades. During World War II, when American males left their homes and their jobs to fight overseas, the government encouraged women to take on wartime jobs to fill in the vacant positions. Hundreds of these jobs were in the STEM fields, and as a result, in the 1940s and 1950s, there was a significant amount of female computers and programmers (Little, 2018). When men returned from the war, they were unable to reclaim these computing and programming positions because they did not have the training or skill set required to use the equipment or complete the calculations. In fact, computer programming was a skillset thought to come naturally to women as it required patience and attention to detail (Eveleth, 2013). One of

the most well-known examples of women in STEM during World War II is the group of Black human computers of NASA, recently given renewed recognition in the book and film, *Hidden Figures*. In the 1950s, four Black female mathematicians at Langley Memorial Aeronautical Laboratory in Hampton, Virginia were recruited to assist in calculating figures to launch rockets that ended up contributing to America's victory in the Space Race during the Cold War (Lee Shetterley, 2016). These women also helped lay the foundation for computer programming as we see it today.

In the 1960s and 1970s, the world saw many technological advances but none more impactful than the development of personal computers. Technology was becoming more compact, affordable and available to consumers. For the first time, technology such as personal computers, printers and memory such as floppy disks were being marketed directly to consumers to purchase for their homes ("7 Tech," 2016). With this tech explosion, leaders of large tech companies became desperate for employees who could be hired on immediately to perform more and more programming jobs. Personality and aptitude tests were developed by psychologists to profile the type of individual capable of performing computing jobs and the results of the test determined that the only people generally qualified for the type of skills required to be a programmer were largely antisocial (Chang, 2018). Because women generally tend to be more social, outgoing and family oriented, they did not fit the programmer mold. This became a self-fulfilling prophecy as more "nerdy white men" began to fill programmer positions, and fewer and fewer women were interested in applying (Eveleth, 2013). In reality, these large tech companies wanted to elevate the position of programmers to be more exclusive and male-dominated. "Ads began to connect women staffers with error and inefficiency. They instituted math puzzle tests for hiring purposes that gave men who had taken math classes an advantage

(Eveleth, 2013, para. 4).” Another incident occurred in 1973 that caused countless of women in STEM to feel alienated from their male colleagues. Researchers at the University of Southern California Signal and Image Processing Institute were testing out a new image processing technique and needed a new test image different from the stock images they had already exhausted. One of the researchers grabbed a photograph from the centerfold of a nearby Playboy magazine depicting model Lena Söderberg in a risqué pose. The image became iconic and widely used in image processing due to its “mixture of detail, color, shading, focus, textures, reflections and flat regions that allow testing of multiple algorithms. These algorithms range from edge detection to denoising and even include shrinking the image down to the size of a human hair (Matthews, 2015, para. 5)” yet it became controversial among female computer science students because the image itself promoted the objectification of women and their negative reactions toward the image made them feel unjustified in their feelings and isolated from their male classmates (Chang, 2018). Thus, causing further division between men and women entering the STEM workforce. Although, it won’t always be this way.

Nowadays, women make up a significant amount of the workforce in STEM from entry level positions to senior-management and leadership positions of S&P 300 tech companies. In higher education, female doctors hold tenured faculty positions and author books on emerging STEM research and discoveries. Unfortunately, the reality is that a majority of positions are still held by men. This disparity in numbers negatively affects women in a number of ways. Perhaps the most significant way that women are impacted is through the sexual harassment they experience in the workplace. Sexual harassment is defined as unwelcome sexual advances, blocked access to promotions, and doubts of legitimacy or competence (Dresden, Dresden & Ridge, 2018). In 2017, a sociopolitical sexual harassment awareness campaign called the

#MeToo movement developed as a result of sexual harassment accusations brought forth in many different industries that shed light on harmful behavior. Because one of the industries at the forefront of the #MeToo movement was the entertainment industry, it garnered extensive media attention. The phenomenon seemingly sprung forth overnight and the next day, dozens of female celebrities, models, politicians, and newscasters began to share their stories on social media and expose their attackers publicly. The STEM industries were not immune from this coverage and men from the highest ranks in Silicon Valley tech companies to faculty members in Ivy League schools were accused of propagating sexual harassment within their workplaces (Williams & Massinger, 2016). In an interview about her book, *Brotopia*, Emily Chang explains

“Bad behavior has been tolerated and normalized for far too long. And people simply have a narrow idea of who can do these tech jobs. If you’re a woman in the tech industry, you’re the only woman in the room over and over again (Tam, 2018, interview section, para. 6.)”

More than a year has passed since the start of the #MeToo movement and Silicon Valley tech companies are still dealing with the fallout. This has impacted female STEM employees in a couple of different ways. In companies in which a sexual harassment case was brought to light but punishment was not enacted, women are either leaving these companies or refusing to join altogether. For the men in these companies, trends have arisen wherein male executives are afraid to be alone with female colleagues in meetings, in mentorship relationships, at business lunches and dinners and on business trips. The reason for this fear is justified, but the female employees are paying the price. More male-only meetings are taking place behind closed doors while the female counterparts are excluded from being involved in company operations and decisions (Vigo, 2019). As a result, women are isolated while men have the opportunity to

perpetuate the culture of sexual harassment and assault without consequence. In the wake of their awareness, women find ways to grapple with this unjustified reality.

Women have been shown to cope with the gender differences in their workplaces in four distinct ways: downplaying their femininity, neutralizing gender differences through discursive positioning, sticking to women-only circles, and leaving the STEM industries altogether (Alfrey & Twine, 2017). Each of these coping mechanisms will be broken down further in the next few paragraphs. The first coping mechanism of women downplaying their femininity is exhibited in a few different ways. One of the most common ways is through their appearance. Many women in STEM choose to dress less femininely, wear simple hairstyles and wear less makeup. In fact, studies have shown that genderfluid women tend to be more successful and taken more seriously among their male colleagues (Alfrey & Twine, 2017). Along these same lines, transgender men are more often seen as “one of the guys” and rewarded with higher pay, more authority and power compared to their cissexual female counterparts (Alfrey & Twine, 2017). Another way that women downplay their femininity is by publishing their work in tech journals, magazines and online media under male pseudonyms. In doing this, female authors hope that their work will be read without bias to avoid misogynistic criticism of their work. In one study, a female author published an article under a male pseudonym and it garnered high praise. Six months later, she re-published the same article under a different title and a female pseudonym and readers reacted to the article with criticism that the article was technically incorrect and useless (Jacobs, 2007).

The second coping mechanism that women utilize to cope with the gender differences in the workplace is through discursive positioning (Alfrey & Twine, 2017). Discursive positioning is a theory within the psychology of interpersonal encounters. Positioning embodies individuals’

everyday participation in communicative events involving one or more other individuals (Harré et al, 2009). Positioning includes not only language one uses but also other nonverbal behaviors and activities such as direction of gaze, posture, and gestures. In conversation, positioning can be seen in both implicit and explicit practices (Harré et al, 2009). While not outwardly expressed, discursive positioning can be used to convey “idiographic implicit/explicit practices implying powers, abilities, or status levels which support ascriptions of duties; and vulnerabilities, incapacitations, social deficits, which, in turn, support rights-ascriptions and claims (Harré et al, 2009).” Women in male-dominated environments may use discursive positioning in their language and nonverbal behaviors to appear more likeable by their male colleagues. For example, in meetings, women may intentionally or unintentionally speak in ways that come off as neutral or non-offensive especially if they are proposing an idea or asking for something.

The third coping mechanism is to stick to women-only circles within the STEM industries (Alfrey & Twine, 2017). These can include female-run startups, nonprofits that specialize in women in tech, attend conferences specifically for females in tech, or even spending time with other women employees at work. Because women see these circles as safe spaces, a culture of collaboration can be fostered and women are able to hold one another accountable in a way that is different than a male and female colleague could. In her essay, *The Barriers Women Face in Tech Communities* (2007), Gloria Jacobs writes,

“Awareness of and accountability for behavior in women’s groups means a lot more than just safety from sexual harassment, or discrimination. It means that if one is treated unfairly or harshly in any manner that a person finds offensive, the entire community will

hear your claim. They will give you advice, opinions, and will collectively decide if action should be taken. (p. 9)”

Within these female-only groups, women do not take antagonism and will vote out members who do not contribute to the success and purpose of the group (Jacobs, 2007).

The final way that women cope with the issues that working in a male-dominated workplace bring is by leaving the STEM industries altogether. This is often referred to as the ‘leaky pipeline.’ Jacob Clark Blickenstaff (2005) explains this phenomenon as “The effect of differential leaking is to create a sex-based filter that removes one sex from the stream and leaves the other to arrive at the end of the pipeline (p. 1).” While nobody has consciously decided to filter women out of STEM, Clark-Blickenstaff explains, the cumulative effect of these factors has undoubtedly contributed to the gender imbalance we witness today. In some cases, women leave their STEM jobs to devote all of their time and energy to childbearing and childrearing. In other cases, women leave STEM and go to other industries that are less male-dominated, or generally more accepting of women employees.

Problem Statement

My overall premise for my research design is that there is a disparity between the amount of women and the amount of men who work in the science, technology, engineering and mathematics (STEM) fields, especially within leadership positions (Richter, 2018). I have purposefully chosen to base my research on the STEM fields and not STEAM (science, technology, engineering, arts and mathematics) because the gender disparity in STEM is more significant than in STEAM. Drawing upon feminist theory, historical evidence of STEM organizations in America, and the current academic literature regarding this topic, I have identified several factors that contribute to this phenomenon. First and foremost, the social

system of patriarchy in which men hold primary power and predominate roles of leadership and authority in order to keep women financially dependent on men and out of the economy and the workforce acts as a base for the way that male-dominated professions like science, technology, engineering and math function to this day (Keith, 2017). While it cannot be denied that, at least in America, women have more rights and power in 2019 than in the past decades, there are still subtle and, often times, unconscious ways that the patriarchy works to keep women oppressed. One of these ways is by the masculinized cultures that male-dominated environments continue to reinforce through beliefs, values, and traditions. Within these masculinized cultures are negative gender ideologies about women that elicit negative stereotypes that women are not as capable of performing the same job as men (Banchefsky & Park, 2018). When these roles that have historically been held by men are threatened, men react in several different ways. Two common ways that men react to the perceived threat of women are assimilation and segregation- the idea that women should either behave more like men or try to fit in with the male group, or that women should be excluded altogether (Banchefsky & Park, 2018). The culmination of all of these factors results in work environments where women do not feel welcome, and cannot easily thrive as professionals compared to their male colleagues.

The issue of gender inequality in the STEM fields is problematic for several different reasons. The first issue I see with this is that by making the STEM fields unwelcoming for women, STEM companies are silencing potential leadership voices. Women make up roughly half of the world's population. Excluding women from leadership roles and blocking their access to promotions does not allow for organizations that are truly democratic and progressive (Alfrey & Twine, 2017). Without diverse views and opinions, male-dominated organizations cannot compete with more innovative and progressive companies during these changing times.

The second problem is that by keeping STEM environments largely homogenous and masculinized, these companies and organizations are setting a poor example for future generations of female leaders (Milgrom-Elcott, 2018). In doing a quick scan of the available literature regarding women in the workplace and female leaders, a common theme that frequently arises is that instead of fostering collaboration and support, it is more common for there to be in-fighting and competition within women. Since there are so few women in STEM to begin with, pitting women against one another perpetuates the issue of gender inequality as well as the stereotype that women in STEM must be more masculine-presenting in order to be taken more seriously by their male counterparts. In 2019, many k-12 schools are making a concerted effort to promote more initiatives both in the classroom and in extracurricular activities to teach kids STEM, including programming and coding (Milgrom-Elcott, 2018). This means that young girls now have the opportunity to learn the exact same curriculum and gain the same specialized set of skills as their male classmates. Instead of growing up and thinking that they can only have professions held historically by women, these girls can strive to become senior programmers, software developers and CIOs of their own tech companies but if the STEM fields make them feel unwelcome simply because of their gender, they may elect to choose professions that are female-dominated instead. In relation to the previous point, the last problem that stems from gender inequality that the pervasive masculinized culture in STEM fields does not allow for positive gender ideologies. Unless this culture changes, negative gender biases and stereotypes regarding women will continue to exist in STEM environments as unspoken cultural norms.

Purpose Statement

My purpose with this research is to use my conceptual framework regarding the inequality of men and women in STEM, informed by my literature review, the historical context of female oppression and feminist theory, and my personal experiences as a woman in STEM to design a survey to test the validity of my conceptual framework. My aim in conducting this survey is to observe women who currently work in STEM to see how their experience compares or contrasts with the overall statements within the current literature surrounding this topic. In doing this, I will discover whether or not the current literature is a satisfactory representation of the experience of the majority. Using the data gathered from my survey and the information from the literature, I will connect the Integral Leadership and Authentic Leadership theories to the current issue and use the findings of these two theories to ideate on how we can make the STEM industries better work environments for current and future female leaders.

There are several questions this study is designed to answer. First and foremost, I would like to be able to answer the question “does gender inequality in STEM exist, and is it an issue for women?” Another question I pose in my research is what type of support system women in STEM have. Do they have other female colleagues that they work directly with, and what is their relationship like with these individuals? Have my participants experienced sexual harassment in their workplaces and, if so, how many times? Have the participants engaged in any of the four coping mechanisms outlined in the literature- downplaying their femininity, using discursive positioning when interacting with their colleagues, sticking to women-only circles or leaving STEM altogether? Do the participants feel safe at work, and what would make them feel safer? Lastly, what are the biggest challenges they face and what would they change about these challenges?

Some of the central concepts and key terms used throughout this study are gender, female, position, downplay, and safe. Gender is the range of characteristics pertaining to and differentiating between masculinity and femininity. Female is the gender characterized by predominantly female traits; for the purposes of this study, it is assumed that those who identify with the female gender are women. Position is used to refer to the title, responsibilities, duties and roles that one fulfills when they are at their place of work. The term downplay is used in the study as a verb to minimize or make something appear less significant than it really is. In the study, I ask the participants to define what the word “safe” means to them, however, for the purposes of the study, the term safe generally means protected and not exposed to danger or harm.

Significance of Study and Rationale

The topic of gender inequity in STEM is important to me for three main reasons. The first reason is as a feminist, women’s equality is paramount to everything that I value. In her book, *We Should All Be Feminists* (2014), Chimamanda Ngozi Adichie says,

“Gender matters everywhere in the world. And I would like today to ask that we begin to dream about and plan for a different world. A fairer world. A world of happier men and happier women who are truer to themselves. And this is how to start: We must raise our daughters differently. We must also raise our sons differently (p. 25).”

American society is on a precipice of becoming more gender-inclusive than ever, but we still have a long way to go. To me, women’s equality is not about taking power away from men, but sharing the power more equally with women. Researching this paper gave me an opportunity to take a deep dive into feminist theory, which I found both fascinating and disheartening. I have been lucky enough to grow up in an era of opportunity and privilege for women because of

feminists who fought for women's rights. Though progress has been made, the fight continues, not against men but against the systems in place that perpetuate inequality and injustice for women.

The second reason I chose to study this topic is because I have the personal experience of being a woman in the professional STEM industry of technology for almost 10 years. While I have generally been fortunate enough to work alongside men who are compassionate and inclusive, much of my experience aligns with the overall themes found in the literature review. One aspect that I found particularly resonate was that women in STEM are often blocked for promotions and opportunities. I have been working in the Information Technology Services department at the University of San Diego since June of 2014. Since the day that I started my position, I stood out within my team. I was hired as a temporary worker on a ninety day evaluation period, and when the end of that period came I had surpassed both of my male seasoned colleagues in performance and customer satisfaction. Over the next three years, I remained a high performer on my team. I took the initiative in learning new skills and sharing the information with my colleagues. My work ethic spoke for itself in my yearly employee reviews. When my manager resigned in 2015, a reorganization of positions in my office was set in motion. The lead position was vacant and I asked what I needed to do to fill it. I was told that there was not enough money in the budget for the position and that I needed to be patient. Meanwhile, I watched both of my male colleagues propel into promotions while I essentially ran the Help Desk single handedly for the next 8 months. In October of 2017 I was told to edit my resume and draft a cover letter as the lead position was opening. I had been performing the duties of the lead since the position was vacated, but without the pay or title change; I assumed it would be a sure thing. The position was never opened, and a few months went by until I

confronted my manager about this. I explained to him that I had been in the same position for four years and that I deserved a title change, at the very least, so that I could put it on my resume to prove professional growth. He belittled this, saying that the title did not make me a leader, my actions did, and that I did not need a title change to prove my worth but he did agree to bring it up to the senior director, who is also a woman. Finally in October of 2018 I got the promotion and a pay raise alongside it. My female senior director was my champion. I should have asked her about it from the beginning instead of going through the proper, male, channels. All of this is to say that I experienced firsthand being blocked from promotions, being given fewer opportunities for growth than my male colleagues and being paid less.

The third reason that this topic is so important to me is because during my time in the Masters of Arts in Leadership Studies program, women in leadership has been a topic of leadership studies that I am deeply passionate about. For decades, leadership theory was dominated by trait theory which stated that individuals could only lead if they had a specific set of traits: biologically male, tall, strong, and assertive to name a few (Nahavandi, 2015). Fortunately, the leadership field as a whole has come a long way from trait theory and it is now generally accepted that everyone has the potential to be a leader regardless of their gender, status or role. In *We Should All Be Feminists* (2014), Adichie says,

“The person more qualified to lead is not the physically stronger person. It is the more intelligent, the more knowledgeable, the more creative, more innovative. And there are no hormones for those attributes (p. 17).”

Yet, while leadership theories have become more sophisticated and gender-inclusive throughout the recent decades, society as a whole still struggles with embracing female leaders. In my classes at University of San Diego’s School of Leadership and Education Sciences (SOLES), I

have been surrounded by female classmates and professors and the idea of female leaders was widely normalized and accepted by everyone in the program. Questioning gender norms was not only tolerated but encouraged, and female students were urged to use their voices and speak up for themselves. In the three years I have spent in SOLES, my cohort witnessed the near-election of Hillary Clinton, the first female presidential candidate nominated by a major party, and the #MeToo movement which brought female leaders as well as taboo issues of discrimination and gender inequality out of the shadows and into the societal spotlight. This encouraged lively and intellectual discussions in my leadership classes and provided an outlet for me to process these current events through a leadership lens. Unfortunately, I realize that SOLES is not representative of the majority of higher education or corporate environments. I will face a challenge when I graduate from the University of San Diego and enter into STEM organizations where female leaders are not embraced; but because of my time in SOLES and the women role models I have met, I know I am prepared to take up my leadership and respond in hopes that I can inspire other women to not only join STEM, but to proudly wield their leadership abilities and continue making STEM environments more comfortable for women employees.

Methodology and Methods

The philosophical approach I have taken to design my study is a blend of post-positivism, interpretivism, social constructivism and feminist theory. The post-positivism approach stemmed from my desire to examine the causes that influence outcomes (Creswell, 2003). In this case, to examine the cause of gender inequality in the STEM fields as we know it today. Feminist theory ties in with my philosophical approach because the oppression of women sparked the feminist movement initially, and because the oppression of women through the social system of patriarchy is an overall cause of gender inequality everywhere (Keith, 2017).

The philosophical lens of interpretivism and social constructivism applies to my study because these two perspectives maintain that the way in which individuals make sense of the world is subjective and purely derived from their experiences (Creswell, 2003). While the issue of gender inequality in the workplace is socially-constructed (Banchevsky, Park. 2018), it cannot be denied that, for generations, women in the STEM fields have shared similar experiences. In my study, I sought to design questions that would capture the subjective experiences of the participants to identify common patterns and themes and acquire a fuller picture of the societal contexts that influence the larger issue in order to form my conclusions on the issue.

I also strove to apply my findings from the literature review to two different leadership theories in order to determine how applying these theories might be able to change the way we as society attempts to interact with and address the issue. The two leadership theories I chose are authentic leadership (AL) and integral leadership theory (ILT). Authentic leadership is a theory that describes authenticity as the act of “owning one’s personal experiences, including one’s thoughts, emotions, needs, desires, or beliefs (Gardner, Cogliser, Davis & Dickens, 2011, p. 1121).” Being authentic includes cultivating self-awareness and aligning with ones values, which can enable leaders to lead their followers more effectively. This particular style of leading is characterized by the self-regulation of one's own thoughts and feelings, positive modeling, relational transparency and behaving authentically (Gardner, Cogliser, Davis & Dickens, 2011). I believe that when leaders are able to express their own unique leadership identity and style, followers feel inspired to do the same. This has nothing to do with gender, and everything to do with the personalities and passions that people bring into work each day. When people feel encouraged to show up authentically at work, they are more likely to want to collaborate with their teammates and produce high-quality work.

Integral leadership theory by Ronald Heifetz and Martin Linsky is a methodology for working with individuals and teams in order to create sustainable leadership throughout every level of the organization that brings about significant and lasting change. In this theory, the authors identify two types of change: adaptive change and technical change. Adaptive change is needed for problems where an obvious solution is not present. This is the more difficult type of change because it requires questioning the deeply-held beliefs and values of the stakeholders involved to get at the core of the issue and dismantle it. In *Leadership on the Line* (2002) Linsky explains that

“You place yourself on the line when you tell people what they need to hear rather than what they want to hear. Although you may see with clarity and passion a promising future of progress and gain, people will see with equal passion the losses you are asking them to sustain (p 12).”

Technical change is easier because the solution to the issue has been identified by known experts of the issue, and a clear plan of action can be implemented in order to resolve the issue.

Adaptive challenges require adaptive leadership, which requires emotional intelligence, organizational justice, adherence to one's character, and lifelong development of oneself and others (Heifetz & Linsky, 2002). Heifetz emphasizes this in *Leadership on the Line* (2002) by saying “the challenge of leadership when trying to generate adaptive change is to work with differences, passions, and conflicts in a way that diminishes their destructive potential and constructively harnesses their energy (p. 102).” While this style of leadership requires skill and strength, it has been proven to be the most effective type of leadership when attempting to tackle adaptive challenges, such as the problem of gender inequality in STEM. With enough awareness

and practice, women throughout every level of the organization can learn how to practice adaptive leadership to create sustainable change for their companies and organizations.

The purpose of my study is to poll individuals who identify as female and work in any of the science, technology, engineering and math industries to determine if the conclusions of the current literature apply to professionals today. In order to conduct this observational study, I have designed a mixed methods instrument. The instrument is a twenty-five point survey which will be given to a targeted group of participants. The survey has been written using the Qualtrics survey platform and will be distributed electronically by email using a generic link so that each participant who takes the survey will remain anonymous. The intention in doing this is that by maintaining anonymity rather than confidentiality, participants will feel more comfortable and be more likely to share their experiences truthfully and candidly. Additionally, some of the questions asked in the survey are sensitive in nature and may trigger emotional responses from the participants. I will start by emailing the participants ahead of time to inform them of my study and ask them for their participation. I will explain the purpose of the study, my intentions and what they will be expecting to receive next. I will follow this email up a week later with an actual link to the survey. I will then check the survey results every day to see how many responses come in, and depending on the volume I will send out periodical reminder emails to individuals who have not yet taken the survey.

The population sample group for the study was decided upon using the non-probability sampling technique of judgmental or purposive sampling. The reason for this is because the participants will be chosen specifically based on a set criteria, discussed above, which I believe will provide me the types of responses I am looking for. While I have designed my study, I have not conducted my study due to time and resource limitations. That being said, my proposed

population sample, distribution methods and statistical analysis are purely hypothetical and I will be describing my intentions for if I was to formally conduct my survey. After proposing my study to the Institutional Review Board for the University of San Diego and acquiring all of the approval necessary to proceed with conducting the survey, I will administer my survey to females employed in STEM in San Diego within the higher education and corporate sectors. For the higher education sectors, I will distribute my survey to all female full-time and adjunct faculty members of the science, technology, engineering and mathematics departments within the three largest universities in San Diego: University of San Diego, University of California San Diego, and San Diego State University. For the corporate sectors, I will distribute my survey to all female employees in three of the largest STEM companies in San Diego: Illumina, Qualcomm and General Atomics. The target age range of my participants is the typical age of working professionals which is generally ages 20-65.

The survey is comprised of both open and closed-ended questions. The first set of questions are demographic in nature. The following questions have to do with the participants' experiences at work, specifically their position, management, co-workers and overall office culture. The final questions ask participants to share their personal narratives of gender inequality and discrimination in the workplace. Since most of the questions are qualitative, I would first collect the responses and export the data into one database so I can easily read all of the responses and look for common themes. Upon noticing the same words or phrases appear in multiple responses, I would create a code for these words or phrases. For instance, if I see the theme of "being excluded from meetings" arise in several of the participants' responses, I would code this theme as "exclusion." Once I have generated all of my codes, I would use a qualitative analysis software to generate statistics from those patterns and themes. Once those statistics

have been generated, I can use my findings to support or refute knowledge claims within the literature review.

Interpretations

Since I am not actually conducting my study, I do not have findings on which to draw interpretations and conclusions. That being said, I can speak to the limitations that I observe within the literature review, and the possible limitations that I can see arising from my research design. The primary limitation of the literature review that I need to note is that the data collected from the studies on gender equality cannot be generalized to the culture of STEM organizations everywhere. Many of the studies conducted were carried out for small population samples. For instance, the study on negative gender ideologies was done with undergraduate students at a handful of public higher education institutes. While the findings of the study were significant, based on literature reviews regarding gender ideologies and can likely apply to a number of male-dominated workplaces, they can only be generalized to the environments in which the studies took place. Furthermore, I personally know a number of women and men who work in corporate STEM environments and their experience of gender inequality in their workplaces is very different than the overall experience discussed here. Another limitation of my literature review is that the articles I chose to reference are not from 2019. Even though the bulk of the literature is current from within the past decade, the amount of women in the workforce changes rapidly from year to year and my findings may no longer be accurate. Another gap that I found in the research is that while historians show that there were hundreds of women employed in STEM in the 1940s and 1950s, there are equal amounts of articles that explain how these women were not recognized for their efforts until very recently. One article, in particular, shows photos of women in a 1950s computer lab. For decades, it was assumed that

these women were models and it was not until recently that it was realized that these women were the actual programmers of the machines (Little, 2018).

As it pertains to my study, I know that the results that I garner from my survey cannot be applied to the population of every woman in America who works in STEM since the sample I am surveying is small. Even if I distribute the survey to thousands of participants, I have no guarantee that I will get results. One way of combating this limitation could be to offer an incentive for completing the survey in the form of monetary compensation. Since I am conducting this study on my own and not part of a research team or organization, I do not have the budget to offer that incentive. Another way to ensure participants take the survey is by promoting the inherent value of the survey by using a rhetoric that appeals to the participants' pathos, ethos and logos, or emotions, credibility and logic. By emphasizing the value of the survey and the positive impact that it could have on women in STEM, it is likely that I will get more responses to the survey than if I were to distribute the survey link with little to no explanation.

Conclusion

Despite societal advancements in gender equality within the workplace, the science, technology, engineering and mathematics fields continue to be male-dominated today. Not only is there a disparity between women and men in these workplaces, women have been made to feel unwelcome in the STEM industries by the masculinized culture that characterizes these companies and organizations. This masculinized culture brings negative gender ideologies about the female gender which includes stereotypes that doubt the competence and abilities of women. I recognize this as a problem because it silences the voices of women who may not have the opportunity to climb the leadership ranks within STEM. By only electing males to leadership

positions, these companies and organizations are missing out on the possibility of diverse and innovative points of view. Another issue is that this is setting a poor example for school-aged girls today and a precedent that if these girls want to be successful in STEM they are going to encounter many challenges to get there. A third issue is that in allowing the STEM industries to remain male-dominated, the toxic masculinized culture will remain pervasive within these fields and the cultural norms and negative gender ideologies will continue to go unaddressed.

I want to change the world. More importantly, however, our sons and daughters growing up in 2019 want to change the world. In her 2018 article, *Girls, If You Want to Change the World, Try STEM*, Talia Milgrom-Elcott writes, “To increase gender diversity in STEM, there’s a latent, untapped opportunity staring us in the face: girls’ strong desire to change the world. We just need to help girls connect the dots between changing the world and STEM (para. 2).” I believe that by embodying the characteristics of Authentic Leadership and taking an adaptive approach as outlined in the integral leadership theory, male and female leaders today, as well as male and female leaders of tomorrow, have the opportunity to start making changes toward a better future and, ultimately, a better world. Through raising awareness of this issue and initiating difficult conversations within our workplaces, as well as providing the younger generations of women the leadership tools they need to thrive in the STEM environments, we can balance the scales of equality and make these places welcoming for everybody.

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Appendix A

Capstone Survey

Survey Flow

Block: Demographic Questions (5 Questions)
Standard: General Work Questions (8 Questions)
Standard: Co-worker Questions (3 Questions)
Standard: Feelings Questions (9 Questions)

Page Break

Start of Block: Demographic Questions

Q1 What is your current age?

Q2 What is your gender?

- Male (1)
- Female (2)
- Non-binary (3)

Skip To: End of Survey If What is your gender? = Male

Q3 What is your race/ethnicity? Select all that apply.

- White/Caucasian (1)
- Hispanic/Latino/Spanish (2)
- Black/African American (3)
- Asian/Asian Pacific Islander (4)
- Native American (5)
- Other- please specify (6) _____
-

Q4 What is your current marital status?

Married (1)

Widowed (2)

Divorced (3)

Separated (4)

Never married/Single (5)

Q5 Do you have a child or children?

Yes (1)

No (2)

Other- please specify (3) _____

End of Block: Demographic Questions

Start of Block: General Work Questions

Q8 What is your position/job title?

Q9 How long have you worked in your current position?

Q28 How long have you worked for your current company?

Q29 Which STEM field do you work in?

- Science (1)
- Technology (2)
- Engineering (3)
- Math (4)

Q10 How long have you worked in this field?

Q18 Rate your position from "entry level" to "upper manager" (1 = entry level, 5 = upper management)



Q11 What do you like about your job?

Q12 Describe one initiative you have championed in your role to improve something about your team, department or company?

End of Block: General Work Questions

Start of Block: Co-worker Questions

Q13 How many female co-workers do you have?

- 0-3 (1)
- 3-6 (2)
- 6-9 (3)
- 9+ (4)

Q15 How many female managers do you have?

- 0-3 (1)
 - 3-6 (2)
 - 6-9 (3)
 - 9+ (4)
-

Q17 How many female employees are typically present in team meetings, including yourself?

- 0-3 (1)
- 3-6 (2)
- 6-9 (3)
- 9+ (4)

End of Block: Co-worker Questions

Start of Block: Feelings Questions

Q19 To what extent have you experienced the following?

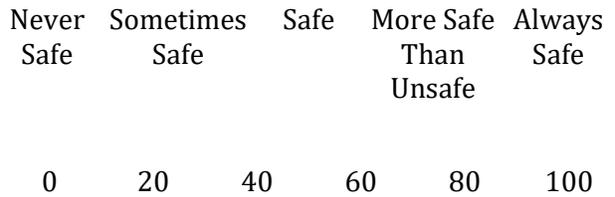
	Never (1)	Once or Twice (2)	Frequently (3)
Been excluded from promotions, special projects, leadership opportunities (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experienced unwanted sexual advances (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt your authority being questioned (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt your competency being questioned (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a sexual harassment claim to Human Resources (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a sexual discrimination claim to Human Resources (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20 To what extent have you experienced the following?

	Never (1)	Once or Twice (2)	Frequently (3)
Downplayed your femininity in team meetings (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Downplayed your femininity in one-on-one conversations with male colleagues (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Been afraid to cry or show other emotions (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stuck to women-only groups (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q22 In a work environment context, what does the word "safe" mean to you? How do you define feeling safe?

Q21 How safe do you feel at work?



How safe do you feel at work? (1)	
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Q23 What would make you feel safer at work?

Q24 Tell me about your support system at work.

Q25 What do you feel is the biggest challenge you face as a female employee?

Q26 How/what would you change about your workplace if you could?

Q27 Is there anything else you would like to share?

End of Block: Feelings Questions
