PEERING INTO THE CULTURE OF A CIVIL ENGINEERING DISCIPLINE

AND FINDING THE WHITE RABBIT

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ABSTRACT

PEERING INTO THE CULTURE OF A CIVIL ENGINEERING DISCIPLINE

AND FINDING THE WHITE RABBIT

SHARON GORMAN

The representation of female students and students of color within the civil engineering discipline has been relatively stagnant during the last thirty years. *Leaky pipeline* approaches attempt to provide measures or programs that try to reduce the exiting of female students or students of color without necessarily addressing the social complexities of the environment itself. This ethnographically informed case study provides an explanation of social complexities that may prevent female students and students of color from fully fitting inside their civil engineering discipline.

Specifically, this study explored how female students and students of color navigated their civil engineering discipline as juniors or seniors at a medium-sized public university in the United States Southwest. During 2013, five staff members (all female) and eight students—both male and female—were interviewed. In addition, the researcher observed two upper division classes for a month and half, three times a week. The researcher also observed public spaces inside the engineering building. Finally, the researcher reviewed and analyzed public websites, syllabi, degree progression plans, and newsletters to further support findings.

Using a Grounded Theory approach and informed by critical and post-structural feminist and race theory, the researcher adapted a Grounded Theory Paradigm Model

(Strauss & Corbin, 1990) to expose contradictions for explaining the social complexities of the context. The researcher found that students who identified outside the dominant white male role saw nuances of the context because of their Border Identities. Border identities, which evolved as a result of students coming from a different ethnicity, community background, and gender, allowed contradictions to be exposed and examined. As a result, the researcher discovered that highly regulatory educational contexts such as a civil engineering discipline support rituals leading to professionalization of students (in this case, as future engineers). Professionalization, which espouses values of sameness as related to the individual, in fact penalizes "the different." Through the professionalization of students, values of hard work, productivity, meritocracy, and effort intend to homogenize the experience of civil engineering students across the board, despite differences of identity, in order to maintain and preserve the dominant white male context.

ACKNOWLEDGEMENTS

"I could tell you my adventures—beginning from this morning," said Alice a little timidly; "but it's no use going back to yesterday, because I was a different person then." (Carol, 2013, Chapter 2, para. 50)

This doctoral journey has been such a transformative adventure on so many levels. The possibility of this dream started when I left the familiarity of my home and community in Texas and landed in amazingly beautiful Arizona to pursue my master's degree at Arizona State University many moons ago. My two academic mentors at Texas A&M University, Drs. Anil Menon and Abdul Karim Shaikh (now deceased), believed in my abilities and encouraged me to pursue a graduate education in the first place. Because of their unwavering support and commitment toward my educational pursuits, I am a more confident, curious, and open person today. I also recognize the value of mentorship, especially as a young female trying to navigate in environments that don't always feel supportive. Without their support from long ago, I would not be here today.

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I am also hugely thankful for my professors in the program who challenged me to look more critically at the world around me. Drs. Gerald Wood, Guy Senese, Frances Riemer, Joe Wegwert, and JeanAnn Foley all gave me a reason to pause and reflect on

existing educational practices, status quo, social justice, hegemony, and contradiction. I attribute the critical direction of this dissertation as a result of their amazing ability to open my eyes and challenge my existing beliefs. My hat goes off to you.

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Chapter 1: Step Inside My World

There was nothing so very remarkable in that; nor did Alice think it so very much out of the way to hear the Rabbit say to itself "Oh dear! Oh dear! I shall be too late!" (when she thought it over afterwards, it occurred to her that she ought to have wondered at this, but at the time it all seemed quite natural); but, when the Rabbit actually took a watch out of its waistcoat-pocket, and looked at it, and then hurried on, Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waistcoat-pocket, or a watch to take out of it, and, burning with curiosity, she ran across the field after it, and was just in time to see it pop down a large rabbit-hole under the hedge. In another moment down went Alice after it, never once considering how in the world she was to get out again. The rabbit-hole went straight on like a tunnel for some way, and then dipped suddenly down, so suddenly that Alice had not a moment to think about stopping herself before she found herself falling down what seemed to be a very deep well. (Carol, 2013, Chapter 1, para. 3)

Introduction

When I was a young girl of five, I saw "Alice's Adventures in Wonderland" performed live at the local children's theater. I recall the colorful characters and the sets as I sat next to my mother in awe of what I was watching but not really understanding what I was seeing. Because it was my sister's 8th birthday, my mother reserved a party room for the after-the-play birthday festivities. We partygoers were expected to meet the actors in costume after the play. I was nervous because I didn't know what to expect. Three costumed actors—the Mad Hatter, the Turtle, and the White Rabbit—walked

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inside the party room. I gulped with fear. They were huge! They were *beyond* colorful

with their exaggerated stage make-up and otherworldly costumes. I held onto my

mother's hand for dear life. To me, my mother's hand represented safety—safety from

these crazy-looking humans in costume and make-up. My mom gently pushed me to

meet the performers in the room, but I would not budge. Their world was just too

unfamiliar to me. I held her hand even tighter. My mom's hand represented "home" and

the feelings of safety and familiarity, which is a part of being home.

I had forgotten this memory until visiting my parents' home this past summer.

My brother, who was preparing to become a teacher after being—not so happily—in the

business world for almost twenty years, wanted to try out a language arts lesson that he

had created. He wanted to stage a Mad Hatter's Tea Party for my two young daughters.

He planned every detail meticulously—the costumes, the learning activities, the food and

tea. Talking about the tea party lesson plan with my brother took me back in time.

A few weeks prior to the "tea party" discussion, I had defended the research

proposal for this study to explore how female students navigated the civil engineering

discipline. I was excited but nervous about starting the daunting task of data collection

and analysis in front of me. However, questions of my insufficiencies flooded my mind:

- What if I couldn't find classrooms to observe?

- What if the instructors were not supportive of my study?

- What if I was not accepted in my observer role?

- What if students decided not to interview with me?

Questions inside my head continued on, and on, and on. I felt a sense of groundlessness

much like Alice falling through the rabbit hole. At "home" for a week, I put these

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overwhelming feelings aside; I just didn't want to be burdened with my insecurities and concerns about the huge pending task coming my way. Plus, I felt safe being back home. I felt the familiarity of smells, humidity, heat, idiosyncrasies of the house, parents' personalities, community nuances, and so on that allowed me to temporarily suspend my anxious feelings about the future.

Being home also reminded me of what I left behind so many years ago—beliefs, attitudes, and perceptions about things. I was no longer that scared, wide-eyed five-year-old girl who depended on my family's safety. Like that young girl, however, I felt tempted to hold onto my mother's hand for dear life as I stepped inside the unfamiliar land of an engineering discipline. I, too, was not an eighteen-year-old girl who would be going away to college even though I felt like one. Like an eighteen-year-old leaving home for the first time, I felt equally as anxious (and nauseous); but I was also curious about stepping into an unknown context and what I might find. Reflecting on the past, I knew that my "home" self was forever changed after going to college but with little pieces of me—"my home me"—still intact.

Why Alice?

During my prospectus defense, one of my committee members cautioned me about using too many metaphors when explaining my arguments. She succinctly said, "Find one and stick to it!" I have to admit, I love metaphors because metaphors cause us to make connections outside a literal interpretation. I am tempted to describe my brief experience in the world of a civil engineering student with multiple metaphors. The danger of using too many metaphors, however, is that I might lose the thread that ties my analysis together. However, a single metaphor—if chosen carefully—might become the

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glue to create a story, which not only resonates with readers but also further explains the richness and validation of my experience through my data.

As I began analyzing my data at the initial stages, I felt a sense of groundlessness—not knowing what was really going on but knowing I had great data. That is when I recalled my reflection about Alice prior to starting the study. I then decided to use Alice jumping through the rabbit hole as the metaphorical glue for this study—Alice who, like me, fell through a rabbit hole and landed with a thud into an unknown land, one that seemed both strange yet familiar while she tried to make sense of what she was experiencing.

The metaphor of diving into the rabbit hole in a true spirit of discovery as Alice did in a seemingly fantastical world was just the metaphor I was hoping for. I really wasn't certain what I would find diving down the metaphorical rabbit hole, which has represented this research journey. For one, I held previous suppositions about what I thought I might find inside the civil engineering discipline—mainly a serious working culture with some degree of sexism. I thought I might find:

- Serious hard-working students who would dedicate themselves to their studies/degree (which I did);
- Stereotypical nerdy student with the pocket protector and thick glasses (which were a few but not the majority);
- Overt sexism and a climate that overtly discriminated female students (which there were some, but most of the time it was subtle); and/or
- An all-too-serious approach (with no humor) from both students and faculty (which was not entirely the case).

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What I was unprepared for was a varying and rich collection of students, with a sense of humor and likability and students who cultivated social connections that were essential for surviving. Students across the board survived in many ways—surviving the semester, surviving the degree, and surviving the process. I also found it challenging to make sense of what I was seeing and hearing in my data. As I stated to my chair on numerous times, "It's all very messy!"

Before I get started, I openly admit that I was unable to commit to a yearlong ethnographic study, which is the accepted time norm for a true ethnography. I acknowledge up front that this short time in the field could be the most glaring criticism of my research. But rather than hiding from these insufficiencies, I embrace them— while my observational journey was short it was meaningful. I am willing, therefore, to share what I learned on this extraordinary journey. I aim, therefore, to share these findings from a true exploratory spirit, one that uses my personal context and curiosity as a Science, Technology, Engineering, and Math (STEM) professional as I connect intimately with the data.

Exploring Contexts

I am an older white female doctoral student with nearly two decades in the workplace, starting my professional work life with an undergraduate degree and graduate degree in social sciences. My career has consisted of a smattering of administrative and coordinator jobs, entry-level software technology jobs, and for the past twelve years plus years in project management and educational technology positions. This is not the career picture or path that I necessarily envisioned as young high school student, a student who was talented in both math and science. Then again, I was raised in a socially

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conservative urban city in the South where "women libbers" (a.k.a. feminists) were considered social freaks and men-haters. As a white middle class female, I was expected to settle down and have a family soon after a short-term professional career where I would then be "taken care of" by an imagined husband's financial prosperity. And I sort of believed that this would be my future, even though I often questioned why. While I was certainly capable of pursuing a Science, Technology, Engineering, and Math (STEM) discipline at university, I chose a social science discipline with a business minor instead because the subject matter felt more comfortable and doable to me. STEM disciplines, especially engineering, certainly seemed off limits to undergraduate females like myself, when nearly 90% or more of the student population in engineering was male at the time.

Working to support my life became and has been a necessity and my personal reality. Unlike the social expectation of "being taken care of," I never had the option *not to work*. In my thirties, I eventually married and had children. However, I am the primary breadwinner of the family and am responsible for most of the childcare, household duties, and family finances. While I have made some professional achievements especially in the male dominated world of technology (albeit educational technology), I have stayed in a relatively stagnant position with little to no professional advancement in the past ten years. While self-confidence in my abilities and technical expertise has given me stability in my position, I am realistic about moving up or getting promoted.

Returning to graduate school as an older doctoral student, however, has given me a rich personal history to examine:

How individuals, in the welter of their daily experience, often become falsely

conscious of their social positions. Within that welter, the framework of modern

society is sought, and within that framework the psychologies of a variety of men

and women are formulated. By such means the personal uneasiness of individuals

is focused upon explicit troubles and the indifference of publics is transformed

into involvement with public issues. (Mills, 1959, p. 5)

I realize now that my personal troubles as a female navigating the professional world and

the home are not atypical in society. In fact, females who work outside the home have

consistently stated that the distribution of housework and childcare is unequal (hooks,

1984; Minerick, Wasburn, & Young, 2009; Spitze & Loscocco, 2000; Valian, 1998;

Walters & Whitehouse, 2012). Females are on average paid nearly 23% less than males

in similar professions with a similar educational background (AAUW, 2013). Also,

female employees comprise nearly half of all jobs in the U.S., but they are employed in

less than twenty-five percent of all Science, Technology, Engineering, and Math (STEM)

jobs (The U.S. Department of Commerce: Economics and Statistics Administration,

August 2011)—jobs that are considered highly paid in the U.S. In addition, persons of

color represent 25% of total employees in scientific and engineering professions with

approximately half of this total percentage assigned to Asian Americans or Asian

immigrants (Falkenheim & Burrelli, March 2012). It is unclear how much of this 25% is

specifically allocated to engineering. Also interesting to note is that six percent of all

scientists and engineers combined have some type of disability (Falkenheim & Burrelli,

March 2012). It is unclear, however, the type of disability depicted in the report or which

science or engineering discipline was pursued by the disabled worker.

Women also comprise a whopping 55% of all undergraduates (Horting, 2006) but are underrepresented in the engineering field and most other STEM degrees (The U.S. Department of Commerce: Economics and Statistics Administration, August 2011; Yoder, 2011). Females in fact represent 18.4% of all engineering students in the United States with the majority of female engineering students in Chemical Engineering (over 33%), Biomedical Engineering (over 39%), and Environmental Engineering (over 44%) (Yoder, 2011). Civil Engineering, which consists of 21% of females, is representative of the overall average female population of any one engineering discipline (Yoder, 2011). Surprisingly, females represent only 9.4% of the average population in the Computer Science discipline (Yoder, 2011). Finally, females represent approximately 12% of the total of all U.S. engineers in the engineering field itself (Horting, 2006). Why is this so?

Several months ago, I asked a white male engineer about why females are not becoming engineers. He replied without hesitation, "At the end of day, you are going to find out it is because of their biological clock. That is why women don't go into engineering." "Hmmm," I replied, "I think it is much more complicated than that." Later I asked a white female medical professional a similar question. She responded similarly, "Oh, it's because women want to get married and have children." According to these two separate accounts, females' maternal drive is the reason why females do not pursue engineering. Would I hear a similar response from other engineers and professional women? What would I find in the research?

Past research has tried to show that female students have distinct biological, psychological, and social disadvantages and/or reasons in succeeding in STEM areas (Pinker, 2005; Steele, 2010; Tyler-Wood, Ellison, Lim, & Periathiruvadi, 2011;

Winkleby, Ned, Ahn, Koehler, & Kennedy, 2009).   Rarely do research studies attribute

females' maternal clock as the primary reason for females not going into engineering, but

studies do suggest that female engineers are disadvantaged by having "maternal" duties

and responsibilities (Kvande, 1999; Minerick et al., 2009; Woodcock, Graziano, Branch,

Ngambeki, & Evangelou, 2012). Research in engineering education tends to address the

"leaky pipeline" by using programming approaches or fixes, which attempt to reduce the

number of female students exiting engineering degree programs. However, these

programmatic fixes have not produced the increase as hoped (Foor & Walden, 2009;

Minerick et al., 2009; Woodcock et al., 2012). Minerick et al. (2009) suggest that "the

leaky pipeline metaphor itself" fails to address the cultural and social complexities of

females' situation in engineering, which is often not fixed by programmatic directions.

In addition, these past research studies derive from a deficit perspective where females

themselves are lacking something (e.g. values, attitude, beliefs, and so on) to be

successful in STEM degrees and professions. Viewing females with a deficit perspective,

which draws on well-established stereotypes and the status quo, ignores complex social

and cultural conditions that may keep female students from succeeding in STEM

disciplines and fields (Gill, Sharp, Mills, & Franzway, 2008; Gorski, 2008; Phipps, 2007),

such as engineering. Post-structural feminist and critical perspectives may offer an

alternative way outside a deficit perspective to shed light on the social and cultural

perspectives in the world of engineering and engineering education.

     bell hooks (1984) cautions, however, about feminists and other critical researchers

engaging in dualistic approaches, especially looking solely at economic divisions

between white middle class women and white middle class men. hooks (1984) contends

that feminism needs to include multiple identities of women (as white middle class women, working class women, women of color, gay women, mothers, wives, partners, sisters, daughters, students, community members, and so forth). Feminist research scholars must consider the intersectionality of these multiple identities, which address power structures in a more nuanced and complicated way. hooks (1984) argues that a transformed society based on feminism is one that *includes* men but under different ideals and beliefs. According to hooks (1984), a society based in feminist ideals promotes human relationships and interactions sustained by "intimacy, mutuality, and camaraderie" over "alienation, competition, and dehumanization" (p. 34).

Countering Personal Authenticity in Becoming a Professional

Being authentic as a professional may not be the same as being authentic in one's personal world. As an introvert for most of my life, I have learned to be an extrovert. I know what it is like to fake a persona in order to portray confidence as a professional—to make it seem I knew what I was doing when really I felt like I was dying inside. I know what it is like to play the game. But even as I play the game, I don't always know the rules—or at least I am not privy to accessing certain privileges and rights where I have felt alienation, like accessing opportunities for a leadership position despite my number of years of professional experience. I've often wondered why I was not considered for advancement into positions—clearly thinking it was something I was or, more strongly, was not doing, such as:

- Not putting myself out there;
- Not networking with those who held the power to make employment decisions;

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- Not knowing the right people;

- Not doing enough in my job to be noticed;

- Not being a go-getter because of my personal responsibilities of being a full-time mother;

- Not being loud enough;

- Not being smart enough;

- Not being technical enough;

- Not highlighting my victories enough;

- Possibly not "leaning in" (Sandberg & Scovell, 2013);

- And on, and on, and on.

These deficit approaches, which are about fixing me the individual, clearly indicate I just don't know what to do!

Part of diving into the rabbit hole is leaving the familiar world in discovering something fresh and anew. Possibly, my self-deficits may be the blame for why I have not progressed along my professional journey as much as I would have liked. However, as I have explored more critical and post-structural approaches to how meaning is created and how structure can often oppress individuals who otherwise have potential and/or desire, I realize the road to being a professional is not as black and white as it may seem. The professional world, which appears so neutral, is in fact rife with entrenched hegemony, often subtle more than overt. As my chair replied to one of my initial analysis, "Right, so neutral isn't actually neutral."

Statement of the Problem

As mentioned above, engineering schools across universities have been criticized for not successfully retaining female students and students of color who are often lost along the "leaky pipeline" (Minerick et al., 2009). Engineering school leaders have attempted to fix the leaks through policies and programmatic approaches that keep females students and students of color within the pipeline. However, these policies and functional programmatic approaches to "fix" the leaks have fallen short in either recruiting or preventing female students from leaving the discipline (Foor & Walden, 2009; Minerick et al., 2009; Woodcock et al., 2012). Questions about why females and people of color in engineering are exiting the discipline despite programmatic interventions are indeed baffling. Some researchers suggest that cultural and social complexities within the engineering culture are not being adequately addressed within the discipline (Foor & Walden, 2009; Minerick et al., 2009; Woodcock, et al., 2012).

Some researchers have found that female students and students of color tend to stay away from engineering coursework and degrees for several known reasons such as stereotype threat (or underperformance due to a physiological response in attempt to counter the prevailing contingency identity), microaggression (or subtle and/or overt language that tends to persuade individuals to doubt themselves and/or their abilities), lack of self-efficacy (or individual belief about one's own capabilities) and/or unfavorable attitudes toward engineering degrees and careers in general (Brownlow, Smith, & Ellis, 2002; Marra, Rodgers, Shen, & Bogue, 2009; Steele, 2010; Sue, 2010). Perception of females' technology identity may also be another factor contributing to females being lured away from challenging engineering degrees. For instance, Goode (2010) alluded that low technology identity might affect females' confidence in

engineering courses that require a high level/mastery of technical skills compared to other coursework. These deficit approaches to why female students do not persist in engineering seem to overemphasize that females are either psychologically or academically not prepared for engineering studies and careers in the existing culture.

Some feminist scholars in engineering, however, have suggested that underrepresentation in engineering points to deeper and fundamental problems characteristic in the engineering discipline and profession itself (Beddoes, 2012; Foor & Walden, 2009; Riley, Pawley, Tucker, & Catalano, 2009). For example, Riley et al. (2009) proposed that conceptual frameworks within the engineering discipline support gender oppression in the form of "hierarchical thinking, value dualisms, conceptualizations of power that privilege some, and logic domination," (p. 23) which may lead to categorical thinking. This form of gender oppression could be more pervasive in the engineering field compared to other professions.

Similarly, critical scholars Demerath, Lynch, and Davidson (2008) argued that students' identity with a dominant competitive culture of a school could impact students' sense of belonging in that school and subsequent student success. In their ethnographic study, they found that students who did not identify with this competitive spirit felt excluded and overly stressed out because of what was expected of them inside the school culture. It could then be possible that female students and students of color who feel separated from the competitive values of the dominant culture inside an engineering school may also feel a similar exclusion and similar stresses. This might also impact their success and persistence inside the discipline.

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One thing is for certain; understanding why there is underrepresentation of females and students of color in engineering is indeed complex. This study provided a critical exploration of the cultural and social complexities of female students and students of color in the engineering discipline, which might be impacted by a pervasive dominant engineering culture, or the "social practices and representations that affirm the central values, interests, and concerns of the social class in control of the material and symbolic wealth" (McLaren, 2003, p. 75). The lack of connection to the dominant culture along with other factors may in fact be keeping female students and students of color marginalized and subordinated within the engineering discipline. Thus, in my study, I acknowledged the need to critically examine and evaluate the dominant culture of an engineering school and how females and students of color interact within that culture.

Finally, engineers who are in the engineering field itself have conducted most of the critical cultural and postmodern feminist research studies at this point (Beddoes. & Borrego, 2011; Beddoes, 2012; Foor, Walden, & Trytten, 2007; Foor & Walden; 2009; Kvande, 1999; Riley et al., 2009; Tonso, 2006). As a non-engineer but a STEM professional in general, I was able to bring a different perspective on the cultural and social contexts inside a school of engineering. Like a fly on the wall using multiple lenses, I was able to see social and cultural phenomenon that might not always considered by an engineering cultural insider. In support, Beddoes & Borrego (2011) contend that collaborative research is greatly needed between engineering researchers and social scientists/gender studies researchers outside the discipline to further elucidate the complexity of engineering contexts of females and other marginalized students within this cultural context.

Purpose of the Study and Research Questions

As I highlighted and represented above, female students and students of color are underrepresented in civil engineering (Horting, 2006; Falkenheim & Burrelli, March 2012). While certain abilities and strategies can and do help students persist inside the civil engineering discipline, female students and students of color (i.e., African American, Native American, and Hispanic American) in engineering are still graduating in relatively fewer numbers compared to their white male and international male counterparts (Horting, 2006; Falkenheim & Burrelli, March 2012). With this said, it is likely or more likely that female students and students of color will persist to graduation if they reach their junior and senior years (Haden & Lapan, 2007) because they have "passed the threshold of the first two years" (p. 11) and culture shock is no longer an issue. So while individual strategies and conditions are helpful for these students' persistence, they do not point necessarily to why underrepresentation exists in the first place.

Haden and Lapan's (2007) insights intrigued me because the study suggests that culture shock is an issue, at least, initially. While culture shock seemed to no longer be an issue for junior- or senior-level engineering students, the idea of culture shock in general infers that a different culture exists, which demands those individuals, who don't necessarily belong naturally, to assimilate. In my own observations, I found that cultural and gender diversity (along the biological binary) is modestly represented within the civil engineering program, or at least in the two classrooms I observed in the Fall 2013—one team-based class with 36 students and one lecture-style class with 64 students.

In the smaller team-based senior-level class (which consisted of all civil engineering students and mostly senior-level students), the distribution of students was as follows:

- International students (male and female) made up approximately 22% of the classroom population;

- Female students (white females, female students of color, and international female students combined) made up approximately 31% of the classroom population;

- Male students of color (Hispanic, African American, Native American) made up approximately 14% of the classroom population; and

- Female students of color (Hispanic, African American, Native American) made up approximately 8% of the classroom population.

The percentage of females was high compared to the 20% national average of female students that is typical in civil engineering, which is a promising descriptive statistic. The percentage of students of color (22% combined) is promising as well.

In the larger lecture-style junior level class (which consisted mostly civil engineering students with some mechanical engineering students who take civil engineering classes as an elective or part of a minor, with mostly junior-level students and several senior-level students), the distribution of students was as follows:

- International students (mostly males) made up approximately 23% of the classroom population;

- Female students (white females, female students of color, and international female students combined) made up of approximately 19% of the classroom population;

- Male students of color (Hispanic, African American, Native American) made up approximately 5% of the student classroom population; and

- Female students of color (Hispanic, African American, Native American) made up of approximately 6% of the student classroom population.

The average of females in this classroom matches the national average of roughly 20% females in civil engineering. The percentage of students of color, however, is low at a combined 11% of the classroom population. The influence of mechanical engineering students with combined junior- and senior-level students in this class may have affected the descriptive statistics for this classroom population (or, in other words, why the classroom population consisted of fewer female students and students of color). It could also point to how cohorts of students vary between years. What is most intriguing to me about this latter point is how perhaps the senior teams-based class I observed might be unique to this cohort of students in their very diversity and their ability to collectively move through the system and persist. Was it the diversity of the student make-up that provided an environment for persistence or was it something else?

Alas, this is not a quantitative study, and so I will dwell no further on the descriptive statistics of the classroom populations. However, despite the difference (albeit not measured for statistical difference) between the two classrooms, the culture from appearance seems diverse. Would I then be able to assume the environment is open to cultural and gender differences given the seeming diversity? As I began observing the

classrooms and the public spaces of the building, I surprisingly couldn't see large differences between students. While I could "see" that students were possibly from a different country, from a different biological sex, from a different American ethnic background, I just couldn't see big glaring differences between the students. Students looked similarly, dressed similarly, spoke similarly, and acted similarly in most cases. The students seemed, at least to me, fairly homogenous/fairly the same.

With these initial aha moments, I realized that the primary question for this study *would not* primarily be about **how** female students and students of color persist and navigate the culture. Rather the more important question for me became **why** are these students pushing through to graduation in spite of obstacles along the way in a *seemingly* diverse culture. This overarching redefined question gets at the root of the complexity of the culture within the discipline itself, which may prevent access by students who do not necessarily fit in or want to fit in because they perceive themselves so differently compared to the dominant culture or what the dominant culture expects of them. In other words, female students and students of color may be giving up a piece of their identities or their personal authenticity in order to fit in the culture, but for what? What is their schooling actually doing? The findings of this study attempt to explain just that.

As I reflected on this new awareness, which luckily occurred at the beginning of my observational period, I had to slightly modify my initial research questions to the following:

- What is the dominant culture reflected by the cultural artifacts and actions/interactions observed within the civil engineering discipline?

- What is the purpose of schooling inside the civil engineering discipline?

- How are females and students of color identifying themselves within this dominant culture?

- How are these students negotiating their identities inside the dominant culture?

- Why are these students pushing through to graduation?

These questions guided me as I continued to observe and to interview students in the fall semester. Note that I had already interviewed 4 of 5 staff members in the summer prior to the fall semester, which again guided me in my classroom observations and student interviews and helped me reformulate my research questions. These guiding questions also helped me connect to a paradigm model developed by Strauss and Corbin (1990). The paradigm model under the context of my study will be explained in Chapter 3.

Significance of the Study

There were several reasons why I pursued this study. For one, administrators and college professors in technical disciplines such as engineering might now understand the cultural and social complexities of underrepresented female students and students of color, whose experiences may impact their persistence in the program and subsequent careers in engineering. Fixing the "leaky pipeline" by providing programmatic solutions has not led to increased persistence of females in engineering (Foor & Walden, 2009; Minerick et al., 2009; Woodcock et al., 2012). In fact, the number of female students and students of color in engineering has been relatively stagnant over the last thirty years in spite of these programmatic interventions (e.g., Horting, 2006; Yoder, 2011). Administrators and college professors who understand the social and cultural complexities of their female students and students of color might offer different programs

and instructional approaches that are more inclusive of their female students and students of color in engineering. Programmatic approaches that address the social and cultural complexities of females and students of color in the engineering context might be more effective increasing student persistence than past approaches.

Two, female students and students of color might now have an understanding of the engineering culture that will allow them to negotiate the culture more effectively. These students, who felt frustrated or different inside the engineering disciple, might now have an understanding of reasons outside themselves. They might now be able to use this information to find a collective voice that allows them to negotiate better inside the engineering setting in order to transform the engineering culture itself.

Three, male students from the dominant culture may now gain a better understanding of female students and students of color within the engineering discipline. As members of the dominant culture, male students might not be aware of cultural and social differences that impact female students differently. They might become more cognizant of a multilayered context, which they had not considered before.

Road map – Not the Typical Five Chapter Dissertation

I have used a modified version of Strauss and Corbin's (1990) Grounded Theory Paradigm Model to structure my findings. After Chapter 3, I departed from the five-chapter dissertation format to better explain the model in smaller, more digestible chapters. As a result there are eight chapters in this dissertation. It is my hope that shorter chapters will make it easier for the reader to relate to the model, which is the basis on how my theory on sameness and home identity emerged.

In Chapter 2, I explored the literature that has been informed by past ethnographies along with critical and post-structural perspectives. The literature review gave me the scholarly context to begin my data collection and analysis.

In Chapter 3: The Method Employed has been modified to reflect a reflexive ethnographic approach to how I interacted with the data. It also shows the actual data collected for the analysis**.**

In Chapter 4: Causal Conditions – Starting Point for Students, I have explained the minimum conditions for students entering the civil engineering discipline in the first place and staying inside the discipline. These minimum conditions give the students' confidence for the possibility of persisting in the first place.

In Chapter 5: Context/Phenomenon – Explaining a Culture of Sameness, I define a culture of sameness in a seemingly neutral culture that is rife with contradictions. In addition, I offer an argument borrowed from Victor Turner's liminality versus ritual theory informed by Peter McLaren's Schooling as a Ritual Performance that schooling in the civil engineering discipline is intended to professionalize in an effort to cultivate sameness or professional sameness.

In Chapter 6: Explaining Intervening Conditions in Maintaining a Culture of Sameness, I explain how knowledge capital in tandem with social capital is used, albeit differently from sub-sets of students (female students, students of color, white male students), in support of a culture of sameness. In addition, I argue that female students of color use their border/boundary identities to help them navigate the culture more effectively because they come from a place of awareness about the culture they are participating in.

In Chapter 7: The Impact of Actions/Interactions in the Face of Contradictions and Consequences of Maintaining a Culture of Sameness, I attempt to demonstrate how *interaction rituals* (informed by Erving Goffman's theory of the same name)—such as letting it slide and minimizing personal emotions during social interactions—and *impression management* (also informed by Erving Goffman's theory of the same name)—such as minimizing gender/ethnic/culture diversity, being unemotional, pleasant or cooperative (or professional), and keeping up with problem-solving appearances—cultivate a culture of sameness. At the same time, I expose contradictory experiences or contradictions that seem to fracture the culture of sameness. These contradictions consist of the following:

1) Questioning work/life balance in a culture that values high personal productivity;

2) Up-playing gender roles or gender orientations;

3) Feeling uncomfortable when international students are excluded or made fun of; and

4) Questioning the existing politics/culture.

In addition, I attempt to show how the consequences a culture of sameness in the midst of contradiction leads to certain consequences for female students and students of color. These consequences result from maintaining a culture of sameness when these students feel conflicted about their own personal difference and include the following:

1) *Superhero-ifying* – or doing it all and then some and overcompensating their personal productivity in lieu of their emotional well-being;

2) *Automating* – or giving up one's personal authenticity while becoming a professional and minimizing one's personal-ness in the process; and

3) *Questioning the discipline* and/or thinking about leaving the discipline altogether but conflicted about financial investment into the degree.

Finally, in Chapter 8: Pulling it together – Conclusions, Implications, and Further Research, I will pull it all back together by offering conclusions to the interpretations of the findings, implications, and recommendations for future research to administrators. I also share some of my reflections in a true spirit of reflexivity offering my insights, lesson learned, and how this experience has forever changed me much like Alice after she journeyed through the rabbit hole on a road of personal and cultural discovery.

Chapter 2: Every Research Adventure Starts with a Context

Curiouser and curiouser!" cried Alice (she was so much surprised, that for the moment she quite forgot how to speak good English). (Carol, 2013, Chapter 2, para. 1)

Introduction

My personal and professional curiosity drove me to explore this topic. As a female in technology and as a technology career professional, I have encountered roadblocks along my career path that seem to support the idea of a glass ceiling. I have noticed in my own personal context as a technology professional that I have to work harder to be noticed, I have to behave in a way that is appropriate to a female way of acting, and I have to play the game to be accepted. The few times I have dissented or challenged authority, I have been reprimanded. Speaking up means that I might lose face or even lose my job. I have been second-guessed and challenged at meetings for my technology know-how, as if I do not know what I am talking about. I simply learn more technology as a way to protect and defend myself and to show that I am capable in my position. I have reinvented myself over and over again. I have pretty much stayed at the margins by remaining silent, doing my job, and being creative in my own way. It is much easier that way. I am not a very good follower, but I am good at what I do. I, at least, know that.

Returning as a doctoral student has boosted my self-confidence. Faculty members who appreciate the freshness of my approach and ideas often compliment me. They wonder why I have not been promoted or moved to a leadership position. I answer, "Well, there has never been the opportunity." I am not a big self-promoter or a

competitor for that matter. However, I do love solving problems and providing technology solutions. I have a good sense of humor, which gets me through to the end of the day.

Nevertheless, my situation has produced many question marks that drive my curiosity and has led me to this study. I am driven to know whether my personal story is similar to other females' stories, and whether structures in the form of formal educational environments, like the a civil engineering program, do impose restrictions and inequalities on "the different." As mentioned earlier, men represent nearly 81% of all engineering students (Yoder, 2011). Men also represent 88% of the entire engineering workforce across the board (Yoder, 2011). I have often wondered whether cultural and structural barriers in a predominantly male environment tend to unintentionally and perhaps even intentionally regulate students who are not men. Taking a look critically at social structures with a feminist stance is a first step to see how existing structures place undue burden on "the different."

I also, however, have questioned the apparent intransigence of cultures, such as inside a male dominated school of engineering. Taking a postmodern and post-structural standpoint, which considers that boundaries, reality, and culture are not as fixed as we might think, I wanted to see if females in engineering who acknowledge their difference and difference in identities can help influence change in more discursive ways. The danger, however, of a completely post-structuralist stance is that it "denies the existence of structural barriers, class struggles and inequalities based on various collective characteristics, such as colour, race, gender, etc…" (Gouvias, 2012, p. 286) and lead to further "'stress on 'segmentation', 'differentiation' and 'collective disempowerment'"

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(Gouvias, 2012, p. 286). This, however, was not my intent by including a post-structuralist stance in this study. I acknowledge that collective action and bargaining is a strategy (and may be the only strategy) for overhauling intransigent structures that exist in dominant cultures. By taking a post-structural stance, however, I tried to discover if the dominant discourse in combination with individual discursive strategies in connection to identity can help lead to transformation, especially in cultures that appear to be unwilling to change. Discourse can bind but it can also release. Can *discursive shifts* impact change in seemingly immovable cultures?

The following literature review is my attempt to make sense about how female students and students of color in a predominantly white male school culture in civil engineering navigate this culture, and how and if females and students of color are changing the existing culture in more discursive ways in connection to their accepted difference and their multiplicity of identities. First, I have included a definition of culture, which will frame my study. Second, I have reviewed ethnographies and case studies that attempt to define the culture of engineering, which includes cultures in schools of engineering. Third, I have reviewed how heteronormativity in connection to gender is a discursive method to bind rather than release and maintain the status quo. Fourth, I have looked at ways in which females navigate their identities in a dominant culture such as engineering in an effort to transform it. Finally, I have explored how the college experience is a transformative experience and, through ritualization via the curriculum and expectations of the student, can alter the original "home" identity of a student.

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Culture as Fluid

Humans make meaning of their world both in the immediate sense and larger sense of the word through symbolic interchanges. These symbolic interchanges provide a context for which humans act, communicate, feel, and believe. Culture, which binds symbolic interchanges into some sort of meaningful whole, operates to give humans a way to intuitively understand—as if by second nature—on how to interact in a way that is socially accepted, preferred, and supported. In *The Interpretation of Cultures* in the chapter entitled, "The Impact of the Concept of Culture and the Concept of Man," Clifford Geertz (1973) offers a poignant definition of culture, which provides an orientation of the role and function of culture in society:

> Culture is best seen not as complexes of concrete behavior patterns–customs,
> usages, traditions, habit clusters–as has, by and large, been the case up to now, but
> as a set of control mechanisms–plans, recipes, rules, instructions (what computer
> engineers call "programs")–for the governing of behavior. (p. 44)

Culture in this light appears to be socially binding, and members within the culture often blindly follow and act in ways that reinforce the culture either willingly or unwillingly. The price of not adhering to the dominant values of culture is marginalization. However, culture is not static but fluid. By the very nature of culture as a collection of social interchanges, culture can change when outside influences or signifiers—in the form of contradictions—offer a convincing enough argument, which then transforms existing beliefs and attitudes toward new and different ways of knowing and understanding (Foucault, 1972).

In *The Archeology of Knowledge*, Foucault (1972) offers a convincing argument about how discursive formations result in the fluidity and temporality of culture as he writes:

> I would like to show with precise example that in analyzing discourses themselves, one sees the loosening of the embrace, apparently so tight, of the words and things, and the emergence of group rules proper to discursive practice. These rules define not the dumb existence of a reality (culture), nor the canonical use of vocabulary, but the ordering of objects. 'Words and things' is the entirely serious title of the problem. (p. 49)

He further explains that culture (reality) is exposed through the constant analyzing and re-analyzing of discursive regularities and formations. He purports that an "archaeology of knowledge" is the key to unlocking culture by exposing differences in a more serious and intentional way, "to throw some light on the matter, to determine how they are divided up, how they are entangled with one another, how they govern or are governed by one another, to which distinct categories they belong" (Foucault, 1972, p. 171). Actively analyzing and questioning "positivities" (or what is perceived as truth) exposes metaphors and juxtapositions that no longer work. Contradictions appear to be accidents of discourse but in fact expose the illusions of unity, and discourse analysis is the root to revealing these contradictions (Foucault, 1972, p. 151). Finding contradictions, then, becomes the key to transforming existing cultures that otherwise seem entrenched in themselves. For instance, believing that a culture of engineering is static undermines the possibility of real change. It assumes that members within the culture must play along to belong or they must leave. Looking at a culture of engineering as fluid, however, suggest

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that transformation is possible with an intentional allowing of emergent values, which supersedes older and more entrenched values that bind rather than release.

A Culture of Engineering

Engineering is seen in general as applied math and science, where problem solving is paramount in connection to helping society (Pawley, 2007; Riley, 2008). Engineers make things for utilitarian purposes (Pawley, 2007; Riley, 2008). There is nothing inherently good or bad about this societal function, but what has come into question is how the engineering culture may perpetuate certain predominant values at the expense of others, and this perpetuation of particular cultural values could be a reason why female students and students of color are underrepresented in the engineering discipline itself. Given the above definition of culture, culture—rather than simply being shared viewpoints with common values among its members—is regulatory. A culture is reinforced and supported by values by way of what is said and not said as well how members "who disagree" or "who won't play the game" are handled. Culture is not static; yet, if it is perceived as such then the culture itself seems nearly impossible to change. Members must assimilate to "fit in" with its values and not the other way around. What is hopeful, however, is that—even in a culture's apparent intransigence—culture can (and will most likely) change overtime. Discourse, which can either reify or reject elements of culture, can help lead toward this transformation over time and with participants' intent.

So what is a culture of engineering? The research is fairly clear that a distinct engineering culture exists not only in the engineering workplace but also in engineering schools (Downey, 1998; Foor et al., 2007; Hacker, 1989; Kunda, 2006; Kvande, 1999).

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The culture in an engineering school, moreover, is often predicated on societally supported values and beliefs mirrored in the engineering workplace (Bastalich, Franzway, Gill, Mills, & Sharp, 2007; Faulkner, 2009; Gill, Sharp, Mills, & Franzway, 2008; Phipps, 2006; Powell, Bagihole, & Dainty, 2008; Riley et al., 2009; Tonso, 2006). The engineering cultural values are believed to stem historically from militarization and industrialization values where hierarchical, patriarchal, and authoritarian positions are pervasive and supported (Beddoes, 2012; Downey, 1998; Hacker, 1989; Riley, 2008). Bastalich et al. (2007) further describe that culturally sanctioned behaviors such as aggressiveness, ego-driven behavior, competition, and a confrontational mindset are supported and reinforced in an effort to position individuals better within the hierarchy of the organization. Bastalich et al. (2007), moreover, posit that a hidden curriculum within engineering schools themselves support values of "exploiting of others, and the failure to notice the exploitation of others, is normative" (p. 390). While this latter positioning is rather harsh, it does, however, indicate that the norms of the hierarchy are deeply in place without real questioning of the existing culture. Bastalich et al. (2007) continues that culture is reinforced by maintenance of the status quo, and if you (the engineer) do not agree with how things are done then you can "choose" to get out. In other words, to be successful you must play by the existing cultural rules of the game. Really, there is no choice because you either must accept the terms of the culture or be forced out as if you (the engineer) made the choice to do so.

Other ethnographers and researchers have also indicated that a hierarchical mindset exists but they, in addition, expand on what the engineering culture might be as described in the next sections.

Individual productivity, competition, creativity, technical control, hard work, & self-governance. In addition to hierarchical and paternalistic values inside the engineering culture, the engineering culture is also known to demonstrate values of individual productivity, competition, creativity, technical control, hard work, and self-governance. In *The Machine and Me*, Gary Lee Downey (1998) described that the computer engineering culture has been traditionally seen with what he calls "a doctrine of competitiveness" that leads to national economic productivity and increased global status and welfare resulting from a militarized and industrialized past (p. 3). However, he found that, while organizationally-minded competiveness for global positioning does indeed exist, the computer engineering culture itself relies more on the idea of individual agency related to interconnectedness especially in solving everyday problems for some societal utility. He suggested that productivity is viewed more in terms of speed rather than economic global positioning. For example, a fast computer shows the ingenuity of the engineering not because it is necessarily going to dominate the world market.

Downey (1998) suggested that in the engineering context there is an inherent need for control (pp. 34-35)—self-control, control of processes and outcomes, control of messages, and control of contexts—much like the technology and computers being created. This mastery of "technical" control can lead to a power position for leveraging and staying on top but more from a sense of individual agency than from a nationalistic goal toward global or economic domination. There is an expectation that engineers are creative and driven (Downey, 1998, p. 210) within the engineering context because individual agency is required for a better society in which humans are a part of. Additionally and perhaps more poignantly, individual engineers like to compete with

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each other to "one up" the other thereby proving their worth and productive value inside the organization. Their individual productivity is both socially and economically rewarded by the organization; this socially sanctioned behavior, thus, reinforces the values of individual competition within the organization.

Similar to Downey (1998), Gideon Kunda (2006) in *Engineering Culture: Control and Commitment in a High-Tech Corporation* also found that an individual production mentality is prevalent in the engineering culture but more as a result of normative control from management and upper management than from individual agency. Kunda (2006) stated that normative control leads employees to act "in the best interest of the company not because they are physically coerced, not purely from an instrumental concern with economic rewards and satisfaction…Rather, they are driven by internal commitment, strong identification with company goals, intrinsic satisfaction from work" (p. 11), which leads to "a moral orientation to the organization" (Kunda, 2006, p. 11). And the recollection "You get to choose which 20 hours to work out of the day" (Kunda, 2006, p. 18) is common among members inside the engineering organizational culture. Engineers are rewarded socially and economically for their "hard work" but more from their penchant for obsessive work patterns that feeds their strong egos and addictions to work—"the prize for hard work is more hard work" (Kunda, 2006, p. 39). Through their efforts of hard work and self-discipline, successful engineers are given the more exciting engineering assignments leaving junior engineers the more lowly and boring engineering tasks. This favoring of assignments fosters individual competition throughout the engineering culture. The main byproducts of this competitive mindset are burnout, cynicism, and ultimate departure from the engineering profession itself.

In addition, Kunda (2006) purports that the organization of work is often described as organized chaos with insider descriptors such as "vague, decentralized, chaotic, ambiguous, a controlled anarchy" (p. 30). The adage "If one thing is constant, it is change" is a common feeling about the software engineering work context (Kunda, 2006, p. 30). Engineers are socially rewarded for their creativity and their ability to get things done amidst the organized chaos. Values of self-governance with connections to individual freedom and entrepreneurship are rewarded and promoted throughout the work culture. Emotional conflicts in the workplace are discouraged and rebuked because the behaviors counter self-governance and self-control. There is constant pressure to "Do what's right" (Kunda, 2006, p. 178) for one's productive self and for the productivity of the company. Peer pressure related to winning keeps members competitive with each other and keeps members productive in the larger sense. Peer pressure is also considered the second reason for member burnout and members leaving the engineering discipline.

Work-as-pleasure, power, & masculinity. In addition to values of individual productivity, competition, creativity, technical control, hard work, and self-governance, values of work-as-pleasure, power, and masculinity have been revealed inside the engineering culture. In *Pleasure, Power, & Technology*, Sally Hacker (1989) asserts that work can be a pleasurable as it relates to "expression of human creativity" (p. 5), and she defines work as "a preparation, a making, a shaping, something upon which labor is expended" (p. 7). She argues that the militarization of the work environment in highly technical fields, such as engineering, strips the more cooperative aspects of work-as-pleasure and turns work-as-pleasure into hierarchical institutions predicated on a more militaristic style of control, power, and authority. Hacker (1989) suggests that gender

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subordination is the by-product of this organizational hierarchical mindset, which keeps females and workers of color in their place.

She further explains that the notion of "technical rationality" arises from a blind trust of the hierarchical structures in place where men are "persuaded to give up autonomy, come to value a narrow technical rationality over reason, and to accept as normal and right contemporary forms of relationships, sexuality, eroticism, technology, and work" (Hacker, 1989, p. 33). In this hierarchical world of engineering, more "masculine" (a.k.a., more technical, abstract, and complicated) disciplines such as electrical engineering and computer science have greater prestige over civil engineering, which is "too involved in the natural and social world" (Hacker, 1989, p. 35). She posits that status is attributed to what is considered masculine such as "speed, sophistication, and abstraction, rather than the feminine world of nature and people" (Hacker, 1989, p. 36). The values of masculinity are seen as being rational, in control, and predictable. The feminine is, however, considered as "dangerous and unpredictable" (Hacker, 1989, p. 37)—and not to be trusted. In fact, the purpose of engineering in many instances is to control and plan against the dangerous and unpredictable factors of the natural world or Mother Nature.

Hacker (1989) further explains that the rewards associated with solving real problems (or for a job well done or getting a good grade) are the extreme pleasures of engineering. She elaborates that engineering students see themselves in an exclusive, prestigious club because only the smartest and most efficient students persist in engineering where other social responsibilities (relationships, community, and outside friendships) are secondary or removed altogether. Students learn "the rules of the game

and playing it well; using the prestige of technical expertise to curtail the demands on energy and time from such publicly unrewarded distractions as family and community" (Hacker, 1989, p. 44). Hacker (1989) attributes the seductive power of prestige and special privileges of engineering that lures students because the work is seen as important in the larger sense of the word. She posits that the hierarchical structure of the engineering classroom emphasizes the "sense of eroticized power relations – glory and status in pain given or taken, in pleasure withheld; the postures of superiority or dominance and submission; a fetishism with special equipment and technique" (Hacker, 1989, p. 49). Female students and engineers often feel relief when they are finally accepted as "one of the guys"; other females feel resentment because they must suppress their "sexuality and with it a good part of the spontaneity needed for creativity in the field" (Hacker, 1989, p. 49). Hacker (1989) claims that the masculine eroticism (or sensual and intellectual pleasures connected to a dominant position) maintains "men's superior power with respect to women" and permits aggressiveness and sexual aggressiveness towards females and keeps females in their place in their de-gendered status.

Being "one-of-boys" or "as good as a man" are common sentiments of successful female engineering students and female engineers. Successful female engineers and homosexual male engineers need to downplay their femininity in order to survive and/or thrive inside the masculine hierarchy of an engineering culture (Barnard, Hassan, Bagiljole, & Dainty, 2012; Bilimoria & Stewart, 2009; Cech & Waidzunas, 2011; Faulkner, 2009; Franzway et al., 2009; Kvande, 1999; Phipps, 2007). Phipps (2007) purports the culture of masculinity is to "pathologize girls and normalize masculinity [Walkerdine, 1998:160]". Beddoes (2012) defines this culture of masculinity as

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patriarchy, conservatism (in preserving the status quo), lacking any reflexivity, which then creates barriers to females and homosexual males from entering the culture in more gendered nuanced ways. In a culture of masculinity, Powell, Bagihole, & Dainty (2009) makes an interesting case that males belong naturally to the engineering context whereas females are seen as foreign intruders (and are thereby less capable than males).   They purport, "Women are typically viewed as 'honorary men' or 'flawed women' for attempting to participate in fields traditionally dominated by men" (Powell, 2009, p. 412). To be "one-of-they-boys," females abandon their more feminine identities in order to fit in and be socially accepted. Females who identify more with their feminine identities are considered "flawed" and are either pushed to the margins or are forced to leave because of their unwillingness to adapt.

Hard/ "real"/ technical versus soft/"imaginary"/social. Hacker (1989) purported that highly technical engineering skills are aligned more with masculinity whereas social/people oriented skills are considered feminine. Males are perceived generally as "hard" including their own phallic nature, which penetrates, intrudes, and dominates. Hardness is construed as more challenging, difficult, and technical, and therefore males by their association with "hard" are perceived as more capable of highly technical or "hard" work and engineering disciplines, such as mechanical engineering and electrical engineering (Brawner, Camacho, Lord, Long, & Ohland, 2012; Cech & Waidzunas, 2011; Foor & Walden, 2009; Hacker, 1989; Phipps, 2007). In contrast, females are perceived generally as "soft" and social, and they tend to lean towards engineering disciplines where social skills are most likely to be rewarded such as

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industrial engineering, chemical engineering, and environmental engineering (Brawner et al., 2012; Cech & Waidzunas, 2011; Foor & Walden, 2009; Hacker, 1989; Phipps, 2007).

Cech and Waidzunas (2011) demonstrate this hard/soft polarity in the following narrative excerpt, which underscores the values of masculinity tied to hierarchical social structures:

> One of my friends who is a mechanical engineer was describing the body as a mechanical engine that only functions under various strains and stresses and relationships. And he didn't think that gayness was one of those relationships . . . basically, 'the man is the plug and the woman is the outlet and if there are two plugs, how is [anything] going to charge?' (Lisa). (p.10)

The very nature of males being the plug (phallus) and females being the outlet (vagina) is reinforced by the language of electrical and mechanical engineering where parts are named according to male and female physical properties. This conscious naming in male and female physical terms reinforces the more endorsed masculine values of these "harder" engineering disciplines.

Burack & Franks (2004) posit a parallel argument where hard skills are "technical, mathematical, and scientific" (p. 84) (associated with masculinity and virility) and soft skills are "interpersonal and communicative" (p. 84) (associated with femininity). They argue that this male/female polarity entrenched in the nomenclature of the engineering discipline and workplace reinforces the hierarchical values, where masculinity and anything associated with masculinity is ranked higher compared to anything perceived as more feminine. They continue:

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These uses of the modifiers hard and soft have no obvious connection to the skills

they denote in engineering. There is no strong intuitive connection between

mathematics and "hardness" that those outside the science and engineering

professions would make and that would affirm the usage as reflecting a common

sense parallel. However, connections between masculinity, virility, male sexuality,

and hardness are culturally engrained, have unconscious emotional resonance, and

are widely and immediately understood. Likewise, the connection of softness with

femininity is a cultural signifier with both conscious and unconscious meaning.

Neither are hard and soft understood as equivalent terms. Perhaps because of their

status as marked with already-gendered meanings, hardness and softness are

hierarchically ordered, with what is hard commanding greater respect and

recognition than the soft. (Burack & Franks, 2004, p. 84)

Foor and Walden (2009) further explore this hard/soft polarity inside the

industrial engineering discipline, which is considered "soft" engineering and reinforces

the hierarchical nature of engineering, especially in the engineering education context.

They state, "Engineering education, as hierarchical social community, reinforces these

relationships in the production and reproduction of acceptable gendered identities" (Foor

& Walden, 2009, p. 46). In connection to industrial engineering, where females are more

adequately represented compared to other "more technical" engineering disciplines,

industrial engineering is considered "imaginary" engineering and therefore is not "real"

(Foor & Waden, 2009, p. 47). Industrial engineering perceived as "imaginary"

engineering is described by three main discourses:

1) Its perceived "distance from technology" (where industrial engineering aligns more to people side and therefore is "less technical, less hands-on, and less physical" [Foor & Waden, 2009, p. 48] making it less "real" and more "imaginary" [Foor & Waden, 2009, p. 48]);

2) Its perceived "less rigorous curriculum" (even though most engineers have to take similar foundational courses albeit not as many as Electrical Engineers, for instance. It is, however, considered the easiest engineering discipline where students do not have to "work as hard" [Foor & Waden, 2009, pp. 48-9]); and

3) Perceived as "business engineering" (where the Industrial Engineering discipline is decoupled from engineering and associated more with business, thereby diminishing its value as an engineering discipline and is perceived as the "last rung" in the hierarchy of engineering. [Foor & Waden, 2009, p. 50]).

So while female students are entering into the industrial engineering discipline in greater numbers than other engineering disciplines, they may be doing so because of the perceived easiness, social aspects of the field, and disassociation with the engineering discipline itself, which seems to align with the male (hard)/female (soft) polarity.

Phipps (2007) offers an alternative view of the male/female polarity—or what she calls the "gender binary"—in the engineering discipline where women are viewed as "domestic, passive, and emotional" (p. 780) and men are viewed as "rational, individualistic, competitive, confident, and technically skilled" (p. 781) and is also associated with "soft/hard" polarity as she writes:

The binary between soft and hard which is associated with girls/women and boys/ men respectively relegates girls and women to the sidelines in terms of the

popular assumption that hard science and technology subjects are somehow real

science and technology (Faulkner, 2001). (p. 782)

Women are relegated to the sidelines in an effort to uphold "gender conservatism"

(Phipps, 2007, p. 783) in which they are tied to the gender binaries that keep them in their

place. What is so fascinating about this study is that Phipps asked both females and

males alike to categorize a list of specified characteristics, which in the end and

unprompted, were sorted into a male/female binary. The following characteristics were

lumped into one category: feminine, social, identified with home (private), conscientious,

insecure, fearful, compliant, illogical, in need of support, frivolous, lacking in

imagination, and so forth. The following characteristics were lumped into a second

category: masculine, technical, identified with work (public), hard, brilliant, confident,

adventurous, brave, independent, competitive, able to deal with difficulties, interested in

abstractions, and so forth. This categorization experiment showed that both males and

females alike viewed certain attributes and characteristics along the male/female binary

and thereby upholding the hierarchical structures along this gender binary.

Perceived neutrality and objectivity of the engineering field. Postmodern

feminists argue in general that neutrality and objectivity do not exist because everything

is shaped by the dominant discourse, which reinforces and reifies the claims of neutrality

and objectivity (Coleman, 2009; Pawley, 2004; Renegar & Sowards, 2009; Riley, 2008;

Riley et al., 2009). Nevertheless, the engineering discipline operates as if neutrality and

objectivity exists and, therefore, the mere association with neutrality and objectivity

legitimates the discipline. Riley (2008) offers an additional claim that engineering

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upholds a positivistic mindset where values of reductionism and technological determinism rule (albeit unknowingly) the day. Riley writes:

> Reductionism is the notion that phenomena (or problems) can be broken down into smaller components for analysis and that analysis of the components can fully explain the system as a whole. A reductionist perspective is evident in the engineering problem solving and engineering design processes. Technological determinism holds that technology develops on its own in a self-propelling fashion (i.e., without regard to social forces) and that its innovations, in turn, impact society and drive political, cultural, and economic developments. (p. 41)

She posits that science and engineering is subjected to "the same vicissitudes of power that other forms of truth face from institutions in society" (p. 41). However, the engineering discipline sees itself as ahistorical, apolitical, and divorced from a politicized economy, when in fact social forces based in history and politics have inherently shaped it. For instance, the funding of projects is based in part in how engineering fits the needs of a politicized economy. She argues that the consequence stemming from this neutrality is the engineering discipline divorcing itself from its social responsibility whereby the engineering discipline takes its actions for granted (for better or worse). She concludes, "The ideal of one true science obscures the fact that any system of knowledge will generate systematic patterns of ignorance as well as of knowledge" (p. 42).

Riley (2008) also points out that this positivistic mindset leads to an "uncritical acceptance of authority" (p. 42) where expertise and certain kinds of knowledge are unquestioned and perceived as truth. She posits that this unwavering belief in a certain type of knowledge exhibits three traits of intolerance:

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1) "Monism" (or the belief that there is only one right answer and uncertainty is not tolerated)

2) "Simplism" (or reductionism or the belief that rational and technical solutions can solve all social problems)

3) "Preservatism" (or "a desire to restore a lost mythical order to society" [p. 43]).

It certainly can be implied here that these knowledge traits will enforce the status quo in order to "keep things the same" (or even attempt to make it better as in the bygone "glory" days – Sorry, Bruce) and anything that appears to contradict this mindset is seen as a social infraction and is not condoned. You can imagine how difficult it must be for outsiders who attempt to make changes and are confronted with a reality, which is perceived as static and thereby unchangeable. You can also imagine that females and persons of color who may be perceived as intruders or outsiders must play the game to fit inside this static universe. Any contradiction may be perceived as an unwelcomed attack on the very values it steadfastly upholds.

Gender and Heteronormativity

In a seemingly neutral and objective world, there is little or no room for negotiating something different. Is it any wonder that marginalized populations remain underrepresented in engineering disciplines? Feminists, however, criticize this engineering's claim on objectivity as "androcentric" (Pawley, 2004) since it is seeped with values of hegemonic masculinity under the guise of heteronormativity (Bastilich et al., 2007; Beddoes, 2012; Cech & Waidzunas, 2011; Gill et al., 2007). Like the Titanic on its virgin voyage along with its entire engineering glory, hetereonormativity ignores the obvious in order to perpetuate its awesomeness when in reality the icebergs lie just

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ahead. In attempt to reveal the icebergs, postmodern and critical feminists expose the discourses of hetereonormativity inside the hegemonic masculine engineering culture as a way to point out the contradictions to make room for the possibility of transformation.

While hegemonic masculinity is oriented in the western culture as an "independent, risk-taking, aggressive, heterosexual and rational man" (Kvande, 1999, p. 308) and reflects the values associated with male power in the engineering culture, heteronormativity is the discursive glue in which hegemonic masculinity can thrive. Heteronormativity is defined as "the enforcement of norms that create a strict male/female sex binary and designate heterosexuality as the only acceptable relationship form" (Cech & Waidzunas, 2011). As in the soft/hard binary as explained in a previous section, heteronormativity tries to impose entrenched views about acceptable male behavior and acceptable female behavior. Heteronormativity assumes the binary of male and female roles, and any deviation from this expectation is considered abnormal or wrong. Heterosexism is the by-product of a heteronormative culture. Hetereosexism includes language and violent discourse that alienates and vilifies those individuals who live outside the sex binary. Sexist jokes and/or the use of sexist and homophobic slurs and jabs (e.g., "so gay", "bitchin" "such a dyke/butch", "girlie," "pussy," "dick," and so forth), which are intended to amuse, are ways in which the heteronormative culture is reinforced (Bastalich et al., 2007; Cech & Waidzunas, 2011; Chikkatur, 2012; Pascoe, 2007). In addition, there is a pervasive notion of "that is just the way it is" because "boys will be boys" and "there is nothing you can really do about it." In a highly masculine culture like engineering, hetereonormativity plays more of a regulatory role to validate males' status and diminish females' status. Males are perceived as more capable and

more technical than females, for example (e.g., Bastalich et al., 2007). In addition, more gendered nuanced roles outside of this male/female sex binary are perceived as non-existent or condemned. Heteronormativity is reinforced in several ways: 1) Sheer Ignorance; 2) The allowance of sexism; 3) De-gendering; and 4) Intentional silencing.

Sheer ignorance. Franzway, Sharp, Mills, & Gill (2009) offer a provocative case about how heteronormativity in a highly masculine culture such as engineering is reinforced by ignorance or the denial that gender exists in the first place. Franzway et al. (2009) write:

> The concept of sexual politics not only recognizes that men's concerns and practices are the norm, but it also draws attention to the invisibility of men's power, which is constituted as a normal way of being…where women are merely slotted in. (p. 97)

Franzway et al. (2009) suggest that four forms of ignorance (or denial of gender) exist in the engineering context:

1) "Knowing that we do not know, and not caring to know" (p. 98) – which stems from the notion that females are perceived as equal, and not knowing why (or really caring to know why) females are underrepresented in engineering but no one is motivated to do anything about it.

2) "Do not even know that we do not know" (p. 98) – for example, there is a belief that males get promoted more than females because of merit alone; social conditions, such as women giving birth to or adopting a second child, women taking maternity leave, or a men having a stay-at-home wife that cares

for all the unpaid household duties allowing the husband free to work long hours, are not considered.

3) "Willful ignorance where 'they do not know and do not want us to know'" (p. 100) – which is an attempt to deny that sexual politics and the sexism *exist* in the engineering workplace or classroom.

4) "Ignorance is produced by the construction of epistemically disadvantaged identities" (p. 100) – which supports the idea that, while gender neutrality is advocated, women are seen as less capable or "don't cut the mustard" at the same time (p. 101).

In other words, hetereonormativity provides the conditions of ignorance by denying that heterosexism and social gender inequality even exists.

The allowance of sexism. The allowance of sexism comes from the notion that "boys will be boys." Men will joke around in heterosexist ways. They are given carte blanche to act more aggressively by consistently being noticed by teachers and administrators (Chikkatur, 2012; Gallas, 1998; Pascoe, 2007; Sadker & Sadker, 1986; Sadker, Sadker, & Shakeshaft, 1987; Willis, 1977). They are allowed social privileges because of their maleness (Chikkatur, 2012; Gallas, 1998; Pascoe, 2007; Sadker & Sadker, 1986; Sadker, Sadker, & Shakeshaft, 1987; Willis, 1977). In the engineering context, women have learned to tolerate sexism—the sexist jokes and the extreme teasing, for instance—by not reacting to it (Bastalich et al., 2007). Younger female engineers speak about having little choice "but to establish familial, paternalistic, or 'granddaughterly' relationships with men in the workplace" (Bastalich et al., 2007, p. 395) or having to participate in "flirtatious gender games" which minimizes their

competence (Gill, et al, 2008). New clients or outsiders often mistake female engineers as secretaries, and as a result female engineers have to re-establish their credentials as engineers time and time again unlike their male counterparts (Faulkner, 2009).

Female engineers also claim that males perceive them as getting unfair advantages because they are women (Faulkner, 2009). In one research study, female-only preparation and support programs in engineering schools inadvertently produced *spotlighting*—or "singling out women by gender in ways that make them uncomfortable" (McLoughlin, 2005)—because white males (especially low socioeconomic males) perceived that these "special" students were getting unfair advantages. As a result, female students viewed themselves as less capable because of the specialized attention (McLoughlin, 2005).   Instead of gender-specific programs that unintentionally spotlight gender, McLoughlin (2005) advocates for anti-sexism programs in Engineering Schools designed to "identify, pre-empt, and eliminate sexist, racist, homophobic, unethical, and other unacceptable and unprofessional behavior in engineering education" (p. 376).

In addition, Lesbian, Gay, Bisexual (LGB) students often hear "anti-gay epithets within their engineering communities" (Cech & Waidzunas, 2011) such as "faggots" or "that's so gay" to "disparage people, things, and ideas" (p. 9). Many gay male students feel pressure to conform to the "straight male breadwinner model" (Cech & Waidzunas, 2011, p. 9) as to not highlight their difference. Bisexual students have an even harder time because they do not fit in "either the 'gay' or 'straight' categories," and female bisexuals are often perceived as either slutty or opportunistic. In addition, LGB students use covering or passing (or downplaying their identities) strategies that minimize their more gendered nuanced selves in order to not bring attention to them. LGB who expend

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"tremendous amounts of emotional work, including hiding, lying, and isolating from their engineering peers" pay a huge price to play in the game. Moreover, LGB faculty in engineering felt "especially vulnerable to bias, discrimination, and retaliation in the academic workplace" (Bilimoria & Stewart, 2009, p. 88) and used covering and passing strategies like LGB students to minimize their vulnerability. These above examples suggest that sexism tied to heteronormativity is pervasive and should be addressed in more intentional ways.

  De-gendering. In addition to an overall sexist environment described above, de-gendering functions to remove gender from the engineering workplace and academic environment altogether. De-gendering is an attempt to validate masculinity and minimize femininity. Females who become "one of the boys" have intentionally de-gendered themselves to fit into this highly masculine hetereonormative culture (Barnard, et al., 2012; Bilimoria & Stewart, 2009; Cech & Waidzunas, 2011; Faulkner, 2009; Franzway, et al., 2009; Kvande, 1999; Phipps, 2007). Female and homosexual male students who try to assert their femininity are encouraged to downplay or "tone down" their femininity (e.g., dress, speech, and/or mannerisms) because it makes heterosexual males feel uncomfortable (Bastalich et al., 2007, Bilimoria & Stewart, 2009; Cech & Waidzunas, 2011, Faulkner, 2009; Franzway et al., 2009; Kvande, 1999; Phipps, 2002; Phipps, 2007; Powell et al., 2009). Females often dress in more androgynous ways, for instance, to not highlight their femininity (Faulkner, 2009; Franzway et al., 2009; Kvande, 1999). Faulkner (2009) contends that this intentional de-gendering leads to in/authenticity, where males are "gender authentic" and females are "gender inauthentic" in the engineering context (p. 172). Gender authenticity experienced by male engineers and

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male engineering students allow for "real membership" where heteronormative pressures in a highly masculine culture is considered "the way things are" (Faulkner, 2009, p. 173). Females in their inauthentic selves enter the engineering context as fragile members. Faulkner (2009) continues that females' fragile membership as engineers produce unintended consequences for females who experience (often unexpectedly) "loss of self confidence" (p. 175) or low self- esteem, or who see themselves as 'frauds' (p. 176). Feeling like a fraud or "not feeling like myself" leads many females to exit the profession altogether (Bastalich et al., 2007).

Intentional silencing. Silencing functions to reinforce power relationships along male/female lines. In K-12 schools, males are taught to be active by being loud, adventurous, risk-taking, and assertive whereas females are taught to be passive by being silent, cautious, reserved, and respectful (Fordham, 2004; Gallas, 1998, Pascoe, 2007; Sadker & Sadker, 1986). Sadker and Sadker (1986, 1992) contend that male students in general receive more attention, because of their loudness, than females do. They also suggested that male students are called on more often than female students (even when the proportion of male to female students are the same) (Sadker & Sadker, 1992). In addition, male students tend to interrupt the flow of conversation more often than females (Sadker & Sadker, 1986).

In the engineering context, intentional silencing along male/female lines has also been found. Amelink & Creamer (2010) found that females are quieter and typically do not speak up until the end of a lecture or group assignment, for instance. In the case of LGB students, these students intentionally silenced or covered up their identities speaking only in technical language (Cech & Waidzunas, 2011) and rarely speaking about their

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personal lives because it makes heterosexuals uncomfortable. In one case study, a highly aggressive and high academic achieving male engineering student used his power status to undermine and dominate one female chemical engineering student by "checking" her work and second-guessing everything she brought to the table and, while at the same time avoiding his own responsibilities in the group project (Tonso, 2006). This female student rarely stood up for herself against the abuse, but when she did it was in a professional manner that focused on her work efforts. Even though she conducted most of the engineering in the group, this female student was perceived as less-than because of her secondary status. Intentional silencing by this male engineering student was intended to undermine the female student and reinstate his own power status.

Curiously, I did not find many studies addressing intentional silencing in the engineering context. I wonder, however, if it is more common than has been studied.

Negotiating Gender Identity as Challengers

Negotiating identity is often the key for surviving and thriving in a dominant culture; it, too, can help transform a dominant culture when contradictions are made known and subsequent actions take place. Kvande (1999) offers a very provocative theory about how and why some female engineers negotiate inside a hegemonic masculine culture of engineering while other female engineers take the time to transform the pervasive masculine culture in engineering. Kvande's research study took place in the country of Norway, which is known for its more distributive practices and policies between males and females; the particular findings in this study may or may not have as much relevance here in the United States, but her theory is quite provocative and telling nonetheless. She defines the hegemonic masculine culture of engineering as oriented in

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the western culture as an "independent, risk-taking, aggressive, heterosexual and rational man" (Kvande, 1999, p. 308). She attributes that "male-defined interactional rituals are responsible for women's withdrawal from engineering firms" because women are not willing to display male-defined interactions in the form of "aggressive displays of technical ability, self-promotion, and self-confidence" (Kvande, 1999, p. 308). However, Kvande (1999) contends that both females and males are agents "whose actions either challenge or confirm the existing gender order and hegemonic masculinity" (p. 308). In other words, both female and males through their actions, behaviors, attitudes, and discourse reinforce the hegemonic masculine culture, but they may also transform the culture by the intentional allowing and supporting for a more gendered workplace. Gender order, then, is not necessarily static inside the engineering workplace; females and males alike can challenge existing structures that allow for a more gendered workplace allowing for multiple identities to exist and thrive in that workplace.

Kvande (1999) then continues to explain how females negotiate their identity in the engineering workplace through their own positionality. Positionality is a flexible and fluid way to negotiate the workplace culture in more intentional ways. Positionality can either reinforce the existing cultural structures or challenge the existing cultural structures. She theorizes that females use four main strategies to navigate their positionality in a predominantly hegemonic masculine culture of engineering. First, she describes one female strategy group as *The Homeless*. These female engineers perceive that they are disadvantaged because they are women, but they do not necessarily want to change the culture. These female engineers tend to use what Kvande (1999) calls a "sameness and subordination" intentional strategy in which they "keep a low profile in their work,

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perform their duties and obligations to the best of their abilities and hope that they will gradually be accepted" (p. 313). One of the females interviewed mentioned that she could not show any artifacts of femininity (make-up, skirts, feminine haircut, and so forth) because the men will "make comments" (Kvande, 1999, p. 313) and not take her seriously. She had to "adjust to the ways of men" (Kvande, 1999, p. 314). Females in the *Homeless* category are not socially connected to members inside the workplace but prefer relationships outside the workplace so they can be more themselves. Females in this group were not "especially happy in their workplace" but they felt powerless to change it.

Kvande (1999) describes the second female strategy group as *One-of-the-Boys Women*. These female engineers embody the hegemonic masculine values and "unfortunately have to accept the men's norms in order to get ahead: 'Especially in marketing oneself and the swaggering behavior. It is a male quality to advertise oneself'" (Kvande, 1999, p. 315). They are criticized outside of the engineering culture as "acting like men" and being "iron" ladies. They are highly technical in their jobs. They are as ambitious as their male colleagues. They are self-confident in their work and know how to get superiors to notice their performance. Female engineers in this group predominantly choose not to have children because having children will interfere not only with their own career advancement but how "the boys" perceive them. While they at times feel like they are ignored in the workplace, they do not believe any workplace discrimination exist based on gender differences. Instead they blame the lack of opportunities or lack of experience for reasons why they do not advance within the

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company. They tend not to have social female relationships outside the workplace because they are not able to relate to more traditional females.

The third female strategy group Kvande (1999) describes is *The Compensators*. These female engineers experience "the most problems in the work situation" (p. 316). They are consistently placed in subordinate female roles and denied roles/jobs with greater responsibilities. They feel ignored and silenced. They love engineering but are usually dissatisfied with their jobs in the engineering workplace. They typically are mothers although they admit that motherhood impacts how others perceive them as subordinates. They use an intentional interactional strategy called "compensation" in which they try to partially withdraw by keeping a low profile, dropping out of the competition (for good roles and jobs), spending more time with family, and devoting less time to the workplace (even though this behavior conflicts with the expected norm to work excessive hours). Often, these female engineers work part-time (another form of dropping out), even though part-time for them means they work a seven-to-eight-hour workday. If they are offered managerial positions, they usually refuse the offer because the expectation to overcommit/overwork was inherent in the promoted role. Kvande (1999) suggests that female engineers in this category use a strategy of *difference*. They perceive their difference with males inside the organization yet they compensate by actively withdrawing in order to deal with their feelings of difference.

Kvande (1999) calls the last group *The Challengers*. These female engineers embody their difference in ways that transform the engineering workplace itself. Their sense of agency allows them to identify discrimination and challenge the hegemonic masculine norms inside the workplace. Unlike the Compensators, they do not drop out.

They use feminism and critical ideals to argue for more equality in the workplace and overturn expectations of an "overtime culture." They strive to improve conditions that support more work/family balance. They challenge men who work "nights and weekends" just so they will be noticed and "to show they are in the race" (Kvande, 1999, p. 319). In other words, they strive to understand the sociopolitical aspects of the workplace that enforce hegemonic masculine values and norms by meeting "men's domination head on" (Kvande, 1999, p. 320). They focus on interactional strategies based on cooperation opposed to individual competition. These female engineers are able to delegate and decentralize authority without negatively impacting their success in the company. As mothers, they use interactional strategies to successfully negotiate their positions as mothers. They embody their differences as females in the workplace and use this difference in cultivating creative ways to undermine gender-power systems.

Kvande (1999) finally suggests that Challengers have been successful in transforming existing hierarchical hegemonic masculine workplaces into dynamic network organizations where females are fully accepted and fully integrated in the workplace without gender-power systems in place. These dynamic network organizations produce an "egalitarian culture" (Kvande, 1999, p. 321) in which women define their work on their terms without having to adapt to the hegemonic masculine values more typical in hierarchical organizations. The sense of agency allows these female engineers to confidently proceed, despite initial battles, to help transform more masculine entrenched cultures into egalitarian work environments based in cooperation and more realistic expectations of females and males in the workplace.

Like Kvande, Hacker (1989) also suggested that cooperative work arrangements are favorable towards females in the workplace because these cooperative structures can "stimulate more democratic participation at work than traditional (hierarchical) organizations" (p. 96). In engineering schools that use more cooperative methods (as in Polytechnica in Spain), for instance, more informal learning is advocated and promoted through the constant sharing of information. Sharing information is valued over individual knowing and individual competition. The training is more hands-on, visual, and spatial and less on abstract learning and ways of knowing. Further, Hacker (1989) advocates for more feminist ideals in the view of technology itself if the engineering context is to also be transformed in egalitarian ways. She also advocates for looking at the intersectionality between technology, gender, race, and class, which may further explain hegemonic structures that could then be transformed.

As mentioned in previous sections, covering and passing strategies, downplaying femininity, allowing sexism, and supporting gender neutrality are other less favorable ways female students and LGBTQ (lesbian, gay, bisexual, transsexual, queer) students negotiate their identities. However, more positive intentional strategies such as the challenging strategy described above may help female and LGBTQ students help transform the hetereonormative masculine culture inside engineering schoold into a more inclusive and egalitarian environment. I also wondered of students of color used similar strategies. I framed my interview questions to see if students challenged the existing norms and practices in an effort to transform the culture (See Appendix B and Appendix C).

Negotiating Identity as Border Crossers or Boundary Crossers

Female students and students of color may also negotiate their identities using border crossing (Giroux, 1992) or boundary crossing (Foor & Walden, 2009; Pawley, 2007) strategies. Giroux (1992) suggested that border crossing extends to the multiplicity of cultural and social identities that can begin to blur at the borders creating "alternative public spheres" (p. 22). These alternative public spheres allow for the "formation and enactment of social identities" that enable conditions for social equality and cultural diversity, which can be embraced in more positive and comprehensive ways. In connection to female students and students of color in engineering, border crossing would mean that these students who have been viewed from the margins because of their cultural differences are now brought to center stage in a more intentional way that validates their complex identities—as students, as family members, as Latinas, as Asian Americans, as African Americans, as community members, as females/males, as LBGTQ students, as low socioeconomic students, as middle class students, and so forth. In other words, border crossing attempts to address the social and cultural complexities of students' lives as students (and teachers) begin to explore the asymmetrical power relationships in connection to their own identities.

Rooted in postmodern discourse analysis, the act of deconstructing the postcolonial discourse is the key to uncovering the asymmetrical power relationships that have been at play in multicultural school settings, which then can lead to students' collective agency. Giroux (1992) writes:

 At stake here is deconstructing not only those forms of privilege that benefits

males, whiteness, heterosexuality, and property holders, but also those conditions

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that have disabled others to speak in places where those who are privileged by virtue of the legacy of colonial powers assume authority and the conditions for agency. (p. 27)

Reclaiming the collective voice of the diverse community of students while validating the multiplicity of students' identities is key to deconstructing the postcolonial discourse. Students need to be able to "interrogate their own histories" (Giroux, 1992, p. 30) in an effort to explore the contradictions in what they learn and how they learn. This cultural remapping allows—then—students to create a narrative that counter the Master Narrative, or in this case an alternative to highly hegemonic culture supported by heteronormative discourse.

Giroux (1992) challenges educators and students alike to "take up culture as a vital source for developing a politics of identity, community, and pedagogy" (p. 32) in order to discover how marginalization is internalized but can be challenged and transformed. Through the act of border crossing (or the blurring of identities in an alternative public sphere), both students and teachers are able to validate alternative identities that are different from the dominant leading to their own transformations and to the creation of their own version of academic achievement and success.

Like Giroux (1992), both Pawley (2007) and Foor and Walden (2009) use the idea of crossing boundaries through a boundary language, which acknowledges the multiplicities of identities. Boundaries mark "the social territories of gender relations, signaling who ought to be admitted or excluded…boundaries highlight the dynamic quality of structure of gender relations, as they are influenced and shaped by social interactions [Gerson and Piess, 1985]" (Foor & Walden, 2009, p 43). Foor and Walden

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(2009) suggest that experiencing life at the borderlands helps to "locate cracks in the hegemonic barriers" (p. 43) in order to create new definitions. Boundary crossing suggests that belief and practices are not fixed; it suggests the culture itself is fluid and can change. Pawley (2007) also suggests that faculty get outside the discipline in more cross-disciplinary ways to expand the viewpoints inside the engineering context because blurring the boundaries suggest that contexts can change. It is from this position as border/boundary crossers where contradictions can be uncovered and transformation can occur.

Explaining Inherent Liminality (Antistructure)

When typical college-bound students arrive to college or university, they arrive at a threshold or "betwixt" state—from adolescent to adulthood (Turner, 1969). College is often considered a rite of passage as students leave home and become adults (Nathan, 2006; Turner, 1969; Zarrett & Eccles, 2006). For many, college represents the first time students leave their home and community. Some students are prepared to leave home and what they left behind, while others are not so ready. A common college experience of a "typical" college student may be different than a "typical" engineering student who arrives with a clear aim to become a professional. In addition, female students and students of color who have more nuanced identities connected to their "home" identity, "community" or their "gender" identity may need to navigate in different ways compared to white male students who arrive to the context ready to embrace their identity as engineering students on the road to becoming a professional engineer.

When a typical (18-20 year old) student leaves for college, there is a knowingness in advance that the college experience is life changing. Many of these 18-20 year old

students leave home for the first time and have experiences as independent adults without any parental supervision (Nathan, 2006; Turner, 1969; Zarrett & Eccles, 2006). These 18-20 year olds experience their first tastes of adult freedom when they leave home for the first time in a bounded organizational system, like a university. The university provides a context for students to learn how to become an adult. As Zarrett and Eccles (2006) describe:

> …college-bound youth have the opportunity to extend exploration of the self, develop new ideas, take advantage of multiple opportunities, and try out various lifestyles. In essence, universities are social institutions that have become increasingly tailored to provide a sort of semiautonomy to assist the transition into young adulthood. (p.18)

For the first time, many students learn how to structure and organize their world much like the adults who took care of them. They learn how to manage their time, their course load, their relationships with friends and romantic partners, their food intake, and their sleep. The loose hold of the university guides students' behavior by providing sanctions, which determine if students are deemed worthy to stay (because they are passing their classes). These sanctions are in the form of attending class (and penalties including failing a class for not attending), grades (passing all classes with a C grade point average or be terminated from the university), dorm rules (key or keypad access, curfew, guest restrictions), and so on. Keeping these organizational sanctions in mind, students get to decide how they will spend their time studying, working on school projects, participating in extracurricular clubs, partying, visiting home for the weekend, and so forth.

College is also a time for students to experiment with their own identities (Nathan, 2006; Zarrett & Eccles, 2006). They arrive to college having an identity based on their adolescent affiliation to "home" and the "home" culture—which I have labeled as their own "home" identity. This "home" identity is connected to their ethnicity, home language, religious affiliation, and foundational belief system about the world around them. In the safe confines of the university context, students have the luxury to experiment with identities, which either contradict their "home" identities, confirm their home identities, or a combination of the two. Without their parents, grandparents, extended family, and community looking constantly over their shoulders, students start to become their more authentic selves as they experiment with their identities—almost like trying on different clothes and finding the fashion that fits "who they are" best.

One purpose of the university experience—or at least in its recent liberalist past—is to begin preparing students as adults who connect with their authentic selves (Nathan, 2006; Zarrett & Eccles, 2006). Part of transforming students into authentic selves, however, involves exposing and engaging students to a collection of educational experiences. These educational experiences consist of requiring all students to take general education and liberal studies classes regardless of discipline. The intent of this educational experience then is to expose students to a variety of different belief systems, approaches, ways of being (ontology), ways of knowing (epistemology), and ways of seeing (phenomenology).

Rebekah Nathan, a cultural anthropologist who went incognito as an entering freshman student at a mid-size university in her book entitled, *My Freshman Year: What a Professor Learned by Becoming a Student* (2006)*,* points to the college experience as

being a liminal (or threshold) experience for adolescents who are transitioning into adulthood. Borrowing from Victor Turner's concept of the ritual in his book, *Ritual Process* (1969), liminality is a transitional or "betwixt" stage for adolescents in becoming adults. Liminal experiences connected to *communitas* (or common connections with others who are at similar/same status and have a similar experience) allow adolescents, or college students in this case, to fluidly discover their identities in their "common experiences" as college students. It is no surprise that once students have graduated from college/university and are out in the real world, they can immediately connect to other adults who have also had a similar "college experience." College as a preparatory "rite of passage" into adulthood creates a commonality, or a *communitas*, for those individuals who have had this experience (Turner, 1969). And this experience differentiates these individuals from individuals who did not or could not have the same experience (due to lack of interest, lack of exposure, lack of money, and so forth).

In college, loose ritual in the form of sanctions (e.g., grades, attendance policies, academic honesty policies, and so forth) and common college experiences (e.g., football games/athletic events, special college cultural events, orientation, Greek fraternities, dorm living, extracurricular activities, and so forth) provide students a context to experiment and to share a commonality with all college students (even though some experiences are more divisive, like Greek fraternities) (Nathan, 2006; Turner, 1969; Zarrett & Eccles, 2006). Some students resist the college experience and its loosely structured approach, and they quit returning to their "home" identity. Other students embrace the loosely structure approach of the university and alter their "home" identity to include their newly discovered college identity along with other personal identities that

come with the college experience. Some students flourish and become lifelong students (a.k.a., graduate students and professors) who thrive in a more liminal way of being (for instance, they don't want to get a job for a job's sake; they want the freedom to research and explore more unbounded conditions and fewer restrictions, which would otherwise be expected of them in the more structured "business' world beyond the university).

College, by and large, provides conditions for students to become acquainted with ways of being an adult with a loose yet safe structure for students to transform in a common experience that leads to adulthood (with a few exceptions, namely those "career academicians" who choose to stay).

Ritualization Towards Professionalization (Structure)

In trade and professional colleges (training students to become a certain type of professional—engineer, hygienist, nurse, computer programmer, architect, and so on), students are usually introduced fairly early to a fairly rigid curriculum path in the process of becoming "that" professional. What I have set out to show in the findings of this study, civil engineering students have less wiggle room to explore a variety of college experiences because they must focus on completing course requirements and pre-requisites that allow them to continue with the program (see Chapter 5). Students had to focus on their coursework and getting good enough grades to keep going smoothly from semester to semester. Failing a course meant delaying an entire year to graduate since a course was offered only once an academic year. In addition, students in a professional engineering program had a different "common" experience compared to students outside the professional degree, who had a more typical "college experience."

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Education rituals can be both a social function to maintain status quo and/or a process of socialization in the becoming of someone—for example, an adult or a professional (Quantz, 1999). Education rituals, if used often or excessively, can have a regulatory and conforming function among its students and can help differentiate between groups of students, creating a separateness from "those who are not 'us'" (Quantz, 1999; McLaren, 1999). In addition, educational rituals can allow students to create shared meanings with each other because they know what is expected of them and how they are supposed to act (Quantz, 1999). McLaren (1999) suggests students can move between "student state" and "street corner state" (or, in the case of this study, non-student state) as they enter in and out of the educational context, which allows students to toy with different ways of interacting and being. However, when a student is always immersed in the "student state"—because of lack of sleep, lack of free time, and/or lack of addressing their own personal needs related to keeping up with their courses—then the students can become stuck, if you will, in the student state. They cannot easily see a different reality outside of this student state. It is only when they begin to question and explore the contradictions or the "dialectic" (Quantz, 1999, p. 500) within their reality does the fractures to this seemingly static state starts to become apparent. This is the point when they may begin critiquing the culture and the way things are. While they may not be able to do anything about it, they at least have a sense that "it's not what it seems."

In this study, I have explored how this ritualization towards professionalization acts as a way to reify sameness at the expense of individual identity or personal authenticity (which may be at odds with professional identity).

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Conclusion

This study was informed by the literature review that helped frame the context for the observations and the interviews. As the interviews and observations continued, I returned to theory to further explain what might be happening. First of all, an engineering schooling culture does exist and it seems to serve a regulatory function for producing future engineering professionals. Second, subtle more than overt sexism and/or racism was observed and gleaned from interviews, and—with this subtlety—there is a type of inferred danger about how students who feel different are supposed to navigate when the rules of engagement are not so black and white. When sexism or racism is more overt, it is often easier to navigate because rules of engagement are out in the open. As the rules of engagement become subtler or more covert, then sexism and/or racism becomes harder to define and students who are different have a more difficult time understanding what is going on. Third, hegemonic masculinity, which places underlying value on heteronormativity, is occurring but again more subtly than overtly. Focus on the individual and individual accomplishments became a way to show that equality exist across students and different students (across ethnicity, gender, religious background, and cultural background). However, time and time again, students who identified outside the dominant white male perspective either were penalized for being/acting differently or had to adjust their ways of being or acting usually by enacting self-regulated avoidance measures. All these preliminary conclusions will be explained in greater depth in Chapters 4 thru 8.

Chapter 3: The Method Employed

The method employed I would gladly explain, While I have it so clear in my head,

If I had but the time and you had but the brain—But much yet remains to be said.

(Carol, 2013, Chapter Fit the Fifth, para. 18)

Research Design

The purpose of this study was, first, to explore the social complexities of female students and students of color in the civil engineering discipline by critically reflecting on the pervasive dominant engineering culture that may keep these students marginalized and/or subordinated. Second, an ethnographically informed case study was used to explore how females negotiated identity through discursive ways in a highly regulatory culture, such as engineering. Third, this study attempted, albeit somewhat unsuccessfully, to identify if female students and students of color were using discursive strategies (as Challengers or Border/Boundary Crossers, for example) to help transform the dominant engineering culture.

In this study, my research questions consisted of the following:

- What is the dominant culture reflected by the cultural artifacts and actions/interactions observed within the civil engineering discipline?

- What is the purpose of schooling inside the civil engineering discipline?

- How are females and students of color identifying themselves within this dominant culture?

- How are these students negotiating their identities inside the dominant culture?

- Why are these students pushing through to graduation?

According to Gay, Mills, and Airesian (2009) and Merriam (1988) a case study is a qualitative design approach that promotes the examination and the analysis of social, cultural, and symbolic phenomenon within a bounded system, such as a school, a department or a program. Merriam (1988) states that four characteristics are essential when considering a qualitative case study design. One, case studies are *particularistic* – meaning that case studies "focus on a particular situation, event, program, or phenomenon" and takes into account a more holistic view of the particular context. Two, case studies are *descriptive*. Borrowing from Geertz's idea of thick description, case studies try to fully describe the "multiplicity of complex conceptual structures, many of them superimposed upon or knotted into one another, which are at once strange, irregular, and inexplicit, and which he [she] must contrive somehow first to grasp and then to render" (Geertz, 1973, p.10). Thick descriptions allow for the interpretation of meaning that may unseat or confound more commonplace notions in an attempt to broaden understanding in more complex ways. Three, case studies are *heuristic*, or help uncover meaning in new and exciting ways that make the unknown known. Fourth, case studies are *inductive* meaning that new relationships emerge and evolve from the data (e.g., observations, interviews, and artifact analysis).

Given that I was studying one discipline of engineering and was trying to discover new ways of looking at unexplored ideas and relationships, an ethnographically informed case study was a suitable design approach for this study since it met the four above characteristics. Specifically, I explored one engineering discipline (the civil engineering discipline) using classroom observations, public spaces observations, artifact analysis, and semi-structured interviews. My positionality while undertaking this research study

was as a critical feminist where I attempted to uncover positions of domination and power structures. I also employed a post-structural stance to help me locate discursive shifts and contradictions inside the dominant culture related to identity. I used a grounded theory approach to frame my data collection and subsequent analysis. A grounded theory approach is an iterative and comparative process to data collection—that systematically examines what is happening (the phenomenon) and leads to an emergence of patterns and subsequent themes for the purpose of inductively constructing a theory about the social and cultural phenomenon being examined (Lapan, Quartaroli, & Riemer, 2012; Strauss & Corbin, 1990). In addition, I used Goffman's theory of self-presentation as a framework for observations. Goffman's theory of self-presentation investigates the tacit agreements between performers (the self or individual female students) and the audience (the civil engineering context bounded by the expected norms and values reinforced by the majority) and the contradictions that may occur or be exposed when performers are "out of character" (Goffman, 1959, p. 238-9). Using this framework allowed me to locate contradictions and discursive elements that either reinforced the dominant culture or countered the dominant culture (See Table 1).

Table 1. Analyzing Contexts for Observations Using Goffman's Self-Presentation Theory

Contexts and Definitions	Examples
Technical contexts: "efficiency and inefficiency as an intentionally organized system of activity for the achievement of predefined objectives" (Goffman, p. 240)	How is the existing cultural context and values being maintained in the school of engineering?
Political contexts: "actions which each participant (or class of participants) can demand other participants, the kinds of deprivations and indulgences which can be meted out in order to enforce the demands, and the kinds of social controls which guide this exercise of command and use of sanctions" (p. 240)	Are female students or students of color expected to act in a certain manner, and if they do not act in certain ways are social and political sanctions imposed on them?
Structural contexts - "horizontal and vertical status divisions and the kinds of social relations which related these groupings to one another" (p. 240).	Are female students or students of color grouped in ways that separate from other males, other females, by class, or by race?
Cultural contexts - "moral values which influence activity in the establishment – values pertaining to fashion, customs, and matters of taste, to politeness and decorum, to ultimate ends and normative restrictions on means, etc." (p. 240).	What is acceptable female behavior and dress and does it differ from male behavior and dress in a school of engineering context? Are their social sanctions when certain behaviors and way of dressing are not carried out?
Dramaturgical contexts: "the techniques of impression management employed in a given establishment, and the identity and interrelationships of the several performance teams which operate in the establishment. " (p. 241).	How do female engineering students or engineering students of color negotiate their identity by either affirming the dominant culture or challenging the dominant culture by the way they manage their identity and interrelationships with others? What are the contradictions with what is said and what is displayed?

In this study, I addressed these questions by conducting an ethnographically informed case study of a civil engineering discipline with observations of a classroom and common areas using ethnographic methods to help identify the dominant culture. I also conducted and analyzed public artifacts such as signage on public walls, interior structures, and discipline and student organization websites that helped further support

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and explain the context. In addition, I conducted in-depth semi-structured interviews of female students and students of color to examine these students' experiences.

Research Context

I conducted this ethnographically informed case study at a mid-size public Tier 2 university located in the southwest United States. In this study, this university is identified as Normal University. At the time of data collection, Normal University had a student population of approximately 26,000 students. As a Tier 2 university, Normal University boasted educational programs that help students get jobs after graduating, but it also supported research to help foster an environment of inquiry. While a liberal education was supported at this university, academic programs that supported the economic development of the state were at the time getting more attention and more funding. These academic programs included the variety of programs under the umbrella of STEM (Science, Technology, Engineering, and Math). Female students and students of color at Normal University typically pursued more non-STEM degrees (Education, Business, English, and so forth). Female students and students of color at Normal University were encouraged to pursue STEM disciplines if they were academically prepared (given their past high school performance in STEM subjects). At the time of this study, student and academic affairs had made efforts to retain students of color and females in STEM disciplines at Normal University through programmatic "retention" approaches. University-wide initiatives focused on better teaching (teaching more creatively, more learning-centered teaching, and teaching with publisher digital content, and so forth) and student retention were pervasive.

A larger college, which includes a civil engineering department, at Normal University was well respected at the time of this study. It received international recognition in many of its engineering disciplines. It was ranked within the top fifty of best engineering colleges in U.S. News Best Colleges Report 2013. In addition, the school supported a [name of multicultural student program] to help support and retain students of color throughout their studies and provide these students with industry contact for finding a job or internship.

It is safe to surmise that similar midsize Tier 2 universities with engineering programs are similar to Normal University. Programs at Normal University have customarily focused on "leaky pipeline" programmatic approaches to address student retention problems.

Population and Sample

The population for this ethnographically informed case study was the research site itself. The research site consisted of the engineering building, including the common areas, hallways, signage on walls, public websites and documents, organization of physical spaces, classroom organization, and the students, instructors, and staff. For the purpose of this case study, I primarily examined female students and students of color interacting with instructors, staff, and other male students. Passive observations took place in the common areas. In addition, I identified two classrooms for passive observations. The classrooms being observed represented the typical make-up of students (female students, international students, male students, students of color). I observed one junior-level lecture-style class and one senior-level teams-based class, which were both required courses for the degree. In addition, I interviewed 8 students

total (4 female students of color, 2 male students of color, 1 white female student, and 1 white male student) and 5 staff members (4 white females and 1 female of color).

Instrumentation

As both a passive observer and interviewer, I am the main instrument for this study. As I mentioned before, a grounded theory approach was used to measure and analyze the data for this study. Strauss and Corbin (1990) referred to the theoretical sensitivity of the investigator, which gives the investigator "awareness of the subtleties of meanings of data" (p. 41). Theoretical sensitivity can be achieved through any or all of the following: 1) Personal Experience (in my case, as a female in a STEM profession); 2) Professional Experience (in my case, as a female in a STEM profession and former employee of two engineering companies), and 3) Immersion in the Research Literature itself. While I did not have direct experience as an engineering student, my background as a female in a traditionally male dominated technology field and my past employment in an engineering firm helped me relate to students.

While collecting data, I stayed mindful of the initial coding process of data, which then leads to theoretical coding. Lapan, Quartaroli, and Riemer (2012) suggested that initial coding allows the investigator to stay close to the data by exploring concerns of the participants, tacit assumptions, explicit processes and actions, and latent process and patterns (p. 44). With this in mind, I conducted my initial coding using TAMS Analyzer Software (Weinstein, 2002-2012), which allowed me to create codes and re-use codes. I was very granular (usually phrase by phrase or interaction by interaction) during my initial coding process identifying the phenomenon being observed or suggested (e.g., showing responsiveness, feeling guided, feeling respected, valuing practicality, valuing

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problem solving, perceiving imbalance, perceiving difference, and so forth). This

granular initial coding allowed for a wide range of possible interpretations of the data.

Using a constant comparative method, I systematically reviewed the data and made

necessary modifications and refinements as new iterations of data were introduced.

While validity and reliability in the quantitative sense, especially replication of study,

was not a concern for a qualitative case study (Lapan et al., 2012), I tried to ensure my

biases were kept in check and that the analysis reflected accuracy of the situation or

observation being considered. I consulted with instructors and cultural insiders to make

sure my observations were valid. I often added follow-up questions during interviews

based on my observational insights to verify what I thought I might be seeing.

Triangulation by using a variety of methods for collecting and analyzing data such as

interviewing, observations, and document analysis was a way to establish validity or

trustworthiness of the my interpretation.

In addition, I made attempts to determine if findings from this study and

population could be transferred (called transferability—a qualitative form of external

validity) to other parallel populations (Lapan et al., 2012). Dependability, which closely

parallels reliability, was addressed by having others such as key informants, committee

members, and dissertation chair audit the analysis to ensure that data interpretations were

accurately reflecting the phenomenon being analyzed.

Data Collection

The data collection started with a preliminary public artifact analysis occurring in

the Summer 2013 semester. At this point, I looked at newsletters, syllabi, course

progression plans, and websites to get a general sense of what was going on inside the

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program. This was my effort to understand the general culture and expectations of being a civil engineering student. This documentation was open to the public, and so it is safe to surmise that civil engineering students will look at this information prior to starting the program or while completing the program. In addition, I reviewed the original analysis of the documents after my observations and interviews in an effort to support the themes I was finding. I concluded that the absence of information about gender and race in the public documentation was telling from a critical standpoint.

Also during the summer, I interviewed 4 out of 5 staff members (four white females and one female of color) who played a support role or an academic advisor role in engineering overall. I used a set of questions for semi-structured interviews (See Appendix D). Interviewing the staff members before my observations and student interviews during the fall was extremely enlightening. Ahead of time, I was able to confirm or challenge some of the insights that I found during my initial document analysis and theoretical review. Also, I was able to discover subtleties within the culture and context, which allowed me to frame my observations and subsequent interviews with students in the fall semester. As a result, I was able to watch with more keen awareness knowing the patterns that emerged during the initial pass of staff members' interviews via my initial coding. With this awareness along with my emergent findings from classroom observations, I was able to ask follow-up questions to the students in order to clarify points that I heard and/or observed. It was also helpful to interview the last staff member later in the fall semester. What I found in this case was that the findings were pretty consistent. Interviewing staff members during different semesters really didn't matter. The findings were consistent despite a lapse in time.

During the fall semester, I observed two classes: one junior-level lecture style class and one senior-level teams-based class. These classes, with a somewhat typical composition of students (male students, female students, students of color, and international students), were observed three times a week for a month and a half starting in mid-September and ending in early November. In Chapter 1 in the sub-section entitled "Purpose of the Study and Research Questions," I specifically addressed the demographic make-up of the two classes and how this informed why I slightly modify the research questions. There, I shared my insights comparing the two contexts and how that difference impacted my observational framework. With this in mind, I wanted to look at how females and students of color might be transforming culture. By the time they are juniors and seniors, female students and students of color will most likely graduate and persist (Haden & Lapan, 2007). These females have found ways to successfully navigate either by supporting the status quo or challenging the status quo (usually the former than the latter in this study). I took painstakingly detailed handwritten field notes (See Appendix A) to collect data during each class period. As I originally planned, I was not able to obtain audio recordings of the classroom sessions (in either of the two classes) because at least one student did not want to be recorded. After each class session, I reviewed the classroom data and wrote synthesis observational notes because this ensured a more accurate reflection of the event (Strauss & Corbin, 1990). Since I didn't have audio recordings, I needed to make sure that the data I collected was detailed enough and captured the spirit of the session.

Near the end of the classroom observation period, I interviewed 8 students total using semi-structured interview approach (See Appendix B and Appendix C). The

questions for the semi-structured interviews are based on the findings from the literature review, artifact analysis, and classroom observations. The questions were adapted as new data arose, which helped to further refine the questions and then lead to data saturation. Data saturation refers to conceptual density and theoretical completeness arising from the data (Lapan et al., 2012). Fortunately, I was able to obtain approval to digitally record (audio only) the eight student interviews. As in the staff interviews, I personally transcribed the interviews soon after the actual interview took place.

Prior to the start of the observations and semi-structured interviews, informed consent forms with explanations of IRB such as establishing confidentiality and anonymity of participants, explanation of safeguards for the data, and follow-up with participants, were collected from all participants (See Appendix D). All audio recordings will be destroyed after the research project is completed.

Data Analysis

The analysis of the data occurred in several stages using a grounded theory approach. During artifact analysis, classroom observations, public observations, and interviews, data were initially coded for specific patterns. Lapan et al. (2012) state that initial patterns should be stated in the gerund form (e.g., acting, controlling, confusing, and so forth) because the focus then is on action and the process allowing the investigator to make connections between the codes (Lapan et al., 2012). At this stage, the use of the gerund form allowed me to code for the phenomenon being described during the participants' interactions or interviews (e.g., feeling socially connected, valuing hard work, feeling respected, perceiving difference, feeling uncomfortable, showing responsiveness, perceiving sexism, etc.). At this stage, I used a constant comparative

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method to modify and refine patterns as new data emerged and was then compared. After the initial coding, I used focused coding to group similar initial patterns into conceptual categories. I began to see larger patterns connected to the initial coding, which led to axial coding. Axial coding put the data "back together in new ways by making connections between category and subcategories" (Strauss & Corbin, 1990) and into a relational form forming a paradigm model. The final stage of analysis was to determine if a general theory (albeit specific to this particular phenomenon and situation) could be generated that might have implications for transferability to similar situations.

In summary, the data analysis in this study included the following:

1) Analysis of 8 student interviews (4 female students of color, 2 male students of color, 1 white female student, and 1 white male student);

2) Analysis of 5 staff interviews (4 white females and 1 female of color);

3) Analysis from observing two different civil engineering classrooms (one junior-level lecture style classroom and one senior-level teams-based classroom) three times a week (except for exam days) for a month and a half;

4) Analysis from attending a STEM-based career fair (and subsequent brochures and recruitment information);

5) Analysis of website for program-specific and discipline-specific information along with external newsletters intended mostly for alumnae and internal newsletters mostly intended for multicultural students in the program; and

6) Analysis of my own personal interactions with faculty and students and observations of the public spaces within the building and other nearby buildings.

The collective data and subsequent analysis using a reflexive approach offered a counter narrative to the existing leaky pipeline approaches (i.e., programmatic approaches that try to prevent females or students of color from exiting the engineering discipline), which, I hope, will help higher education leaders and administrators to critically re-think what might be happening to female students and students of color in STEM degrees, such as a civil engineering discipline.

Why a reflexive approach? From this spirit of reflecting from my own experience as a STEM professional, my approach for this analysis comes from a place of reflexivity, where I as the researcher use my personal connection to what I am studying to help guide me in understanding what might be happening. Davies (2008) explains research that uses reflexivity as follows:

> Reflexivity, broadly defined, means a turning back on oneself, a process of self-reference. In the context of social research, reflexivity at its most immediately obvious level refers to the ways in which the products of research are affected by the personell (personal) and the process of doing the research. (p. 4)

My insights are guided by my own experiences as a STEM professional and as a past student who was particularly good in math. In addition, I worked for several years in my twenties at two different engineering companies—one in an international fabricator with a U.S. business office and the other in a global engineering firm at a major engineering-centric metropolis—on the business side of engineering. I am familiar then with the world of engineering, and it does not frighten me. I am also a career technical professional with over fifteen years of work experience (as a software testing analyst for

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an international consulting firm and most recently as an educational technology professional at two different large and mid-size universities).

Finally, I have an affectionate connection to the students and the instructors I observed. During my observations, I genuinely felt included albeit in different ways in the both classroom settings. I felt like I was "put on the spot" or asked to comment just as the students were. I learned to hold my own and persist through. From this standpoint, I must be reflexive because I would be dishonest if I acted as some neutral observer when I was not. While I hesitate to expose, if you will, a different view of what might be going on, I do so because I care. I care about the students I observed and interviewed. I care about the instructors who readily and openly invited me to their world and actively engaged with me. So while I may be tempted to be nice (Castagno, 2014) I have to be honest about what I saw and heard in the hope that change at a more systemic level may be possible for students who may otherwise feel like outsiders and may give up or, perhaps more dangerous, give in to how things are.

While my intent is <u>not</u> to prove or disprove a hypothesis or a set of hypotheses, I, however, intend to give meaning to a collection of in-class, out-of-class observational data in tandem with student and staff interview data through a deep and intense analysis of patterns that, through my interpretation, has evolved from an inductive approach. Along with more static documentation like websites, newsletters, public artifacts, this data should illuminate a different perspective on females and students of color persistence inside the civil engineering discipline—one that critically reflects and comments on the culture and its regulatory purpose toward creating civil engineering professionals. With this said, I, too, must critically reflect on my initial research problem and set of research

questions, which had to evolve as I began my observational journey. In a true reflective

spirit, I had to readdress and redefine the problem before I began to analyze my data,

which will be examined next.

Using a grounded theory paradigm model approach. Strauss and Corbin

(1990) offer an excellent conceptual framework for explaining a set of relationships and

patterns within qualitative findings (See Figure 1). *Causal conditions* are "events or

incidents that lead to the occurrence or the phenomenon" (Strauss & Corbin, 1990, p.

100). In this study the causal conditions are described as the minimum conditions needed

to be met, which give students confidence for going into civil engineering in the first

place and conditions for why they choose to stay. Context and phenomenon are used

interchangeably in this study. The *phenomenon* is roughly described as students'

persistence inside the *context* of an engineering discipline and associated culture. The

purpose of *intervening conditions* is to "either facilitate or constrain action/interactional

strategies taken within a specific context" (p. 103). In this study, certain intervening

conditions make it possible for students to navigate the context of the civil engineering

discipline more effectively. Action/Interactional Strategies have been shortened to

Actions/Interactions in this study. *Actions/Interactions* are the interactional behaviors

that are managed, handled, carried out, responded to in response to the context and

phenomenon under a set of intervening conditions (Strauss & Corbin, 1990). In this

study, actions and interactions are specific ways students respond in reaction to their

interactions with students, instructors, guests, and staff members within the engineering

discipline context as impacted by their willingness to persist in the discipline. As in the

original model, *consequences* are the outcomes of these action/interactional strategies

within the context (or discipline). In this study, consequences are the outcomes for responding to interactions if continued over the long haul.

Causal Conditions	Context / Phenomenon	Intervening Conditions	Actions / Interactions	Consequences
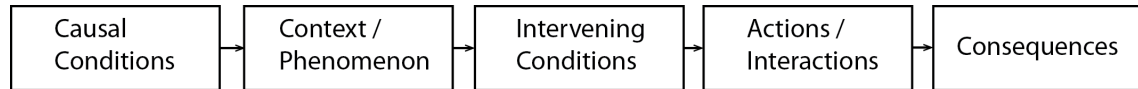
Figure 1: Grounded Theory Paradigm Model

While the Grounded Theory Paradigm Model offers an excellent foundation to explain what is going on the civil engineering context, the model does not inherently address critical components that may be impacting the context. As highlighted in Chapter 2 of this dissertation, contradictions expose the "positivities" (or the perceived truth) by exposing metaphors and juxtapositions that no longer work (Foucault, 1972, p. 171). Contradictions seem to be accidental but they in fact expose illusions of unity (Foucault, 1972). In the spirit of Foucault and critical researchers, contradictions powerfully influence the actions/interactions of participants/players while at the same time they foster a set of unexpected or unintended consequences over the long term if the present conditions of the context are maintained. What is hopeful, however, is that contradictions have the potential to break down the illusions of a seemingly static context (culture) in true spirit of transformation. Contradiction points to the fluidity of a culture and its potential for change. As a result of the value I place on contradiction as a critical and post-structuralist researcher, I have proposed a change to Strauss and Corbin's rather functional paradigm model to include the critical/post-structural component of contradiction and its influence on the phenomenon being explained in a specific cultural context (See Figure 2).

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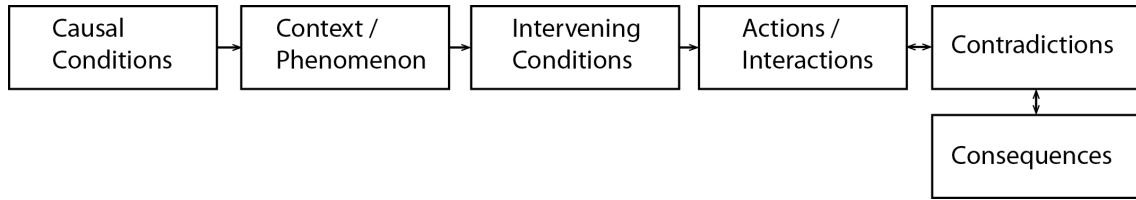
Figure 2: Grounded Theory Paradigm Model Revised

In this study, *contradictions* expose the seemingly static beliefs of the civil engineering discipline inside an educational context via how students respond to others (*actions/interactions*) and the long-term outcomes (*consequences*) of students' responding in seemingly predictable ways over a period of time. My hope, however, is that by exposing the contradictions in connection to students' actions/interactions and consequences that illusions of unity are shattered so that a critical conversation about the cultural context inside the civil engineering discipline can begin. I will be using this modified model to explain my findings, which will be divided up into smaller chapters in order to make a stronger connection to the model.

Protecting my interview subjects/participants and classes observed. Before I reveal my findings, I would like to share my strategy for protecting the subjects and the classes I observed in this study. To recall, students of color in this study were Hispanic, African American, and/or Native American. I intentionally left out Asian Americans because most of the Asians in the program were international students not Asian Americans (from what I could observe). This is an interesting phenomenon in itself, but alas I won't go there in this study.

Since there were relatively few students of color in the two classes I observed—who also participated in the interviews, I cannot in good conscious reveal their specific American ethnic backgrounds for fear of exposing their identities in the process. For the purpose of this study, students from different American ethnic backgrounds will be identified only by their larger group affiliation, that is, students of color (also, student of color, female student of color, male student of color, and so forth). In addition, I will use brackets to identify otherwise information that might identify the student in a direct quote—for example, "My mom warns me about that every time—'Always remember you are a [man of color].'" In addition, I will use white male student or white female student to differentiate from students of color.

Also, I will not identify student's sexual identity. While one participant did openly identify outside the heterosexual norm, this participant will not be named—again out of protecting this student's identity. While I would like to enthusiastically share some of this participant's insights in reflecting a heteronormative culture supported by masculine hegemonic values, I will not for fear of revealing this student. Nonetheless, the near absence of gender diversity is a chilling finding in itself but will have to be explored in a different study.

Since I will not be identifying students' particular American ethnic background or sexual identity, I plan to name participants by their own pseudonym. This should help build the context relevant to each participant's own experience, which are similar but different. Ultimately, this will help me build a case for what I observed and heard.

In this study, students self selected to interview in this study. As a result of this self-selection process, students who were interested in the topic for personal reasons

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volunteered while others did not. The students I interviewed represented only a very small fraction of the student population in the civil engineering program. At least in this small case study, students had similar shared experiences. However, this does not mean that all students are experiencing the context in the same ways. Unlike quantitative research, qualitative research tries to offer an alternative narrative connected to a smaller number of participants' perspectives by drilling in more deeply. Their stories aim to add a contextual layer, which cannot be examined by observations alone or through quantitative studies, which focus mainly on the average population composed of a large number of participants (albeit from different groupings).

For convenience, I am providing a key listing pseudonyms for interviewed participants, which are as follows:

- Female students of color: Sarah, Terri, Jasmine, Rebecca

- Male students of color: Adrian and Matthew

- White students: Madison (female) and Daniel (male)

The reasoning for separating white students from students of color is for examining observed differences in perspectives between these two groups. There are also observed differences between female students and male students.

Finally, I will not identify instructors that I observed by name nor identify the staff members I interviewed. Instead I will use a similar bracketing strategy I used for student's direct quotes. For example, I will write Dr. [name of instructor] to refer to any instructor that I observed or was referred to in the interviews. I will also write Dr. [name of administrator] for any instructor with an additional administrative or programmatic role. I will use Staff Member or [staff member] when referring to the interviewed staff.

In addition, I will name the two classes I observed by the following naming convention: lecture-style junior level class and team-based senior level class. I will use a bracketing strategy when specific content related to class is revealed or mentioned (e.g., [name of project], [name of concept], and so forth).

I know my findings are potentially controversial and so it is in good conscious that I protect my subjects while still honoring their stories/their perspectives while offering an honest reflection about what is going on.

Chapter 4: Causal Conditions – Starting Point for Students Entering and Staying Inside the Discipline

Either the well was very deep, or she fell very slowly, for she had plenty of time as she went down to look about her, and to wonder what was going to happen next. First, she tried to look down and make out what she was coming to, but it was too dark to see anything: then she looked at the sides of the well, and noticed that they were filled with cupboards and bookshelves: here and there she saw maps and pictures hung upon pegs. She took down a jar from one of the shelves as she passed: it was labeled "Orange Marmalade," but to her great disappointment it was empty: she did not like to drop the jar, for fear of killing somebody underneath, so managed to put it into one of the cupboards as she fell past it. (Carol, 2013, Chapter 1, para. 3)

Introduction

Entering into the engineering discipline as a student is sort of like jumping into an unknown land and wondering what is going to happen next. However, before jumping into the discipline, students have a pretty good understanding about the academic journey they are about to embark. Consistent with the Grounded Theory Paradigm Model, causal conditions should be in place before studying the phenomenon and determining any additional findings related to the phenomenon being described and analyzed. When considering causal conditions, I am really trying to find the minimum conditions that attract female students and students of color to the discipline in the first place. In addition, I am looking at the minimum conditions for students staying or persisting inside the civil engineering discipline. I will examine these two conditions separately.

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At this point, I am simply describing the conditions to set up a common understanding why students pursue and stay in engineering in the first place. I will not focus much on analysis here because the assumption is that students arrive to the context with pre-set conditions in place. Critical and/or post-structural studies that examine why female students and students of color do not pursue science and math in K-12 still need be conducted to address this shortcoming. With this said, some interesting findings pointed to differences between how female students of color engaged with the context and the pressures they felt from their families compared to how white students and male students of color engaged in the same context. White male students and male students of color simply did not have the same familial pressures as female students of color.

Why Go into Civil Engineering in the First Place?

Before a student can persist, a student must have some sort of intrinsic or extrinsic motivation to pursue a civil engineering degree in the first place. In this section, I will explore some of these motivators as reflected by the data in my study (mostly from student and staff interviews). Before I begin, I will list the motivators and then I will elaborate on each one with the data to support it. Students were motivated to enter a civil engineering degree because:

- They were good or have been told they are good at math and/or sciences in high school;

- They had prior knowledge that engineering will be tough/challenging despite possibly feeling intimidated or unsure of their ability to be successful;

- They liked structures and civil engineering in general and/or because they thought it was less difficult than other engineering disciplines (mechanical or electrical);

- They liked problem-solving (quantitatively) and had an organizational mindset; and/or

- They saw the degree as a personal economic investment that would lead to a good paying job and saw the degree as an opportunity to move up the socioeconomic ladder.

Good at math and/or sciences in high school. Students who pursue civil engineering have been told that they have an aptitude math and/or science in high school and/or they were interested in math and/or science in high school. Jasmine, a female student of color, indicated that she was interested in "math and the sciences, even though it was more challenging. But I like the challenge." Matthew, a male student of color, was influenced by his dad who himself wanted to try engineering but didn't even though he was good in math. His father encouraged Matthew to give it a try knowing that Matthew was also good in math. Another female student of color, Terri, indicated that she loved how things worked and she was always taking things apart and putting them back together again. Daniel, a white male student, indicated that he was good at math. Similar to Terri, Daniel liked building things with building toys such as "legos and connects" when he was younger. He enjoyed "putting it all together." Madison, a white female student, also liked math and structures and with her father's encouragement she decided to pursue engineering.

Some of the students, however, were not as forthright with their responses, which made me stop to reflect. For instance, Adrian, another male student of color, said initially, "I used to be good at math." I replied, "Used to be?" He seemed be inferring that he was no longer confident about his math abilities. However, he quickly resumed, "I was really good at math in high school and people told me about it, and it seemed—one of my professors did it (was an engineer before becoming a teacher)—in high school. So it sparked my interest in it." Rebecca, a female student of color, went to a science and math magnet high school because her mom didn't want her to go the underperforming high school in the district. She then fell in love with math and science once she became a student in the magnet school. She only became interested in math and science after she became absorbed in the material at the magnet school.

Staff members also indicated students should have math and science abilities. One academic advisor indicated that—in addition to math and science skills—students also needed to be interested in a field where "you can make an impact on society." Another staff member said that the students are "brilliant" (in math and science). Another academic advisor said that students who do not have a natural aptitude in math are able to finish the program but it is much more challenging for them. She often worked with struggling students to explore why they were in engineering in the first place:

> **Staff Member:** If they don't have that aptitude for math, that becomes a real challenge. Not to say that they can't complete it. I have had some students, who have done every single math class like three times, and are still in the program, um, and getting ready to be at the end. But when that doesn't come naturally—I

mean we do tend to want to sway students into areas that they have a natural aptitude for. Otherwise it does become—um—ya know, we begin to talk about the whys. Why do you want to be an engineer? Is it something that their parents have put in their mind? Is it the paycheck, ya know? They see possibly the income they can make.

The staff member seemed to suggest that natural aptitude was preferred in the program, and those that didn't have this natural aptitude needed to question why they were in the program by examining their intrinsic or extrinsic motivations.

The data collectively points to students choosing engineering because they have an aptitude/interest in math and science and or have been told they are good in math and science. Students with a natural aptitude or an acquired aptitude for math and science are going to have an easier time in their engineering studies compared to students who may not have been exposed to math and science in high school. We can assume then that students need to arrive at their engineering studies in college with strong math and science background already in place. Again without this minimum condition—as the last quote reveals—students who don't have this acquired or natural math/science ability and interest will likely have trouble.

Prior knowledge that engineering was tough/challenging. Before starting engineering, students across the board knew that engineering was a challenging and difficult major. They felt intimidated or unsure about their ability to be successful but they jumped in anyways. Jasmine started out in Athletic Training because she felt that engineering was too hard even though she wanted to pursue engineering and was encouraged to do so:

> **Jasmine**: I didn't want to do engineering because how hard it was going to be. So that intimidated me. I eventually switched over the second semester. So that is what happened. I don't know how—I did poorly my freshmen year.

Adrian said that he made sure to take advantage of the free tutoring and resources offered to students to get over his uncertainty. Matthew's father strongly encouraged Matthew to be mentally prepared before starting his degree in engineering. In addition, Matthew had to start believing that he was already an engineer to push through his uncertainties as he revealed in the following excerpt:

> **Matthew:** I saw myself—after my sophomore year—you got to start seeing yourself as an engineer. But that is what I think a lot of people—that is how they drop out—they kind of focus on "Oh man, this work is so hard. I can't do it." But then again people who actually make it is like—seeing themselves as engineers. And that is why they don't quit. You have to start seeing yourself as an engineer. And that is pretty much how you get through everything.

Despite knowing how challenging the degree would be in advance, Daniel, a white male student, felt at times he wanted to drop out of the program as a freshman because the content and classes were very difficult:

> **Daniel:** I don't know. There were times when I thought about dropping because I was like—it was like tough—it was hard at the time. Now freshman year—wow, that was easy. You know, just hearing about what you have to do and this is nothing like compared to what it is going to be—I don't know, I just kept doing it.

In summary, students across the board arrived knowing what would be expected of them and the challenges ahead. They had to push through their uncertainty in an effort to continue in their engineering studies.

Liked structures and civil engineering in general. Students also, in general, went into civil engineering because they liked structures. Two of the female students wanted to be in an architecture program but it was not available at the university. They both rationalized that civil engineering was close enough and felt that it was an even better and more marketable degree. Sarah, a female student of color, had this to say:

> **Sarah:** Originally I wanted to do architecture…but I think it was more like weeding out what would be a better possibility for a career. So when I was deciding, architecture wasn't really a necessary field and it wasn't in high demand. So I did civil engineering because it's very broad and I can go into a lot of different fields but I can still do structures…

Like Sarah, Jasmine appreciates structures, buildings, and architecture, being outside in the field, and because civil engineering is broad with many types of opportunities in the field. Daniel said that in comparison to mechanical engineering, civil engineering was easier and he liked the idea of engineering bigger structures:

> **Daniel:** Well, I guess mechanical, you build little things, I guess—But not enough for me, mechanical engineering. It just seems cooler I guess. Like mechanical engineering is harder—but like I don't know—bridges and buildings better fits me, I think.

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Like Daniel, Madison also felt that civil engineering was easier compared to other engineering disciplines. She also felt like engineering was going to be fun as she referred to the Design for Practice classes that she took during her freshman and sophomore years:

> **Madison:** I don't know. I didn't really think it was hard at all—it was just fun. They have you building things by hand—and testing them and it's easy but fun. So they kind of like make you want to do it before they trap you and give you all the hard stuff. I think they did a good job of making it fun.

In hindsight, Madison laughed about how easy and fun it was at the beginning before the instructors trapped students with hard/challenging material. By then, she felt invested inside the discipline and did not or would not change. In summary and as another minimum condition, students found that civil engineering was "easier" than other engineering disciplines (although it was still hard/challenging). These students also had a love for structures or building (large) things.

Liked problem solving or had an organizational mindset. Students in civil engineering liked to solve problems mathematically and were, in general, very organized/methodical. Jasmine was told by her high school teachers that she should go into engineering because she was both organized and liked problem solving. The nudge from her teachers about her abilities helped Jasmine to consider engineering in the first place.

Sarah felt that her logical mindset was a big reason for her being in engineering compared to another major:

> **Sarah:** So I think I fit in pretty well. I think if I did psychology or something— that is something that is not intuitive for me. I mean, I would have to try so much

harder in the way that you are supposed to do in those other majors. And I think by being here—it is more math-based. Kind of knowing an answer it is either right or wrong. And you only have a right answer—to me that is something I am more used to—just being more logical. Just knowing that it is either right or wrong, and not, "it could be this, it could be this, it may be all of this."

Matthew, who liked solving problems using math and logic, found civil engineering to be personally rewarding. Madison, too, felt like logic/problem solving was a big part of being good in engineering. Finally Daniel said that an organizational mindset was vital for success in this program:

> **Daniel:** I don't know—I guess—I have been organized and neat—stuff like that—they would tell you, like, you have a lot of work but you need to like—you are going to have to study—you are going to need to be organized.

One academic advisor also spoke of how valuable good time management skills were and how essential an organizational mindset was for engineering students:

> **Staff Member:** What really defines a successful student—mostly is having good time management skills because there is so much work involved in all of their courses—is that they really have to—they really don't have time to do all that extra social types of things. And if they do tend to go down that way, then we find those usually are the students that are not doing so well—that they made poor decisions with their time management.

In summary, students who valued solving problems with math and logic alone and had a keen organizational mindset tended to like civil engineering and were willing to continue in the discipline.

Degree viewed as a personal economic investment to move up the socioeconomic ladder. Students also saw a civil engineering degree as a good economic investment where there would be broad opportunities after they graduated. Adrian was looking forward to a good paying job where he could be comfortable. Other students also suggested that they would get good paying jobs after they graduated. Staff members also concurred about student's economic potential after graduating, as one staff member said, "Well, they usually have jobs before they graduate and they make two to three times what the administrative staff makes. So that is a reward right there." Another staff member said that they come into engineering to obtain better careers for themselves.

In addition, quitting the degree meant that they would lose their personal investment as Jasmine revealed, "I just take a step back and just ask 'what am I here for.' If you give up now it's going to be a loss of money first of all. You are giving up—which is something (pauses)—it's not an option." Adrian also felt a similar pressure to complete his engineering degree as a result of his personal investment in the program, "It's definitely the humongous, one of the things is the humongous amount of money that has been put into this."

Seeing a civil engineering degree as an economic investment, students were able to push through some of the obstacles knowing that they would be more personally secure after they graduated. Nonetheless, they also felt burdened by how much money they invested in the degree and felt they could not, logically, walk away (or quit).

Why Stay in Civil Engineering?

By the time students were juniors or senior—in addition to their being motivated to pursue engineering in the first place—these students also relied on a personal and

social support system to help them push through. These again were minimum conditions for students to continue the program. As in the previous section, I will first list the conditions and then explain each condition with the supporting data. In general, civil engineering students managed to stay in the discipline because:

- They felt self-empowered and liked a self-challenge (refusing to give up);
- They felt supported by formal programs sponsored at the university—at least academically;
- They had a strong social/peer support at the university; and/or
- They felt supported by parents or extended family most of the time.

Self-empowerment and self-challenge. Students who felt self-empowered and liked to be challenged also seemed to stay/persist in engineering beyond their freshman and sophomore years. Jasmine, who liked to be challenged, refused to give up and could not see pursuing any other degree despite the obstacles (e.g., lack of free time, sleep, and a personal life outside of school):

> **Jasmine:** I think I fit in because I am a hard worker. I refuse giving up. I refuse to give up. I don't know. I have nothing against business majors. It just seems like—I don't know—just like—they don't seem that busy.

Like Jasmine, Rebecca wanted to succeed realizing how much time and effort she had put into the program, which prevented her from quitting/leaving the discipline.

> **Rebecca**: I guess just to succeed—like I want to succeed. So that really pushes me, supports me. If I don't want to do something—as of late—"What am I going to do—be here for four more years—no—don't even do that. I guess it's just a moment of "I am tired of this—I just want to sleep" and then you quickly get

over it when you realize how much time and effort that you have put in it—being a civil engineering student.

Daniel thought engineering was challenging but fun at the same time. He felt that he would get bored in a different degree as he described:

> **Daniel:** Yes, it's fun but it's also hard. Sometimes I am like "Why am I doing this?" I have to study all the time, like, I could be like other people and not study or do anything—but I feel like I'd be bored —because like—I don't know— there are days like "I need a break" and so I don't do anything—"well, I should be doing something—there is nothing to do. What am I supposed to do—just sit here?"

Matthew attributed his persistence to liking the subject and the self-challenge and refusing to give up despite the personal effort involved.

> **Matthew:** I believe that—I am just a persistent person in general. Um, I don't like quitting things—which is sometimes good and bad. Sometimes you have to give up things in order to be successful. But ultimately comes out to I simply—I like the subject. It interests me.

Students' dedication came with their refusal to give up, which was related to the challenge and interest in the degree overall in spite of the personal challenges (e.g., lack of sleep, lack of free time, and lack of flexibility).

Feeling supported, at least academically. The data indicated that students recognize the value of formal programs, such as living learning communites with a science and math focus, [name of multicultural student program], tutoring sessions, supplemental sessions, [name of mentoring program for out-of-state students], [name of

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student support organization], academic advising and more. These programs, however, were focused more on the students' academics rather than the student's personal or emotional support. Students who needed help, at least academically, used these resources to help them advance academically as one student mentioned, "I also joined the [name of multicultural student program], which at the time was led by (name of administrator). So she really helped out a lot."

Students met academic advisors usually about academic matters (getting into a class mainly). Given legal restrictions, academic advisors cannot give personal counseling to students and must refer students to counseling services. Academic advisors and other staff members confirmed that students are not meeting them about personal matters. When students brought up personal troubles, staff members referred them to the university counseling program. Staff members at times suggested that students consider a different degree or temporarily quit (implying the academic pressure might be too great in addition to students' personal problems). One staff member felt partilcularly conflicted when one female student came to her with personal problems and she really didn't know how to address this student's issue. This female student ended up quitting the program even though she was academically capable, as described below:

> **Staff member:** I have had one female who had some personal issues, and it prevented her from continuing on with her, her program—trying to help her family financially and some personal relationships with boyfriends and situations that they got into. So there are certain specific issues that can come up that only women will be dealing with.
>
> **Me:** So she had some things to overcome that prevented her (from continuing)?

Staff member: Uh-huh

Me: What I am gathering, is that she was still capable of doing it (the degree) she just—

Staff member: Well, at the moment, she is not here. And I don't believe she's here. I am still in contact with her on occasion to see how she is doing. So she had a lot of stress and a lot of, you know, personal issues to deal with. And I hope that she does go back.

This small vignette showed that staff members, while they care, are restricted from talking to students about personal issues. In a program that is highly stressful with great demands on students' time, it would make sense to have a personal counselor on site where students could talk about their problems before they quit. While the program was supportive of academics, the program did not actively address students' personal troubles, which may impact their long term persistence in the program. Students were, however, using their informal peer support systems to help them deal more effectively with their personal troubles (which will be described in the next session).

With this said, formal peer networks, such as [name of mentoring program for out-of-state students], were relating to students on a personal level—albeit these mentoring relationships were still mostly focused on academics. This next example showed how this modest personal support comes into play:

Sarah: The other one that I did my freshman year was [name of mentoring program for out-of-state students]. So I think it was an option—I am pretty sure but I opted to be a mentee. My mentor was actually a civil engineer and so that was helpful because where—you are supposed to talk about how classes are going

and make sure that the stress levels are not too high. But sometimes we would go off-topic and would say, this is the teacher I am dealing with—this is what I am going through. And it just helped me make a better connection of how everyone else was dealing with the same problems that I'll be dealing with or that I am at the moment. So I felt a lot better about it.

Me: What were some of those problems?

Sarah: Oh just dealing with the initial stress, I think that it was a culture shock for me. I always lived in a bubble. Leaving home and being college ready—I didn't know anybody and kind of dealing with a lot different—like a different culture than I was used to at home and different people.

Sarah, a female student of color who left her familiar multicultural community, was shocked when arriving to university and had a hard time adjusting both personally and academically. She took advantage of the tutoring as well as meeting with the [name of mentoring program for out-of-state students] mentor she was assigned to as an out-of-state student. Mostly she talked with her mentor about academics, how to approach classes, and how to deal with the stress related to academics. On a few occasions, she would "go off topic" and would talk to her mentor about personal troubles with an instructor and the culture shock of leaving home. It was as if "going off topic" was not really a sanctioned behavior in the mentoring relationship. "Going off topic" seemed to imply that emotional topics were sanctioned—at least within formal academic programs supported by the discipline.

Nevertheless, students including female students and students of color were very appreciative of the academic programs that were in place to help them succeed. Even so,

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they were taking time outside of class to go to tutoring, supplemental instruction sessions, recitation sessions, and/or instructors' office hours because they often felt like they were not as naturally capable in their studies as other students were. In reference to the tutoring sessions Adrian recalled why he took advantage of the endless tutoring sessions:

> **Me:** And why did you take advantage of it? Why does this do—this tutoring session?
>
> **Adrian:** I like just um—I learn I guess a lot differently than a lot of people here, I guess you just find what works for you and what ways you learn. It would start where I was doing everything—all the tutoring sessions like in the dorms, in private. But then after awhile you feel that you only need—maybe once a week there, once a week here—you only need so few things because you find out what works for you.

Again, while students strongly valued formal academic programs offered by the university, their emotional needs and personal troubles were not being addressed in these programs—largely because legally they were not able to talk to students about more personal matters. However, what needs to be noted is that engineering students were having personal troubles related to culture shock and academic adjustment. In a demanding degree like civil engineering, it would make sense to have a personal counselor on site to help these students get through some challenging personal obstacles.

Strong social/peer support at the university. Students relied on their social/peer support for both academic and emotional reasons for staying in the program. Jasmine indicated that her close friends, who were also students in the program, really helped her push academically. Her close friends were like her family and she hung out

with them every day. When she felt overwhelmed or emotionally exhausted, she learned to take a break and "get a pizza downtown" bringing her friends along. Hanging out with friends helped her regain her emotional balance, which allowed her to push through the program. Sarah also relied on her close friends who were in the program—relying on them both academically and emotionally as she related, "We are all supporting each other because we are going after the same goal." Rebecca found that her close friends who were also in the program supported her both academically and emotionally as she so aptly put it, "We are all here together—frustrated and all." In contrast to the three females of color, Madison didn't hang out with students in the program. Instead when she had free time, she spent it with her friends outside of engineering who liked to party and go downtown as she related, "I am more of the type that wants to wear heels and go downtown. And that's not like most engineers." She was able to unwind with her friends by stepping away from the academic setting thus allowing her to push through academically.

Adrian attributed his success in the program to studying with his friend, Matthew, because they studied and learned concepts/material in a similar way. They also watched sports together. While he didn't openly talk about the friendship being emotionally supportive, he did find the friendship meaningful and relevant to his persistence in the program. Matthew suggested the importance of networking with friends and instructors as a way to get ahead academically. Daniel, in contrast, did not attribute his persistence to his friends but to his own self-initiative and family support.

In conclusion, these stories suggested that most students were pushing through because of their personal connections either within or out of the program. Their friends

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were helping them academically, emotionally, or both. Friends not only helped these students push through academically but friends became an emotional release valve when students were feeling overwhelmed, frustrated, and close to quitting. The data from this study seemed to suggest that female students relied perhaps a little more heavily on their friends for emotional support compared to male students in the program.

Supported by parents or extended family most of the time. Students, in general, felt supported by their parents or extended family, but students of color felt more emotionally or distanced from their families/communities at the same time. Jasmine who was a first generation student found that the transition from high school was challenging especially without much guidance from her parents. In many ways, she felt obligated to do well in college because she needed to be a good role model for her siblings. These familial responsibilities made her push through even when she was tempted to quit and give up**.** Nonetheless, she wished that her family could be more involved. This is how she described her feelings:

> **Jasmine:** You know it is kind of difficult because they haven't been to college, my parents haven't. And they don't know—they don't even know what I am going through…. And sometimes I feel that they are not involved. My mom barely saw this engineering building last year. My dad has never seen it. They didn't mean to, it's just I was on my own when I left for college. That's why I kind of question the support in a way…I would say emotionally supportive. Definitely not somebody—they are not my main (support).
>
> **Me:** Some students may have their parents really helping them

Jasmine: It's not happening here (to herself). Not at all. I mean I love them—and I am doing it to help my siblings. I have four siblings and I want to be a good role model for them—that is supporting me—that goal to help my family out.

Like Jasmine, Sarah felt a strong sense of familial pressure, which was not always helpful to her. She felt pressure to work harder than other students in the program because she couldn't let her family down because they were counting on her to succeed. She felt she had to disconnect from her family and community, and she distanced herself from her community social identity because no one back home could really relate to her:

Sarah: My mom went to college. My dad didn't and none of my other cousins did —so within my generation only one other person has gone. So it was really different because all of my cousins are—most of them are male and only person that went to college....So I think by having that kind of background where my family—I guess—is stereotypical. Um, it was a lot of pressure for me where my family would say, "Hey, we are really proud of you and really living vicariously through you, we are proud that you are going to college. Just a lot to say, "Okay, I can't disappoint everyone who would have gone to college." So just going through that I really feel that I had something to prove to show that I can do this here where everyone else couldn't do it. It was kind of more like to prove to myself—I am just trying so much harder than everyone else is. That makes me sound really bad…It's a lot of pressure. And coming here, I didn't want to fail. That was more for myself, though…And it's also harder. My community is really-really close, and really-really tight knit. Kind of when I did have struggles, I could talk with them. And they are like "you are doing it though, and we didn't.

And it is so much harder than not doing it—and then trying to live than having a degree and go get a job." It does help me go forward—but at the same time it's also what is causing so much pressure. It's kind of like counteractive. I don't know?

In a sense, Sarah had to back away from her "home" identity so that she could concentrate on becoming an engineer. At the same time, she felt pressured to perform at a higher level knowing what her family and community expected her to become.

Adrian shared that he received economic support from his father, which allowed him to focus on his studies without starving or having to get a part-time job as he described below:

Adrian: My family has always been behind me, I guess. I used to talk to my aunt who passed away two years ago. But there are a lot people who are supporting me —my dad and my mom. My dad helps me out with like grocery money, and stuff like that. He makes it so I don't have to work while I am here. I scrape by with that, I scrape by with what he gives me. I will eat Ramen for a few days and then that will leave me a little bit of money for me to go out with, you know, I will condense that grocery money to use it to go out to eat or to get a drink or something like.

In contrast, Rebecca indicated while her family was seemingly supportive they criticized her for not calling home, thinking that she was partying all the time. She had to reassure her family that she was busy with school. She finally convinced them that sending a short text message would have to be sufficient while she was away at school. Rebecca's story suggested that her family was uninformed about how much time and

effort she was spending while she pursuing her engineering degree until she explained it to them. At that point, they were less critical of her not engaging with the family.

Terri, too, felt conflicted by her family's support feeling that her family couldn't believe that she was actually graduating with an engineering degree in four years. She also felt that her relatives might be jealous of her success as she related in the following excerpt:

> **Terri:** My mom—she was sharing—they will ask every now and then, "So is she still in school?" And she is like, "yeah." "So has she changed her major?" "No, she is still sticking with the same thing." And like my cousin's husband, um, because one of my uncle's asked—one of my dad's brothers asked—you know when I will be graduating—and this was last year, "Oh well—if she stays on track she will be graduating about a year from now." My cousin's husband just kind of looked, "No, she just got there." "No, she has been there for three years." And he's like, "No." He is just shaking his head "No…she can't graduate in four years" (incredulous). Okay? And that's—you would think there would be more. My grandparents are very supportive—it's everyone else. I don't know if it is a sibling thing—maybe competitive.

Both Madison and Daniel, the two white students I interviewed, commented on the emotional support they received from their parents in addition to the financial support they received. Madison relates:

> **Madison**: When I get upset that I have not the best grades. And he is like, "Well you are doing all this in four years—so don't feel too bad. You have never failed classes—it's not the end of the world." It kind of makes me just not freak out.

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Daniel also shared how his parents make sure he has everything that he needs to be academically successful—computers, textbooks, car, car insurance, money to drive the car and for food, software needed. In addition, his mother gives him emotional support when he is feeling overwhelmed as he shares:

> **Daniel:** I don't know—sometimes—when I don't understand something—my mom always tells me you need to stop studying and do something else—because she thinks I study too much.

In both Madison's and Daniel's cases, their parents gave both emotional and financial support that allowed them to focus on their studies and push through when they were feeling frustrated or overwhelmed. In contrast, Terri, Jasmine, Adrian, and Rebecca had either emotional or financial support (but not both) from their family. These students often felt pressure from their families that Madison or Daniel did not experience. It could be inferred that students of color have greater social and familial pressure compared to white students who can solely focus on their individual achievements.

Conclusion

Referring back to the Grounded Theory Paradigm Model, causal conditions are again events that lead to a phenomenon. In this study, causal conditions represent the minimum conditions for how students were able to successfully navigate the context (or culture) when they began their journey as engineering students. Students arrive arriving at college with pre-set conditions in place.

Some female students of color noticeably had familial and community pressures that white students or male students of color (at least in this study) didn't

seem to have. For example, Sarah felt pressured by the expectations of her family because she had to prove herself worthy of going to college in the first place and then succeeding in a male dominant profession like engineering. She felt she had to be constantly be engaged as a student so that she could succeed. In a constant "student state" she could thrive in engineering, but she had to avoid the pressures she was feeling at home. Nonetheless, it was very challenging for her because she was very close to her family and her community. You could tell she was conflicted with her decision to remain in her constant "student state" at the expense of being involved with her family and community "at home."

Terri felt similarly about the pressures from her family and community. She had to confront the incredulity of her family and community. They simply did not believe she was capable of pursuing and completing an engineering degree. They were certain that she would have changed majors. Like Sarah, you felt her pride succeeding in engineering, but you also felt her personal deflation as her family and community members questioned her decision to pursue engineering. You could see how her "home identity" was being altered to something different to what her family expected or wanted her to be as a female of color.

Jasmine, too, felt a disconnection from her family, who didn't really understand what she was going through as an engineering student (or a college student period). As a first generation student, she felt great pressure to succeed for the sake of her siblings who could then follow in her footsteps. She would not give up simply because she had to be a positive role model for her family. You could tell she would not entertain any

ideas of failure; it simply was not a possibility. Like Sarah, Jasmine stayed in a constant "student state" so that she could succeed; failing was just not an option.

Rebecca also felt pressure from her family who couldn't understand why she could never call home to leisurely chat. She had to explain how demanding her schedule was and what was expected of her as an engineering student. She, nonetheless, was personally conflicted because she wanted to talk to her mom and her siblings. You felt her longing to connect with her family. Like Terri, you could see that her "home identity" was coming into question; she had to ignore the social pressures from home so that she could remain focused on her engineering studies.

Ironically, the same familial and community pressures didn't seem to be as relevant or applicable to white students or male students of color. In regards to male students of color, perhaps families and communities expect their sons to go off and become future breadwinners. They know that they will temporarily leave their communities to do what they need to do to make something of themselves. As a result, they may not have the same familial and community pressures as female students of color who not only have to prove themselves worthy of the degree but have something to prove to their communities and families as well.

Nonetheless, while noting some differences between female students of color and male students, students who were likely to be attracted to engineering have met the following conditions:

- They were good or have been told they are good at math and/or sciences in high school;

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- They had prior knowledge that engineering was tough/challenging despite possibly feeling intimidated or unsure of their ability to be successful;

- They liked structures and civil engineering in general and/or thought it was less difficult than other engineering disciplines (mechanical or electrical);

- They liked problem solving (quantitatively) and had an organizational mindset; and/or

- They saw the degree as a personal economic investment that would lead to a good paying job and saw the degree as an opportunity to move up the socioeconomic ladder.

Once they pursued the degree and reached their junior and senior years, the minimum conditions for these students staying in the discipline consisted of the following:

- They felt self-empowered and liked a self-challenge (refusing to give up);

- They felt supported by formal programs sponsored at the university – at least academically;

- They had a strong social/peer support at the university; and/or

- They felt supported by parents or extended family most of the time.

To summarize, family support was not as supportive as it may seem, especially for female students of color in the program. Often, they felt social pressure to be and act a certain way in connection to the family or the community that white students just did not experience. While they were still committed to pushing through to graduation, they acknowledged that the path especially in connection with their families had not always been rosy. They had pressure to be successful because they either had to be a role

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model for their family members or they had to prove they were capable of pursuing an engineering degree in the first place.

Nonetheless, the students arrived to the engineering context knowing in advance how difficult their chosen degree would be and were ready learn how to navigate the context along the way. The context, which sets up the modified grounded theory paradigm model leading to intervening conditions, actions/interactions, contradictions, and consequences, will be explained in the next section.

Chapter 5: Context / Phenomenon – Explaining a Culture of Sameness in a

Seemingly Neutral Culture

Just as she said this, she noticed that one of the trees had a door leading right into it. "That's very curious!" she thought. "But everything's curious today. I think I may as well go in at once." And in she went. (Carol, 2013, Chapter 7, para. 97)

Introduction

And in I went. I started my observational period with a sense of curiosity for what I might find. I met with the assigned instructors prior to meeting the students in each of the two classes. After briefly describing my study, both instructors agreed that I could observe their classes. Along with my curiosity, they too seemed to be curious about what I, an outsider, might discover. The students signed the informed consent forms and off I ran (well, sat actually).

Referring back to the modified Grounded Theory Paradigm Model and before getting started, the context and phenomenon will be used interchangeably to represent the *context* (or the engineering discipline and associated culture) in which students participate (the *phenomenon*). It is from this point I will share my initial observations about the two classroom contexts.

To begin, I would like to describe my initial impressions about the instructors and classrooms, which should give a more descriptive view of the contexts. The two instructors were different yet similar in many ways. The instructor for the lecture-based class was a hip, young professor who really seemed to connect with the students with his recent experience as an engineer in the field. He dressed casually but

impeccably with pressed pants and long sleeve shirts always entering the class with an air of casual confidence and eagerness that made you want to be there. He was engaging and used a humorous approach to connect with his students, choosing students to participate and answering questions along the way. I often found myself laughing along with students. He used a traditional lecture-style approach using the white board to draw out models, diagrams, equations, and important key points and to explain abstract theoretical and mathematical concepts. He worked out problems on the white board asking students if there were "any questions" throughout his lectures. Students would blurt out questions, comments, and questions throughout the class session. In addition he would call on students—partly to see if they were getting the concepts and partly to see if they were paying attention. He used the entire time lecturing and covering material moving from one topic to another with interspersed questioning with the students.

Students sat behind long black tables that spanned three main sections—a left section, a middle section, and a right section—all facing the white board with a lectern located on the right side of the room in front of the white board. There were no frills in the windowless room. There were no adornments to the surrounding white walls except location signs to the exits and the fire alarm.

The smaller classroom where the senior-level teams-based class was taught was similarly arranged and furnished, with three sections of black tables pointing towards the whiteboard. There were no obvious differences between the two rooms except one was larger than the other. The instructor for the teams-based class was an older professor who also had a career as an engineering professional before moving into

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academics. He dressed casually, too, with jeans or khakis and usually a button-up style long sleeve shirt. He, too, used humor to connect with his students (albeit differently, which will be explained later). Like the other instructor, he used the white board to explain concepts, draw diagrams, note key concepts, and work out problems. Like the other instructor, he asked students if they had "any questions" throughout his lectures (that is, when he was lecturing, which was more often than not). He also selected students to answer specific questions (similar to the other instructor—to see if they were paying attention and understanding the content he was presenting). Students also blurted out answers, comments, and questions as he presented content. He had a big personality with a commanding voice that boomed across the classroom. The rhythm of instruction was fast, and—as I commented to one student during an interview—the speed of his class was like a rapid-firing machine gun, "pff-pff-pff-pff-pff-pff."

Both classes were demanding and commanded the students' attention albeit in different ways. The instructor in the lecture-style class expected students to pay attention to how he solved problems on the board along with his intentional written details such as color-coding (e.g., different-colored dry-erase markers were used to help differentiate concepts and parts of diagrams) and lesson objectives, which were listed on the white board before students arrived to class. The instructor in the teams-based class rolled in his cart of instructional goodies including his own stash of dry-erase markers in case the ones at the whiteboard were dried out (which was often the case, and he would dramatically throw the dried-out markers toward the waste basket at the back of the class). This instructor moved much like a director in an orchestra using his dry erase markers to draw out diagrams in large scale on the whiteboard. His

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teaching style, at least to me, was entertaining while somewhat threatening at the same time. His big movements and big voice sometimes made me want to cower with thoughts of, "Oh, don't pick me," simmering in my gut even though I was just observing. I wondered if the students felt similarly.

Taking a reflexive point of view, I wondered if I were a student how I would be feeling in a fast paced and/or high demanding class. It was from this student-perspective that I had to observe—not from some neutral outside observer who was just being entertained by the experience. I had to be there as if I, too, were a student. It's tempting for me to "not go there"—meaning not to reveal or expose uncomfortable phenomenon, scenes, or events that show things are not as they seem—because I want to be a nice person. Castagno (2014) reminds us that niceness "compels us to reframe potentially disruptive or uncomfortable things in ways that are more soothing, pleasant, and comfortable" (p. 9) in some sort of tacit agreement that "if I am nice to you, I come to expect that you will also be nice to me in return" (p. 9). However, being nice tends to reify dominant viewpoints because no one wants to go there because the ubiquitous "it" is uncomfortable and potentially hurtful—albeit usually uncomfortable and hurtful to the ones who have the privilege and power within the context. "It" represents, however, the events, behaviors, actions, and/or reactions that show the context is possibly amok or not what it seems. For instance, no one wants to admit that differences between students and groups of students exist. No one wants to admit that subtle and/or overt sexism and racism occur within classrooms. No one want wants to admit that some students receive more favorable or less favorable treatment from the same instructor. No one wants to admit that the environment is not what it seems.

As I mentioned before, I genuinely care about the instructors and the students that I observed. The last thing I want to do is hurt them in anyway. However, by taking a critical and reflexive stand, I must step out of my nice person role to honor the data and my participants' perspectives in the hope that new insights are considered when understanding low female and student of color participation in STEM disciplines, such as civil engineering. So when I hear, "this is a neutral culture because we treat everyone the same," I stop and reflect on what might be happening from a critical standpoint. This is when I tune up my eyes and ears and then look for or listen to see if observed events or spoken perspectives contradict what is espoused and believed to be true.

In this chapter, I will define a culture of sameness that expects all engineering students to act and behave in a certain way (usually in a constant "student state") as the students prepare to become engineering professionals which upholds values of supposed equality, being professional (or downplaying emotions), logic and problem solving, personal productivity and meritocracy. Students needed to adhere to a rigid, fast-paced, and strict program that felt like a ritualization toward their professionalization. These two ideas will be explained next.

Defining a Culture of Sameness

When Sarah mentioned during her interview, "It was different and I wasn't used to it… but I got used to it," she is suggesting that she had to assimilate in some way. "Getting used to it" does not seem to suggest that students or groups of students are being treated the same. Yet I heard from staff and students alike, including female students and students of color, that engineering students should be treated the same as individuals in

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the program where student achievement is based on neutral assessments despite individual differences. Diversity defined in this sense stresses, "It doesn't matter who I am (such as, where I come from, who I have relationship with, what I look like, what my religion is, and so forth); judge me by my individual performance. Reward me for my individual accomplishments." This is the defining quality of a culture of sameness—that is, students are just individuals, and in spite of their individual differences they will belong because individual performance is only valued in the end.

When defining a culture of sameness, it is important to note that cultural players *are not* rejecting the fact that differences exist between people and groups of people, they are simply saying that these differences do not matter because the focus is and should be on the individual despite differences. In other words, *differences* are not seen because they *are not seen as relevant* as one staff suggested, "It's almost like people say, 'You don't see color.' I really think that people don't see the gender differences as far as faculty, advisors, ya know. I don't think that females are treated any differently, which—I think—is a good thing."

In this section, I will explore the elements that make up a culture of sameness in the context I examined as supported by the data. In short, a culture of sameness can be described by five discerning elements—each element will be later explained with connections to data. They are:

- Focus on equality – everyone should be treated the same.
- Focus on being professional – being cooperative, going along, and downplaying emotions/reactions, and minimizing "personal-ness."

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- Focus on positivism or logic – quantifiable problem-solving; a logic and order to reality where math and science can provide valid/reliable explanations to problems.

- Focus on personal productivity, hard work/effort – it is up to the person to make it happen leading to their personal success/academic success/professional success.

- Focus on meritocracy – rewarding the individual via individual performance/individual achievements.

Focus on equality. The focus on equality in a culture of sameness indicates that no individual or group of individuals should get any preferential treatment over another. Everyone should be treated alike and be given the same privileges and consideration. Every student starts the program on an equal playing field regardless of gender identification, socioeconomic status, ethnicity, and so forth. Students of color and female students, in short, are no different (supposedly) and they are treated equally/"the same" as with all students.

Students and staff felt this to be true within the context of engineering. For instance, one staff member considered special programs that targeted underrepresented students as an unequal advantage because all students should have the same opportunities, as shown in the excerpt below:

Staff member: (referring to campus programs to help underrepresented student populations) It seems to me that every—every group except maybe the white males (laugh) have an added resource available to them. So if somebody who is an older student, or somebody, you know, gender, um, seeking or whatever kind

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of differences, there is groups on campus the support those students whether they are an engineering student or some other one. And, I think, that—you know—it all gets down to their support for everyone except for the, you know, the bigger group, which—you know—white male….I felt that it's not fair that there is a minority engineering program and a woman engineering program but no white male engineering program. Ya know, it doesn't seem fair. And so I didn't take advantage of those things but they're there, and for the student wants that—who doesn't feel like they're connected because they are different in whatever way—I think it's great they're available on campus and for some students that really works for them, and as for myself, "You know I don't really want to take advantage of that." If it's not shoved down my throat, it's good.

Again, this staff member believed in the value she places on individual accomplishments over group identification. She did not see programs for underrepresented students as necessarily fair because it countered the idea that individuals are responsible and should be responsible for their own success. She also felt that all students should have the same opportunities to succeed. This focus on equality suggest that all students should be treated the same and no one student or group of students should be given access to an academic success program that is also not available to all students.

Students, including students of color, also believed this equality did and should exist. One male student of color was particularly adamant about how male students and female students had equal capabilities and were both equally capable:

Male student of color: I know a lot of this is about how we interact with women in engineering and all that. And to answer that question—they are just as

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valuable to the profession as men are. They are just as capable. They have the same mind—they may not react to things the same ways—but our brains are capable of doing the same things—and we are equals. And I mean—I have learned a lot from engineers—men and women—and I have a respect—I know this is more of the point (referring to the purpose of my study).

In both of these excerpts, staff members and students believed equality exist and should exist. In a culture of sameness, equality points to the performance of the individual where differences are not seen as relevant and students regardless of gender or ethnic/racial identity are equally capable and equally valued.

Focus on being professional. In a culture of sameness, there is also a focus on being professional, which in a nutshell is described as being cooperative, going along as a good team player/class player, downplaying emotions and reactions, and avoiding emotional displays of behavior. One staff member explained how females have learned to downplay their emotions to get respect by proving their individual accomplishments and not using "because I am a female" card—the card implying being overly emotional or up-playing gender to get certain advantages. She also stressed how male professors must feel uncomfortable accidentally crossing some imaginary line with females, which they (the male professors) do not have to cross with their male students—as shown in the following excerpt:

Staff member: (regarding my question how female students typically deal with problems) I would say a majority of them handle it non-emotionally and non-, what I am trying to say is that I think there is some that play the "because I'm a female" card…Um, but even if it is true, even if it is a situation where they're not

getting the respect or whatever, that they should—because of their gender —the correct way to handle it is to just accept that is that's just the way it is and to overcome it and improve yourself otherwise. So I think a majority of students handle it the same way a male would I they would figure out what I need to do differently, how can I turn this around….But it's just like on-the-job or something, you can't use some things, you have to handle in a professional way…And I remember seeing some female student not handling—I think you should've handled—and thinking, "That's what makes us look bad. You know, you are making me look bad because of the way you are handling this"…I'm sure there's a little bit of that and sure there is the professors who—that's one thing that I think has gotta be really hard—is having a male professor and to treat females as the same as males, but knowing that it's so easy to cross some imaginary line that you don't even know it even exists, and maybe be held accountable for something you never even did. I think it if males treat females differently it is probably because they have to be really careful, um you know. And that uncomfortable feeling could be coming from—just worried that you know something inadvertently offend.

So the sentiment of being professional aligns with this: When a female handled something badly (or when a female becomes emotional), it made "us"—the rest of the females—look bad. A female using the "female card" (or acting emotionally) was seen as unprofessional. I found it ironic that this staff member was more concerned about males from the dominant culture than underrepresented students who might make these instructors feel "uncomfortable." This adherence to the dominant perspective points to a

culture of sameness, where individuals should conform to *how to act* and *how to be* in order to reduce the "uncomfortable-ness" arising from difference. Being professional means, then, to maintain the dominant perspective by remaining unemotional and being the same as all individuals (white males) in the context.

In addition to the above, there were many references of "being professional" or "acting professionally" especially in terms of dealing with intra-team conflict in the teams-based classroom I observed. At one point, the instructor lectured about the importance of working with teammates and overcoming conflict by being professional, "we still have to deal with icky human beings." He said that as humans we would rather avoid conflict than deal with it. The instructor then described conflict as the "Big Blue Frog" in the back of the room, which is obviously there but no one wants to pay attention to it. Jesse (not his real name), a rather vocal male student of color who on more than one occasion blurted out inappropriate comments in class, responded to Dr. [name of instructor]'s Big Blue Frog comment by saying, "Oh, you mean, Andrew" (not his real name)—referring to a white male student, who from my observation, displayed effeminate gestures and mannerisms. I was shocked (and responded with a nervous laugh), but no one really paid any attention to Jesse's comment. The instructor continued on with the lecture on dealing with intra-team conflict reinforcing the idea that "we are human" and that we have to be professional by not letting personal anger or emotions get in the way of the team's productivity because "You have to work professionally."

Later in the same lecture, Dr. [name of instructor] handed out a peer review form and asked the students to fill out the form for each of their team members. He further revealed to the class what being professional means:

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Dr. [name of instructor]: You are going to be professional. You discuss it (conflict) as a team. If you don't get along, someone is going to get fired from the team. One goes with the two members and the other goes off as an individual. If you fire somebody, they will most likely fail the class. You hold this person's future. Do people get angry? Yes. You will have to deal with that anger. We have to deal with those emotions. Your first reaction—defensive mode—"My stuff doesn't stink." This is a normal human reaction. You are not giving any favors to your team member (by not giving an honest judgment of team members in a peer evaluation, which he later described as a "private, not team exercise.")

He then asked the students to turn in the "private" peer reviews at his office where he would later make photocopies of the peer reviews for distribution to the other team members during the next class. At the end of the mini-lecture on team productivity and conflict he asked the class, "Questions?" No one responds. He then replied, "This is your team for the entire semester. You need to improve it. Now let's talk about my favorite class—[name of class]!" Again, being professional suggests that students should not be reactive even when there is cause to do so. While the instructor encouraged the students to be honest in their peer evaluations of their teammates, he also wanted students to disclose their feedback (criticism) anonymously. Being anonymous, students could then avoid being directly accused of a particular criticism. This is an effort on the instructor's part to help students avoid uncomfortable interactions as a known offender—in order to circumvent any direct conflict in the hope of fostering cooperativeness among team members.

In both of these examples, there was a focus on students being professional by not overreacting and getting along cooperatively with one another. Even when obvious conflicts came up in class or in a situation that pointed to students being treated differently or acting differently, the protocol was to "move on" and not pay attention to it. Being professional in a culture of sameness means getting over personal differences, personal-ness, and/or personal identity in an effort to be cohesive and be productive on the team.

Focus on positivism/logic/quantifiable problem solving. Using logic or positivism implies that reality (and as a subset, problems) can be defined in an orderly way backed by scientific or mathematical proof and evidence. Someone adhering to logic and positivism sees math as a neutral way for solving real problems and providing logical explanations of the world. Problems are fixable in which a math and positivistic approach can yield promising rewards and results. In engineering, math and a scientific positivistic approach play an important role. Engineering is applied mathematics for the most part. Math and knowing how to solve problems are critical skills of engineering. Building civil infrastructure (e.g., bridges, dams, highways, water works, etc.) requires a strong mathematical foundation and ability to prove that these structures are safe for the public. This is a good thing. Before a structure or road is built, we the public want reassurance that we will be safe inside the structure or on the road. Because of good civil engineering, we the public do not question whether a structure or road is safe or un-safe. We the public have good faith that engineers and community planners are acting in our best interest with mathematical and scientific proof to back up their designs and products. On several occasions, the professor in the lecture-style class told the students to "trust

your training." Being able to consistently apply mathematical and scientific skills in dealing with civil engineering problems and/or projects develops this trust.

With this said, engineers who have learned to trust—and rightly so—their quantifiable problem solving mindset, may inadvertently create an overreliance on logic and positivism outside of solving engineering problems. This overreliance on positivism may make them see problems within the culture, organization, team, and so forth as solvable—much like a math problem. In Chapter 1, I referred to "leaky pipeline" programmatic/policy approaches, which try to fix the problem of females and students of color exiting the profession—almost like a solvable math problem. In a culture of sameness, anything that is outside of this problem solving/logical mindset is considered a waste of time, unimportant, or not critical to learning to become an engineer. Courses then should have a functional purpose for their role as future engineers. To demonstrate this point, I will reveal how Sarah, a female student of color, had a similar mindset about her liberal studies classes that "don't really have anything we want to learn" (as engineering students) and these studies are not beneficial to her as a future engineer. She suggested that other classes, ones with a functional purpose tied to becoming a future engineer, should be considered electives rather than "unimportant" liberal arts classes. An excerpt of the interview in response to my question about taking classes outside engineering that "made you question the existing norm and values inside the engineering discipline" is provided below:

> **Sarah:** I think it is the fact that—it is something we can't change—it's knowing that we have to take—like 12 liberal studies classes—and things like that don't really have anything to do with what we want to learn. So the fact that we don't

have time already between our engineering classes and we still have to take like—political classes or cultural understanding—which doesn't really relate to what we are doing…So if I could take four classes in a language, I feel like that would benefit me better than you have to take two of these and you have to take a political class and you have to take global understanding—and you are only doing it to meet your requirement. Because we only do it just because we have to—and not because it is benefitting—it's kind of a waste of time because I have to spend so many hours doing this class because I have to do it—where I could just not take it—or take something that I want to take—or something that actually is going to matter like—I could take a business class or something. That would be more helpful than. I mean I took anthropology—and I just didn't like it—but I only did it because it fit my schedule and it met my requirements. So I feel like—it's not less important—we just don't put so much importance because we would rather take engineering classes. If I could opt to take just engineering—and just be out of here a semester early that is what I would do versus spending the whole semester taking liberal studies classes. So that would be the only thing that I would question.

Sarah did not see value in courses that do not adhere to a positivistic and logical mindset and/or have a direct function for her becoming a future civil engineer. In a culture of sameness, which advocates a positivistic/logical mindset, engineering students—including students of color—did not value courses that did not have a direct link to them becoming an engineering professional down the road.

When I asked Jasmine a similar question, she indicated that—while her ethnic study class did make her think differently—the class didn't make her want to go away from engineering. She commented that engineering was more objective and logical compared to liberal studies classes. She indicated that she has learned not to pay attention to differences since most students were Caucasians in the engineering program anyway. This is what she had to say:

> **Jasmine:** I had an ethnic studies class. It was a liberal studies class. It was different—because you weren't really thinking logically. There's subjective in there—which is different. But it did get me thinking a lot about—I guess—what is normal to me right now. I don't know how to explain it. It did bring up things about feminism and racism and stuff. It's like stuff I don't pay attention to any more, because I am in here and everyone is predominantly Caucasian anyway. And the few minorities there are—we all just make fun of each other anyway. I don't know that class was different. But it didn't make me go back (away) from engineering.

I also asked Madison, a white female student, about courses outside of engineering. She found they were helpful as easy classes in order to increase her GPA. At the same time, she did not get the logic of these courses. She had trouble with the instructor of one of her liberal studies classes who changed assignments when other students complained about the workload in the class. She indicated that this would never happen in engineering classes because there is a reason for engineering classes being so demanding—to help students know how to solve problems on their own. The excerpt below shows Madison's thought process:

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Madison: I do one (liberal arts class) every semester. And I am in my last one this semester—they are usually pretty easy— not that much work and they bring my GPA up…I have definitely noticed differences—it doesn't really make me question engineering—it made me question everyone else (laughs)…For example—this semester I am in a liberal study it's a 100-level—so I don't expect that much from freshmen—but we may have 4 easy assignments a week—like a quiz, a question, and a discussion and a response. And it maybe took me two hours a week—they are all easy grades. The class complained enough that the instructor took out one of the assignments every week—and that shocks me—that for one that a teacher would change their plan for the class—because I haven't seen that here…because it wasn't that tough. But at the same time—sometimes I wish engineering instructors would be a little more lenient—which I mean most of them are fine—but…I think they are demanding—but that is just necessary—to prepare us for working…Make us work hard and—um—a lot of classes I feel like we end up teaching ourselves—quite a bit—which I guess—when we go out there we are going to have to use resources to figure things out for ourselves, so it's good, but I think teachers do that too much—a couple not many—maybe one. Like I am literally teaching myself with no textbook or anything—well, you can Google it, you know.

These three vignettes again point to students valuing courses and experience that reinforced their positivistic and logical mindset that would help them as future professional engineers. Questioning difference or more critical components of the culture were simply not examined. Classes outside the discipline (especially liberal arts) were

not valued per se (except for increasing the GPA), and these classes were even seen as being too lenient/too flexible, which was counter to the way engineering classes were taught.

Focus on personal productivity, hard work/effort. In a culture of sameness, personal productivity via hard work, effort, and working successfully with teams is the recipe for personal and academic success as a civil engineering student and as a future civil engineer "out in the real world." Hard work means complete dedication and commitment to the degree while often sacrificing personal needs, like sleep and eating healthfully along the way. The following three staff members confirmed the importance of hard work and individual commitment needed by engineering students:

Staff member 1: I would say the student would have to work really, really, really hard—and that it's a really hard major. They don't get a lot of sleep and there is a lot of collaboration and teamwork that has to happen in these classes, and that the professors specifically or intentionally design their classes so that there is a lot of teamwork because that's what happens with—when you get out into the real world. You have to work with other people to get stuff done.

Staff member 2: They are more concerned about their (um)—that doesn't come out right—not that other students are not concerned about their academics—and grades like that—but such a rigorous major unit of classes or are difficult so you really have to, you know, study hard and work hard to get through the major. You know, and typically engineering majors to get through it four years—other majors might—it's a five year major. So they really have to be dedicated to their studies.

Staff Member 3: So (um) I think in general they are hard working, fairly ethical. I mean there is always those ones that are skirt'n around things (laughter)— getting a little help from that they shouldn't have gotten—but (um)—but, yeah, just hard working and willing to put in a lot of effort.

In the last excerpt, I found it ironic that, while hard work and effort was valued, there was an acknowledgement that some engineering students (note that she was referring to all engineering students, not just civil engineering students) may not be as ethical as they seem (implying there could be cheating going on). This made me reflect that hard work perhaps is not exactly what it seems. It made me question the definition of students' success. Was it hard work and effort that differentiates students from other students, or something else? Were there students who knew how to work the system in order to not work as hard? If so, what were these students learning as a result? Were they learning that it is "okay to skirt around" as long as they got the grade to move on or be noticed? What does this perhaps unethical climate do to those who are focusing on their individual accomplishments, without cheating? These questions will be addressed further in Chapter 6. For now, this finding pointed that the context was not as straightforward and neutral as it seemed.

In contrast to possible unethical behavior suggested by a staff member, Matthew prided himself on his ethical and persistent character within engineering discipline where every semester "gets harder—every single one." However, he pointed to his social responsibility as a civil engineer—his responsibility to the public and the reason why civil engineering students must work harder and harder every semester. He half-laughed about how his instructor consistently talked about not killing people such as "People die.

People die when we don't do our jobs." He knew the importance of being ethical and protecting the public. Bad engineering can cause people to die. However in the end, he knew that it was because of his own personal productivity and persistence that would lead to his professional success as an engineer. He valued the hard work much like a medical student studying to become a professional doctor. The following excerpt described Matthew's thought process:

Matthew: Every semester it gets harder—every single one. It is crazy. And unfortunately my GPA has gone down because of that—every semester. But being an engineer is testing someone's character. Because character is huge—especially as an engineer they talk about ethics and stuff like that. I think making a rigorous program—like tests—because as an engineer is like being a doctor. You can't just make anything. People—there is special person that—you know—as to be in this field. Not because you do good in math—or you are just smart, whatever. Having the character to persist through a problem—because you have to be a problem solver. The basics—you have to be a problem solver to be an engineer….And preparing students—with their psyche—things get harder, things get more difficult—your decisions can cost people lives. We joke about it—we joke about it all the time. I mean Dr. [name of instructor] says, "People die. People die when we don't do our jobs." And the reality is it is a serious matter—and that is in any discipline that you do. And so to have that level of seriousness is important. And so—being it is a tough program—kind of emphasizes how important—how important engineering should be to us because we are—every

night—it builds a "I got to make it now. I am in my junior or senior year, I got to make it now."

Matthew felt an ethical responsibility in combination with a hard work ethic was the best way to approach his studies. In contrast to Matthew, Adrian didn't necessarily see the value of the hard work and effort that students were required to do in order to become prepared as future civil engineers. He questioned the value of all the time students have to commit to homework and projects and whether this effort was really contributing to their learning. Below is what Adrian had to say:

> **Adrian:** This semester has been really bad. I've really got no weekend unlike the first one because we didn't have any homework. But I think that is a lot of effort for students—a significantly more effort for a student because I think we're just— the educational system has this paradigm that students are supposed to work nonstop and they don't get sleep and they have to eat Ramen every night. That's what we built up this image of the student. He doesn't get sleep and he is here most of the time—when it might not be necessary to do that. You might not have to do that—you might not have to and be putting up with homework and projects non-stop to get that same education. I wouldn't know. I haven't been to another university. At [name of university], I would think that there would be another method than running students ragged.

While students and staff seemed to value hard work and a hard work ethic, some students either questioned the reasoning for all the hard work or did unethical things (such as, cheating) to get through the program. This seemed contradictory in a culture of sameness that rewards individual performance, which will be explored next.

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Focus on meritocracy. In a culture of sameness, meritocracy provides intrinsic and extrinsic rewards to students who individually succeed through their academic performance and achievements. Students are incentivized to do well in their classes from their own individual effort. During my observations, tests were used to assess student's individual performance and grades were used to differentiate the great, good, and not so good students. Good students, if they were noticed, would receive recommendations from their instructors for internships, jobs, and graduate school. If students performed exceptionally in their classes or extracurricular projects, their work was put on display throughout open spaces/walls in the engineering building as posters, results, models, and even the actual prototypes themselves (glue-free chairs made of cardboard, stationary bikes producing electricity, and so forth).   In addition to my own observations, a staff member also described in detail the display of students' work around the engineering building for the purpose of highlighting students' merits:

> **Staff member:** We try to show off their projects…For instance, we're thinking of taking photographs of their capstone projects from creative angles—because obviously we can't fit all our capstone projects in the building, but we can display them in an artistic way—that, you know, kind of leaves their legacy, you know, here for years to come…Well, actually, I guess one thing that I've noticed—there have been so many hands-on students in past couple of years…Or we actually talk about them to prospective students, to current students. We talk it up a lot, and we make it clear every time a prospective student comes and every time their family comes in, we make it really clear that, "Yes, you won't be doing this during your freshman or sophomore year here, but know that if you get involved—if you are a

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hands-on student—that most likely you will be the one making the next electric bike, you will be the next one making a [name of project] in the lobby." I think that is the best way to get them involved…"Yes, I am not going to ever get as much recognition as necessarily an artist would, or as an architect would, but—you know—there are different ways of getting acknowledged."

The staff member pointed to the importance of acknowledging students' individual efforts by proudly displaying their work as their legacy to the college and these merits being recognized by current students/staff/instructors and future students/employers. Being visible and separating some students' abilities from other students was a bonus in a meritocratic culture. While this may seem contradictive to a culture of sameness, it really emphasized promoting individual successes outside of a group or ethnic affiliation. The individual was seen as the penultimate measure of success.

In a meritocratic culture, students are valued by their separation from students who are less capable. Students were successful in their math, science, and preliminary engineering courses during their freshmen and sophomore years, which gave them the confidence to move forward. For instance, the instructor of the teams-based class on more than one occasion commented on the students being at the top academically in the university, "You are the upper 5% of the university. We weeded enough of you that you are probably the upper 4%." He held a pride for his students' individual performance reflected by their tenacity in the program and good enough grades to be seniors, but he brought this statistic to light when a student couldn't solve a problem on the spot as if he was saying, "you better get this because you are different than the rest!"

In a culture that supports meritocracy, an individual's ability to perform is rewarded and then professors begin to notice these students. My data showed that while students of color felt like they were rewarded individually via good grades and being noticed, they also felt a pressure to do even better/work harder than their white peers because they had to be seen as a model for future students, as the following excerpt described:

> **Sarah:** I think, you know—from some professors I get a lot more admiration than I do from others….But just kind of knowing—I could be a female, I could be [name of ethnicity]—and not do very well. I think that would just reflect badly on future students with the same identity. So I think it helps to try really hard and be different, which requires a little bit more effort than it does for the other students. But I think it is more important to do that—kind of make a name for yourself—where a teacher can respect you because of your identity. Or they can say it doesn't matter who you are—you are still going to try as hard as everyone else. I mean to me it makes me feel a lot more equal—but at the same time it is valued as being an individualistic versus just being completely different. Being different because of my identity or standing out, being set aside—it's more of—I get—I mean from some teachers—it's like you are an individual—it doesn't matter who you are, but you are going to do what you want to do. I think it is valued.

As Sarah revealed, it was much easier being noticed when she was able to separate herself from the rest of the students, but it required greater effort since she had to prove that she was able in spite of her ethnicity, which might not be perceived as favorably by

the dominant majority. In that sense, students of color must be willing to work diligently and with greater effort in order for their individual accomplishments to be seen.

Conclusion. In a culture of sameness, the individual is celebrated while difference is viewed as unimportant or not relevant. Believing in equality across all students, believing in hard work and personal productivity, believing in logical and seemingly neutral problem-solving, and believing in the merits of the individual as a sanctioned way to differentiate all support the focus of the individual at the expense of students who perceive themselves as different or may be perceived as different by dominant members of the culture.

While there is nothing inherently wrong with acknowledging individuals' achievements in an equitable way as possible, the danger comes when subtleties in the form of contradictions suggest that differences between students do in fact exist. For example, Sarah felt as a female student of color that she had to work harder than the rest of the students because she didn't want professors or students to think negatively about her identity as a student of color. As a result, she had to remain in a constant "student state" because she had to be diligent in proving her worth in the program. Knowing that there is cheating or other unethical behavior in a context also contradicts the emphasis on individual effort based on one's own performance. Later, I will speak to the function of cheating for efficiency. For now, cheating or unethical behavior pointed to how individual efforts are not always adhering to one's own initiative. Adrian particularly questioned being "run ragged" in the program. He, perhaps without stating outright, pointed to the contradiction that the hard work undertaken by engineering students is overkill and does not reflect what a student actually knows. He did not understand why

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he and his fellow students had to work so hard without much sleep. He questioned the constant "student state" that was expected of him in the culture of sameness. These three instances, all point to the contradictions of a supposedly neutral context that supports the individual and individual accomplishments. It can be inferred that students are expected to adhere to values of equality, being professional (or downplaying emotions), problem solving, personal productivity, and meritocracy, which tends to cultivate "sameness" in values across all engineering students. Nonetheless, the inconsistencies explained above show that a culture of sameness is not as neutral as it seems.

Schooling to Professionalize via Ritualization in a Seemingly "Neutral" Culture

Introduction. During my classroom observations, I often felt a pressure to keep up with what was being said or lectured on. In both classes, the rhythm was rapid as each instructor revealed one important topic on top of another. There seemed to be a sense of urgency to get as many concepts covered in the shortest amount of time as possible. The urgency and fast pace had a ritualistic feeling inside both contexts. In the lecture style class, the rhythm was tied to the relationship between the content being covered and a future in-person exam consisting of what students should know. Students had to understand and know how to apply the concepts in preparation for the future exam; their results would become a measurement of their individual knowledge and performance inside the class.

During one class a week prior to the first exam, students—prompted by a particularly visible and forthright white female student, Anne (not her real name)—had a debate with the instructor on whether or not they could bring a cheat sheet to the exam. The cheat sheet was a way for students to write down equations and strategies for solving

problems on the exam rather than having to rely on memorization. Cheat sheets also helped them avoid the initial test anxiety. Dr. [name of instructor] did not think cheat sheets were helpful in preparing students understanding of the material. In fact, students from past classes often wrote out problems verbatim on the cheat sheets and reproduced the same problems on the test. They would inevitably get the question right on the exam. The instructor argued that while the students received credit for the problem they did not understand the concepts, which were foundational concepts for learning the future assignments/material. What is interesting about this scene is that students were clearly worried about tests as a measurement of their individual performance. The tests produced a certain amount of anxiety, and they wanted to be able to handle this anxiety more effectively by having a cheat sheet (students would feel prepared and could organize their thoughts prior to the exam). Nonetheless, some students from the past took advantage of this seemingly neutral way to help all students in the class by copying worked problems from the cheat sheets onto the tests (and then getting full credit for the problem). The instructor indicated that while cheat sheets could be good study guides, they didn't really help students solve the problems (in fact he said that cheat sheets often confused students and became a barrier to students' learning the material). He would rather students focus on studying the material than perfecting the cheat sheet. Female and male students would still worry about the test. In my field notes I wrote:

> Like the first class, male students—white male students, that is—tend to blurt out answers more than female students and minority male (and international male) students. Again white male students were called out by name more often than female students (by instructor).

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One white female student named Anne (not her real name) seems to be the exception (to asking questions and being called on by name by the instructor). She regularly asks questions—she did in the last session. Where others may "wish they could ask," she has a type of boldness—albeit quiet and reserved—that seems respected—at least from the males. It seems as if she can ask questions— poignant questions—that the white males would like to ask but don't. For example, she asks (the instructor) if they can bring a cheat sheet to the exam next week. From the time she asks about the cheat sheet—males begin to further support the idea and a 2-3 minute discussion ensued about "why to have or not to have a cheat sheet."

(In the course of the short heated debate about whether or not to have cheat sheets), he (the instructor) did relinquish a bit and said that he would provide the equations as part of the exam (so students would not have to memorize them). One white male student asked him (the instructor) to provide the equations before hand so that he could study with them (the cheat sheet).

The instructor did not relinquish to the student's request and said he would provide the equations on the last page of the exam (on the day of the exam). He said that the students should already know what the equations are. He also indicated at one point that all the learning objectives were in [name of learning management system] with everything that students need to know to prepare for exam.

There seems to an emphasis on "performance goals." There is a nervousness/anxiety by all students about the upcoming test. They want to do

well and they want to know as much information ahead of time so they can study for the exam as efficiently as possible. They try to work in ways to ask the instructor—both directly and indirectly—about what is on the test—trying to get the instructor "to give" a little—which the instructor did by providing an equation sheet; this was a generous gesture by the instructor. The students would then not have to focus on memorizing information and could then focus on just solving problems.

While I found the short debate between the students and the instructor interesting in itself, the cheat sheet debate seemed to really point to students' anxiety about performing on the tests. The instructor, who had the authority to support or not support their request "to bring a cheat sheet," showed control over the situation while still giving in "a bit." It was also interesting how Anne—one of the few visible and vocal females (because she asked questions and blurted out answers, much like the white males in the class)—brought up the idea of cheat sheets to the instructor. Other white males followed suit by asking follow up questions and comments on why they should be allowed to bring a cheat sheet to the exam. Anne was a bit of an enigma to me; this is what I wrote about Anne during my early observations:

> I am curious about Anne. Is she an emergent, informal leader for the entire class even among white males? She doesn't associate with other females. She sits in the back with her male friends. She uses her knowledge capital to help her classmates (and herself). She has a way to ask poignant questions (not necessarily related to the content of the lecture) where other students, even white male students don't dare to tread.

My notes and observations point to Anne having a certain social power in the class that other students, including white male students, didn't have. In my observations and on several occasions, I noticed Anne going up to the instructor after class to—I suppose— ask a question about the material covered in class. I also saw Anne at the instructor's office to ask about the content. Anne seemed to know how important it was to not only "get" the content (by asking instructor relevant questions) but to also get noticed by the instructor. As a result of cultivating a professional relationship outside of class, Anne was called on more often by name from the instructor, and she was able to use her power status (from being known) to ask questions other students did not dare to ask. This was an interesting finding in itself, which led me to reflect on the idea of female students using social and knowledge capital to successfully navigate the white male dominant context. This will be explained in depth later in Chapter 6. For now, it reinforces the idea that female students are navigating in a way to be noticed in a fast paced and demanding classroom context.

Like the teams-based class with a "pff, pff, pff, pff" pace like a machine gun being fired (as I referred to in the introduction to this chapter), the rhythm of the lecture-style class was fast and furious with a sense of urgency, too, with the purpose of covering as much content as possible. This sense of urgency pointed to a pressure to conform. It also pointed to students maintaining a constant "student state." Students had little time to do anything else but engineering tasks or activities. This constant "student state" points to how ritualization leads to professionalization of students towards sameness. Ritualization towards professionalization will be explained further in the next session.

Ritualization towards professionalization. Educational rituals in high performing professional disciplines can have a more regulatory and conforming function by monopolizing students' time and energy. If you, the student, have little personal time, then you won't be able to think of anything outside the degree. You won't think about something else or something different. You have to use your entire waking energy towards performing and maintaining an illusion of self-control. If you break down emotionally, you may be doomed and forced to exit the discipline. By conforming and giving up your personal identity, you the student accept "the way things are" as you become the professional you are expected to be.

Education rituals that seem to function as a way to conform and regulate students—as they become professionals—may vary. In my observations of civil engineering students, educational rituals seem to be related to cultivating students' understanding and preparing students to what a professional engineer is and how a professional engineer is expected to perform and behave. These rituals also tend to keep students in a constant "student state." Based in my observations and interview data, the following educational rituals seem to have the most conforming effect on students, as they become professional engineers:

- A social responsibility not to "kill people,"

- Using humor to differentiate and to humble,

- A fast pace/rhythm with little wiggle room,

- A rigid course progression path,

- High stakes testing,

- The act of praising/highlighting individual or team accomplishments, and

- Using consternation when "projects" don't go right.

Each of these effects will be explored with the data to support it.

A social responsibility not to kill people. "Guns don't kill people, we do" was an actual quote that I overheard from a male student in the teams-based class, who was referring to the civil engineering's social responsibility to "not kill people." Civil engineers have a social responsible to serve the public and public interest by ensuring safety of citizens—protect them from harm, from disaster, increasing the civic wellbeing (e.g., good sanitation, minimizing heavy traffic, etc.). In the same class, the instructor made references about not killing people (this was a common joke). There is a social responsibility and ethical mindset to "not kill people"—by being accurate, methodical, well-informed, sticking to the industry safety/building codes. During an interview, Matthew shared with me that preparing to be a civil engineer was like preparing to become a medical doctor (which includes intense training for the purpose of saving lives, having an ethical mindset, caring for society, and so on).

With this said, the business part of engineering is not always seen as "ethical" or acting in the best interest of people but rather on maximizing profit, minimizing losses, and getting the business (for example companies choosing a business bid for an engineering job because it was the best economic value/quickest turnaround, and so forth but may inadvertently compromise public safety). Perhaps this is why one instructor I observed made jokes about business students (giving "the business student" an unflattering role inside the engineering scenario he described). He may have been implying that business may not act with the highest integrity. The engineering ethic/mindset is often in conflict with the business ethic/mindset. Talking about ethics of

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engineering, which is often in conflict with the business practice of engineering, I presented an ethical scenario to which Matthew replied:

Matthew: Um—well—you can learn from your mistakes—it is bound to happen again. But and that is more of the business world—business compared to engineering—like, they are trying to cover themselves so that they don't get in trouble—so that it's not attached to the name. Um—as engineers—we should accept and actually attempt to capture—if things go wrong—why did it go wrong? That's really important because—there are just too many factors…That's the bottom line—you put your say into it—ultimately you are not the one writing the checks most of the time. If you are talking to your boss—"I don't feel comfortable with this."…And they choose to take your opinion—but it's your responsibility to speak your mind…And that is pretty much what it is (ethical mindset)—because at some point our job is to protect the public…And sometimes your opinion is not taken and so then you have to say, "well, I said what I had to say." And then you just have to move onto the next thing. Dealing with people—which is not bad—making money is how we make our livelihood—but having—it is good to have a good balance. If it is all about the right job and everything—then nobody would get anywhere—our economy would suffer—if that is what we are looking for "it's all about the money" then the quality is bad—finding the right balance is important, and so. You just have to put your ideas on the table—if it's taken it's taken—if it's not, you just move on with what you have to do.

Matthew reinforced how important having an ethical mindset was as a civil engineer. An ethical character was tied to the social responsibility required by civil engineers. He was

at odds with business ethics but rationalized in the end that "making money" had to be balanced with engineering quality, in order to keep the public safe. He suggested that as an ethical engineer he would try to convince business decision makers but, if they didn't listen, "you just move on with what you have to do." This latter point suggests his reluctant acceptance of business decisions being made that might impact public safety but in the end he must go along because "that is just how things are" in the world of engineering.

Like Matthew, Daniel felt conflicted about how business and engineering don't always see eye to eye. He particularly found that logic (or a functional purpose) was not always the reason for engineering projects getting funded. This seemed to bother him because he felt that engineering/math was not really debatable. You can prove math. However, he was confronted on more than one occasion how engineering decisions were made sometimes by a business decision and sometimes as community planner's decision. While he saw engineering as providing a social/civic responsibility, he wrestled with how decisions were being made, as described in the following excerpt:

Daniel: In engineering I never felt like—I had to think—if you believe something and it's wrong—it's like math, I guess. If something goes a certain speed—how do you debate that—I guess. Well, like—I am trying to think—like my traffic class—you know there is a couple of times where it was—these are guidelines we follow—but sometimes it doesn't happen that way—so you have to do certain things for political reasons—like who is an officer for that city—they just want it there. It doesn't make any sense—how it's like no reason for it at all…when I took the tour of the highway in California—he was saying like, "There are standards—

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by the federal government—the water you know you have to build it for like the worst storm in the last one hundred years." And so that is what they are going to do—they are going to do the minimum. They are not going to do any bigger—you know—because costs go up…I remember him telling me —"the reason like why the road is high over here is to have this tractor that is 21 feet tall—and it comes in once every two years—so you have to build it that high because of where the land is at—so the higher you go each foot the more and more it costs. You know—it raises the cost a huge amount. Moving all that dirt and the structure part of it—it's just—it's just money it comes down to....

Daniel clearly felt conflicted on how decisions were being made about what engineering projects were funded and which were as if there was no logic in the decision-making. He realized the responsibility to address needs within the public but felt that business and/or funding decisions might trump logical reasons why engineering projects are completed.

In the two examples above, both Matthew and Daniel were conflicted about the expectation to be socially responsible and ethical when it contradicted business decisions or an illogical engineering project.

A fast pace/rhythm with little wiggle room. As I mentioned earlier in this chapter, I felt an empathy with students in both classrooms who were trying to keep up with demands expected of them. The students were juggling between all their classes, and combined the tasks expected of them was daunting. As I shared with one student during an interview:

I don't know if I could personally—if I have had the stamina to do it. I mean as an outsider looking in—I would wonder how I could do it. And so—for me—that

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creates fear in why I would go into this—even though I might be capable and that
I have the ability. But do I have the stamina?

After one classroom observation I also reflected:

How can you (the student) keep up? You are expected to keep up and stay on
track. You can't let anything get off course—otherwise you may have to take a
class next year when it is finally offered again.

The fast pace with little wiggle room suggested that students needed to be always
engaged with the content—remaining in the constant "student state" and giving up their
personal needs and desires.

In one class I observed, students were under huge amounts of pressure to meet the
demands of the class. Students and faculty alike described this course as the anomaly in
the program because of the extreme demands expected by the students. Pedagogically
the class was rich and varied with a goal towards applying knowledge inside a real
situation. Nonetheless, the intensity of the projects and the amount of assessments in this
one class seemed excessive especially along side many demands the students were
expected to perform in their other classes. Students joked about earning a badge of
survival after taking this class. It was as if surviving under huge amounts of pressure was
part of their "becoming" professional engineers in line with a ritualization process. Part
of surviving was also the camaraderie and the feelings of *communitas* that survivors
would feel with other students in the current class and past students who had taken the
class. This shared experience connected them together. They would survive "frustrated
and all" but all coming from a similar experience.

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In this one class, students were expected to complete a rather time intensive weekly team project using hand calculations and drawings by hand. This project was in addition to other quizzes and assignments they were expected to perform within the same class. The mid-term project took up most of their time outside of class (on average over 20 hours) during one week of class during the fall semester. Students were exhausted and gave up working on their other classes to focus on just this one project. While completing the weekly project, they were also still expected to turn in homework, complete in-class quiz, and prepare for the upcoming take-home and in-person exam. The instructor boasted the time effort students spent on the project:

Dr. [name of instructor] to class: Report the time on spent on [name of project]. Put what you think you did. Figure out how long it took to work on [name of project]. (beginning of side conversation)

Andrew: I've been up until 3:00 am (trying to finish). They weren't kidding how time consuming this class is.

Jasmine: It's ridiculous!

(end of side conversation)

Dr. [name of instructor] to class: I would conjecture that this is the most important hours in class—your other professors don't like me (because his class takes time away from students these other classes). Why is that? (referring to hours spent on project) Up to now you have been reading and doing some math. In this project, you all made decisions, and some were stupid. But we learn by pitfalls.

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By the time students are seniors, they are expected to apply their knowledge in team projects; this is a good thing in preparing engineering students for the real world. Nonetheless, the instructor's expectation for completing the team assignment was excessive. Students not only had other individual assignments for the same class due simultaneously with the team project but they also had to keep up the demands of their other classes as well.

Several students in interviews commented on the expected time commitment per class as defined by the [State] Board of Regents. Rebecca seemed to be able to justify the excessive time demands that in her opinion were purposeful in preparation for becoming a future engineering professional. This is represented by Rebecca's comment:

Rebecca: I find it really frustrating that we have—granted I am only taking 13 units—but the course load—but the amount of time we spend outside of class it does not equal the expected amount. For example if you are taking a 3-credit class—then they are saying you should spend only 6 hours outside of class. But that is unrealistic in engineering—period. Because it is not just like we are going to do this assignment and we are done—it is we need to sit here and understand this—can we explain it to somebody—and if we can't can someone explain it to us. Can we fully understand this—because I don't think I realized until—last year how interrelated all of our classes are—and I was just in class right now—I was like, "Wow, I learned that my sophomore year and freshman year." And I didn't think I was going to see this again—and as everything goes together—it kind of makes sense. So that's really important.

Again, Rebecca's comments pointed to time demands required by students, which is often excessive compared to non-engineering students but seemed to be justified in preparing students as future professional engineers.

As you recall earlier, Adrian, a male student, questioned the hard work that was required by engineering students. In addition, he questioned why this one instructor insisted on students using outdated methods, such as hand calculations and drawing by hand, to teach applied understanding when there was software that students were expected to know how to use as professional engineers:

Adrian: …making these calculations by hand on paper—and you don't do that anywhere. In the professional world and then intern world, you will be on a computer using the—software that we are paying all this money to be able to use—like AutoCAD and drafting software—And we are not doing it. And we are using his freakin' dinosaur box—curves to draw on the piece of paper…Honestly the box has a note on it that says the last person who checked it out was 2007—or something like that. That was the last person who used it. It goes back to like 19 —something—of how old they are. It's just that—I don't think that it is super relatable. I think that/ I would rather have something that is super relatable. You know you hear from professionals in the world and their day—at least half of their day is spent on drafting using software, AutoCAD. We don't have that kind of knowledge here. You know, we are not prepared for that which is a huge setback—it is a huge setback for us when we go into an interview. And if they want us to put us on a computer at an interview—"Can you do this in CAD?" We

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are going to have to say—"No, not really—how do you do that? We will have to look it up—we are going to have to look online or something like that.

Me: Wow—should there be an AutoCAD class?

Adrian: There is one. It is like a 100- level class and you take it. And it's barely most basic of basic. And you take it your freshman year—and by the time you are here (as a senior) you forget it all…It is very frustrating—in that aspect. And that it is a lot faster—than having to hand-draw a lot of stuff…But I say let us all do it in freakin' AutoCAD—a software that will make it a lot easier and make things more relatable to the world.

Me: And the time that you are saying would go down from 20 hours to like 10 hours.

Adrian: Yeah 10 to 12 hours.

Me: You know which I think is doable, right?

Adrian: Yeah, it's a whole day's worth almost. I guess—but then again—you can't tell a teacher with tenure nothing—because you (the student) are wrong. I don't know I guess I just wish it were a bit um—(different).

I always found Adrian's commentary refreshing because he seemed to consistently point out the contradictions inside the engineering discipline. In this case, AutoCAD is software that recent engineering graduates are supposed to know. However, students were not given the chance to use AutoCAD (only during one class their freshmen year); instead, they had to rely on hand-calculations and hand-drawings for a very big project, which were both very time consuming. It consumed all the students' time and they could not focus on anything else. They had to remain in their "student state."   If they left their

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student state, then they would suffer the consequences because they could not finish the project per the guidelines expected. Students who had used AutoCAD on the project in the same class were publicly reprimanded (which I had observed). This seemed odd to me because these students were applying their knowledge of software that they are supposed to know as professionals down the road. I tried to understand why the instructor enforced hand calculations and drawing by hand, thinking perhaps that there was a pedagogical reason. For example, the hand calculations and drawing might allow the students to understand the theory and abstract concepts better. Adrian explained that he understood how hand calculations could help with these abstract concepts. However, he also felt that that abstract understanding could be easily tested by a homework problem or quiz. He did not see the logic in doing an entire engineering project by hand, which in his own words was a "dinosaur" approach. While he was not ready to change the practices, he was at least looking critically at "how things were." Other students also commented on the heavy time demands of this project, especially in relation to how it impacted their other classes. While this class may be an anomaly, the students were nonetheless feeling overwhelmed with the demands expected of them.

To conclude, a fast pace in a class with many assignment demands kept these students consistently engaged in the "student state." They had little time for anything else but their studies. They regularly forfeited sleep, exercise, healthful eating, socializing with friends just to keep up with the demands of their classes. What seemed contradictory was that some instructors taught in a way that seem to intentionally tax students—by giving students very time-consuming assignments that could have been more manageable had they been able to use software, which they are supposed to know

anyway as future engineers. This latter approach (i.e., using AutoCAD) seemed quite logical. However, this particular instructor gave assignments using outdated time-intensive practices, which felt like overkill and almost like some sort of student hazing. It was as if these senior-level students were expected to complete this intense ordeal as a rite of passage for the sole purpose of becoming "responsible" professional engineers by being in a constant "student state."

A rigid course progression path. As above, students have commented on how classes need to be taken in a particular sequence otherwise they will have to wait another year to take a class. Students who do poorly and have to re-take a class may have to wait an entire year to graduate. I looked at the proposed course schedule and it also seemed to be restrictive. Students were expected to complete a specific set of classes (often 19 semester credit hours) from freshman year all the way through senior year. Students elected to take classes in summer school in order to lighten the load, so to speak, in the fall and spring semester. One staff member suggested that it was a good idea for students, especially struggling students, to take lighter semester loads. However, this was not always possible when a student was receiving a college scholarship for four years only.

Students felt pressure to stay on-track; otherwise, they would have to pay for another year of tuition, room & board, and associated costs. On top of that, some students didn't have the financial means to continue additional semesters of school. This rigid course progression path forced students to be vigilant and be immersed in a "student state." They could not think of anything for the most part outside of their engineering studies. They spent on average 12 hours a day including weekends in the engineering building or library working on individual and group projects, completing homework, and

studying for tests. Students adhered to rigid course path by staying immersed in their studies and could not question the experience along the way.

High stakes testing. Students were expected to do well on exams that are intended to have a cumulative effect, that is, students building knowledge and understanding from one test to another. Students were expected to do well otherwise they may get in trouble on subsequent material as the instructor from the lecture-style class said, "Those of you who are not happy with the exam results, it's time to hunker down and finish strong. Keep in mind it will get more difficult with content that you may not know." Students felt a pressure to perform well on tests and there were supposed to be able to know the content as they moved on.

However, some students questioned the value placed on exams and didn't think they necessarily tested what students knew or the effort that students put into learning the material. Take Terri, for example, who felt she put an "A" effort into all exams while receiving a "D" score, she still felt she understood the material better than many of the other students, as she described:

Terri: As far as effort goes, I think—I don't know. It's kind of hard for me to explain. If I get for my [name of class] exam—I got a D coming back. But I really do feel that the effort that I put forth was an A. But then again—the average of the exam was a 70 and I got a 67.5. And nobody got an A. So when I look at it like that—(long pause) I don't know how to explain…I would rather know the difficult stuff than know the easy stuff and not understand the difficult (stuff). Because—I wasn't satisfied with my D—I am satisfied with the results of the exam. Not the D—but results of the different parts of the exam—that makes me

happy—that I at least that I understand what is going on. I am not happy with the D—but I understand what is going on. So if I had resources to use in the actual— real life—I could Google stuff—then I could have probably gotten the answers— and I could have gotten a B or an A. But I still did better on the things other people got wrong.

She continued a little later on about a different and even more challenging class with high stakes testing and explained her frustration on how much value is placed on exams. If you failed the first test there is no chance to turn your score around. She explains:

Terri: What is irritating is that the first exam is worth 30%, and the second exam is worth 30%—the final was worth 30%.

Me: So if you get a 30% on the first exam then you don't have a chance.

Terri: Yeah.

High stakes testing required students to start strong and end strong. Getting a low score on a test at the beginning of the semester might mean a student will fail and have to re-take the course in the end. Getting a low score, however, doesn't necessarily mean that learning is not occurring. Students were putting in the effort and they were possibly learning material but the tests might not necessarily be testing what they knew about the content. In chapter 7, I will explore how tests are not what they seem as students use strategies such as cheating or knowing "how professor gives exams" when taking exams to perform well (at least grade-wise) in a class.

Using humor to differentiate and/or to regulate. As I shared earlier, I often laughed albeit sometimes uncomfortably during my classroom observations. Instructors used humor to connect with their students but they also used it to differentiate or to

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regulate. In this study, differentiating meant that only a few students were being targeted

with jokes, similar to teasing, while most other students were not. Regulating meant that

humor was used to get students to behave or act in a preferred way (e.g., not being

prepared for class, not doing homework, and not putting the effort in to understand a

problem). In one class, the instructor used humor to differentiate some students over

others. He had a fairly authoritarian use of how he used humor to make students pay

attention or to put students in their place. He seemed to pick on some students, Rebecca

and Jesse (not his real name), more often than others in the class. In a joking tone, he

regularly called on or called out Jesse, a rather vocal male student of color who on

several occasions blurted out inappropriate comments or irrelevant questions in class, as

reflected in my field notes.

> (Referring to a problem) He joked about Rebecca "not getting it"—as if she was
>
> part of the problem. He did call on females during class. Females are generally
>
> pretty quiet in class. But so are males. I sense that they are somewhat intimidated
>
> by the professor. The professor jokes around with the students but in a somewhat
>
> caustic and authoritative way. Don't get me wrong, I've begun to like his
>
> "curmudgeon" spirit but I wonder how it (this spirit) translates to his students and
>
> how students perceive him. Given the students are getting grades—and I am
>
> not—they may feel more vulnerable and unable to speak for fear of being
>
> "publicly humiliated/publicly joked" in class. Jesse doesn't seem to mind being
>
> picked on or "publicly harassed" but seems to kind of like it.

Jesse didn't seem to mind being "publicly harassed" in class and went along with it. It's

as if he received an elevation in social status by being picked on. He just went "with it"

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and continued to make inappropriate comments in class. On the other hand, Rebecca felt more uncomfortable with the attention and public jokes in class. During the course of my observations, the instructor had, in a joking manner, called her grape lady, princess, and other comments about her appearance. I, too, was uncomfortable by some of the "jokes" that I observed between Rebecca and the instructor. Rebecca described this discomfort in the following interview excerpt:

Rebecca: He has called me "crazy, princess, grape lady, um, and something else—and it is usually when we are working on our [name of project] or our [name of project]—or our homework or something…I told my mom…And she was like, "Really, that is what he said?" I was like … my boyfriend said, "Yeah, he really said that!" And my roommate and everybody was just confirming it. And she was like, "what's up with that?" "Mom, I don't know?" Half the time I don't say anything….I don't know if it is because I am the only [specific ethnicity] in class—I don't know if it is because I am loud or outspoken in class. I don't know….The day that he asked me if I could see the board because I wasn't wearing my glasses, I was like, "Yes, I am wearing contacts." "Well, I can see your bright beautiful face shining "—whatever he said. I was just like, "okay?"…I feel like I just have to—He said it the first few times—if it continues—I just let it roll off. A lot of people in class will say, "So what do you think of that?" I don't know; I ignore it at this point. I figure he is just going to do it…A lot of people have been saying, "Well, I have been thinking about it but I feel like it is closer to the line of being inappropriate." I mean I haven't let it affect (me)—if I am going to talk to him or something. If I do feel uncomfortable—and he had said

something—then I would take somebody with me—just so it wouldn't go further than what it should be. But it hasn't affected the way I get my work done.

Rebecca rightly so had a hard time with the instructor's public jokes. She felt targeted and uncomfortable by the attention (in the form of jokes/teasing) from the instructor. I had a similar experience with the instructor prior to the class observation, and so I could relate with how she was feeling. Reflexively, I was able to validate what she was experiencing. We both used similar strategies of "letting it go/letting it slide" to help us get through the uncomfortable interaction. This interaction strategy will be explored in greater detail in Chapter 7. Admittedly, the interaction between this instructor and Rebecca was the most extreme case of this differentiation via humorous remarks. However, I observed this instructor joking with other female students, too. One female student was visibly flustered by one comment and she could barely respond to the instructor. Other females were differentiated by humorous remarks as well. Usually, the female students in the class ignored the humorous remarks and would "let them slide." The instructor joked with only one other white male student about this student's appearance (this particular student wore bold colored clothing to class). The important point here was that humor in the form of teasing was used to differentiate some students from other students. Female students seemed to be targeted more because of their appearance as females. This is contradictory to culture of sameness where students are individually recognized for their individual accomplishments. In a culture of sameness, wouldn't every student be treated the same despite their gender or their ethnic background? Commenting on an individual's appearance, even in a joking manner, seemed to show that appearance had a differentiating function.

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In contrast, the instructor from the lecture-style class did not tease students as blatantly as the instructor from the teams-based class, but he still had a slightly regulatory tone on how he wanted students to behave in class and rewarded the behavior he wanted to see. This is what I wrote about his humor in my field notes:

> Dr. [name of instructor] is a likable fellow—really connects and jokes around with students in a playful way—poking fun of slackers who may not be paying attention to material or material posted in his course shell.

He used a very courteous and respectful humor with his students and spoke, too, of the responsibility of doing good engineering as he said, "also your building fell down" (when not answering a problem correctly). He joked with students about winning the prize, getting a piece of candy, owing a student a dollar for answering a difficult problem, and so forth. He joked about the students needing special accommodations to reduce test anxiety, "What do you want me to do—play some harp music (during the test)?" Regarding the instructor giving students a challenging problem homework set, two male students had playful banter with the instructor:

> **White male student to instructor:** You are not my favorite person anymore.
>
> **Another white male student:** It means at one point he was one of your favorite persons.
>
> **Instructor:** As long I am in your top 100. (the class laughs)

He playfully joked around with one male student about being similar to his two-year-old son to mark the parallel between students asking endless questions and his young son asking endless questions. Again, the instructor's joking tone was playful and appeared to be related to how he wanted students to act and behave.

Compared to the teams-based class, there also seemed to be more explicit and implicit sexualized jokes between students. This more sexualized language seemed to point to creating *communitas* between and among students. Students were learning a common language that aligned along a male/female binary. They made comments, innuendo, and jokes, which seemed to underscore masculinity over femininity with subtle and not-so-subtle sexual overtones. They laughed at sexually suggestive jokes but were at the same time not necessarily offended by the jokes. Sexually suggestive bantering did not seem to bother male or female students, unless it crossed an uncomfortable boundary (which did happen on a few occasions). When Anne mentioned she got her nails done over the weekend, her white male friend replied, "You mean, you really are a girl?" Referring to a man's penis, a white male student, Evan (not his real name), joked at the beginning class "No banana hammocks in this class" referring the use of banana hammocks for some engineering purpose in a different class. At one point in relation to a homework assignment, Evan commented on Anne liking "integrals." A white male student laughed at Evan, "You said she likes "enter girls!" and other students laughed along.

Students also laughed at engineering concepts that seemed more like sexual innuendo, such as "structural stiffness" and "living in a frictionless world." While the instructor was not intending to be sexually suggestive, the students perceived it as so with combined laughter. Implicit and explicit jokes seem to be a way to differentiate between males and females—more in an effort to keep things light than anything else. However, if sexist joking went too far, it was unwanted or could be uncomfortable. In regards to going too far with sexist joking, Jasmine had this to say:

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Jasmine: Yeah. It happens all the time. I even do it. We all make fun of everybody...We all make fun of each other. We say racist jokes and we say the sexual harassment jokes, and whatever. I guess it doesn't bother me.

Me: What is it doing—that bantering?

Jasmine: I don't know. I really don't know. It's funny because it can go up and down—because sometimes it depends on my mood, on my personal mood. If I don't want to be bothered—there is one guy in particular, he's actually my roommate. Sometimes he takes it too far—and it is not the appropriate time. Oh and sometimes it just pisses me off. Sorry about saying pissing off.

She continued to explain how her roommate explicitly joked with her female friend about specific body parts and she (Jasmine) didn't find that to be funny. So while sexist humor, for the most part, is tolerated it can feel uncomfortable when it goes too far.

In conclusion, humor is used to differentiate (in Rebecca's case) or to regulate (in the lecture-style class where certain behaviors and actions were supported). In a culture of sameness that supposedly does not differentiate between students and group of students, I found that the use of humor had a regulatory function to produce a certain well-behaved and deferent student within, at times, a heteronormative context.

The act of praising/highlighting individual or team accomplishments. Earlier I shared how students' work was displayed promptly throughout the engineering building—in lobbies, in common areas, on walls and so forth. In addition students were praised when they answered difficult questions or had perfect or near perfect scores on exams. In the lecture-style class, the instructor jested with students, "I will give you a dollar" or "I will give you a piece of candy" if a student answered a difficult question.

Inevitably there would be one student who could solve the problem and the whole class along with instructor would applaud with excitement. Ironically, the instructor never gave the students a dollar or a piece of candy for the student solving the problem. However, that wasn't the point; the student was being praised out loud by both the instructor and fellow students.

In the teams-based class, the instructor also praised two males and two Asian females for getting perfect scores on a required pre-requisite survey the first time around. He asked the students to stand and everyone in the class, including me, applauded the students for their performance. He then asked the students to stand who received a perfect score the second time around joking "this is the better half" of the students in the class. He inferred that the other half of the class, who didn't get perfect scores the first or second time around, was inferior. After this public praising, I reflected on the meaning of perfection:

> This classroom had a different pulse compared to the more traditional "lecture" style class. There is still a very heavy emphasis on individual work. However, students are also expected to own on their teams—to "perfect" their answers. Perfection (doing perfectly) is the expected norm. If a student performs perfectly, they are publicly acknowledged (with clapping and praise from the rest of their peers). Perfection is tied to social responsibility in some ways, "When engineers make mistakes, what happens, Rebecca?" Response "People die." This makes me wonder how much "error" is acceptable—so fewer people die. Implied here is only "perfection" is acceptable.

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Students and instructor alike praised students for their perfection and the ability to solve challenging problems. The idea of perfection or getting close to perfection seems to be consistent with the values within a culture of sameness. Students are expected to learn from their mistakes and apply this knowledge in positive ways. That is, aligned with meritocracy, students are expected to excel and minimize errors or mistakes, and this is then rewarded and praised. It also points to the minimal mastery students must have to do the job, tied to public safety.

Using consternation when "projects" don't go right. Students were expected to perform at a certain technical astuteness to represent themselves and the discipline. This expectation put a great amount of pressure when projects didn't go right. For instance, senior-level students represented the university and civil engineering discipline by entering their projects at a regional competition. The projects not only highlighted their capabilities, creativity, and ingenuity but their sound engineering with no blatant technical errors. At this university, students could enter their senior capstone project (for which they received academic credit) into the competition. For the past two years, one of two capstone projects entered in the regional competition was disqualified for blatant technical errors. Adrian explained the pressure senior students in this academic year were experiencing in order to not be disqualified again. While these senior students personally did not get disqualified, they were paying the price for former students being disqualified from the two prior years—because being disqualified made the university look bad. The consternation from administration despite a groundbreaking project put a "humongous" weight on the students as described by Adrian:

Adrian: Um, I guess [name of student organization] is kind of supportive because with our capstone. Oops, I am going into politics again. I keep touching politics here (combined laughter). It's just that my capstone is the [name of student organization], [name of project 1] that has been, um, disqualified for the past two years…And the [name of project 2] is the other one—and they race them and all that….All your professors know about it—and so. You get everyone's information and advice. But then there is also again the pressure of just like—one of the chairs is like "if we get disqualified again or if we don't do good—the capstone is gone after this year—so". So it is kind of a lot of pressure—but I mean they are definitely all here for us. Professors have helped us set up some contacts to how to get some materials... Our way is set up so the capstone is for a grade and you know we only get four people…Well [name of student organization] has said like the [name of project 2] did really well last year—and they were like groundbreaking. And last year the [name of project 1] team got disqualified. They didn't build it to the dimension or something like that. And the year before that they got disqualified—for some reason…So the [name of project 2] is fine—the [name of project 1] is just kind of like. We are giving money to [name of student organization]—to represent—you know we are funding them so that they—[name of student organization]—can represent our chapter, the [name of chapter]. And they are putting up a project that fails—or is disqualified—that doesn't really look too good on the chapter…There is a lot of pressure. It is both ways—I mean the [name of project 2] has pressure because what they have to do is find ways to improve on last years'—which was really good, was

groundbreaking. They have to make sure that their whole thing doesn't crack and all that. We kind of like just have to set a bar—we have to measure—we obviously need to make sure that we don't get disqualified. But at the same time we want to be really good—but we don't want to try too good because we don't want to mess up and be disqualified…We want to take risks and do our good jobs. But we still have to worry about not being DQd and put in the organization. It's a humongous weight.

Madison who was working on [name of project 1] for the current annual competition also felt a great amount of pressure to be successful. She felt the pressure of trying to rectify past mistakes from the prior two all-male teams. She was reluctant to be on the project but relinquished because "they must want me" on the project. While this praise gives Madison confidence, she implied that she felt pressure being the first female picked for the project in over five years. She seemed hesitant but willing to work on the project, which has so many repercussions if the project doesn't go right (or gets disqualified).

> **Madison:** I am doing the [name of project 1]…Yeah, there is a lot of pressure there. Because you are all on different time schedules than everyone else—except the other two groups who have the competitions—and then last two years we got DQ'd. I guess I am the first girl to be on this team in like five years; it's been all boys.
>
> **Me:** On the [name of project 1] one?
>
> **Madison:** Yeah, on the [name of project 1]—for the past 4 and 5 years.
>
> **Me:** So how does it feel?

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Madison: Kind of good. I feel prepared for the project— I heard other people wanted in it, too—who are in [name of student organization] before me. Because I wasn't really part of [name of student organization]—and it was my third choice. And people had it as their first choice—who were part of the club—who were also girls. And I get picked. I figured they must want me on it.

Sarah also indicated the importance of doing well on the two capstone projects entered in the [name of student organization] regional competition. As a student member for the organization she felt that she could put pressure on students, financially, to make sure the projects were done up to par. She felt that the while the discipline was hard, it was going to be hard anywhere, "so you might as well deal with it." In other words, she seemed to infer that while there is pressure to perform at the regional competitions it's just the way it is.

Sarah: Two of the projects that we have to do for the club are capstones—so I think last year we were told if we don't do well that they would remove the capstone—but be kind of being able to say, "Well, hey if you want this chapter in the school, then you have to do that—because it won't get done." So kind of being able to put in my input and getting people to listen—it matters —or just like kind of saying, you know—"We have all these funds—this is what we can do with it." So I think it helps a little bit—there is not a lot of it that I would really try to change. I like the program. Some people don't. But it is going to be hard anywhere, you might as well deal with it.

The emotional pressure these senior students experienced—in order to rectify mistakes by former students—points to a larger social expectation pressure by instructors and

administrator to make projects go right. Again, in line with keeping the public safe, that seems to be a reasonable expectation. In addition, students in the program liked to be challenged and they were, for the most part, ready and eager to participate in the competition. Nonetheless, they felt a huge amount of pressure to succeed not only for themselves but also for their club and university. These expectations, whether self-imposed or not, may point to how engineering students are expected to behave when dealing with emotional pressure, as if this is what is expected of them as professional engineers. In addition, by keeping students engaged in the "student state," these students have little time do anything else but focus on projects, tests, assignments in class and projects out of class—all which demand a huge amount of time.

   Conclusion. In a culture of sameness, students in the civil engineering discipline are pressured to perform at a high and demanding level as if in preparation for a similar expectation as professional engineers. Students do not have much wiggle room other than to stay engaged and remain in their "student state" where they dutifully go along and do not question. In other disciplines outside of engineering, students may have fewer demands on their time and energy, and this "extra" time allows them to explore identities outside of the "student" state as they began to transform into adults. In contrast, civil engineering students do not have the luxury to explore identities other than the identity of becoming a professional. This professional identity becomes the central way for students to relate and engage with the profession, which has an effect to flatten identity. Through a high demanding program, they are trained to focus on values of positivism, meritocracy, and personal productivity—which will prepare them for the professional context adhering to the same values.

Flattening identity seems to make a students' "home identity" irrelevant; only being professional is truly valued. Female students of color who have a strong familial and connection to their "tight-knit" communities suffer the most from this flattening of identity. They have to bear the weight expected of them while separating themselves from their "home identity." They also have no time or little time to explore alternative identities that college students outside a professional degree are able to do. Being in a perpetual "student state" forces these female students to accept and live the values and norms of the dominant culture—one that values being professional (or downplaying emotions), positivism, personal productivity, and meritocracy. Flattening identity is the price of professionalization of students who are unable to explore and experiment alternative identities in the safe context of college. They also must separate from their "home identities" that connect them to place and security.

Chapter 6: Explaining Intervening Conditions in Maintaining a Culture of Sameness

"Dear, dear! How queer everything is today! And yesterday things went on just as usual. I wonder if I've been changed in the night? Let me think: was I the same when I got up this morning? I almost think I can remember feeling a little different. But if I'm not the same, the next question is 'Who in the world am I?' Ah, that's the great puzzle!" (Carol, 2013, Chapter 1, para. 3)

Introduction: Defining Knowledge Capital and Social Capital

I begin this chapter reflecting on the meaning of solving a great puzzle. Solving a puzzle requires a certain wherewithal to see connections and use past and present knowledge to figure it out. During my observations, I often asked myself what is going on here? Why are some students more visible or vocal than other students? For example, when I observed the lecture-based class I anecdotally discovered that white male students tended to blurt out answers to the instructor's instructional prompts more frequently than female students, students of color, and international students. This seemingly benign observation made me question if equality, which was a distinct espoused value in the culture, was really happening. So I took out my field notes and began counting how many times and which students blurted out answers, how often instructors called students by name, how often and which students asked questions or made comments.

After looking at the data, what I found was this. The proportion of males to females was roughly 81% to 19%. Female students were interacting (by frequency) approximately 15% of the total interactions. So if relative proportion means equal (or *the same*), then this proportion in the context of the total male to female ratio seemed *fairly*

reasonable although I could surmise that male students *appeared to be* more vocal and interactive than female students overall. However when I drilled into the data a little deeper, I discovered that only four out of the twelve female students contributed (by frequency) more often and in greater volume than the other female students (who were relatively quiet). In addition, the instructor called on the **same four** females by name. However, the males that the instructor called on by name greatly varied—in other words, the males he called on by name seemed like they were selected at random. In addition, the instructor rarely called on international students (Kuwati, Arab, and Chinese students) by name—unless the international student actively held up his/her hand. That was a really interesting finding for me. In addition, white male students often blurted out answers and asked questions about the problems, and the instructor seemed to follow-up/follow-through more with the problems when white male students were called upon. Non-white/international male students, however, rarely blurted out answers or asked questions.

In contrast, female students tended to ask more procedural questions (what is on the exam, can we use a cheat sheet for exam, when is "X" due, and so forth) and informed questions about the problems but tended not to blurt out answers very often. Of the four female students who were more vocal/interactive, one female student began contributing more once she was finally called by name by the instructor (and in subsequent class sessions she became more vocal and interacted more with the instructor).   At one point midway through semester, the instructor out of the blue said, "I feel like I am always calling on the same people. Who haven't I picked on (yet)?" He looked at this one female student, "Vickie (not her real name), have I called on you (implying "before")? She

answered, "No." He responded, "Okay, Vickie" (giving her the go ahead to ask the question). She followed up by asking a very relevant question/insight to the problem on the board. The instructor then continued to process the problem asking her to contribute along the way. It was completely amazing! From that point she became one of the more vocal female students in the class. Looking at the observational data (descriptively and somewhat quantitatively), I began to speculate that *having knowledge capital* (related to social capital) might have something to do with what I saw and analyzed (Bourdieu, 1986; Coleman, 1988).

Bourdieu and Coleman came from two different theoretical viewpoints when looking at how social capital operates inside the educational context (Dika & Singh, 2002). Social capital for Bourdieu (1986) related to the idea of individuals having preexisting social connections because of birth or by subsequent association—which served to differentiate individuals or groups of individuals. Bourdieu believed that, like economic capital, having sizable social capital at the onset (like social class tied to birth, for example)—much like an initial large economic investment—leads to much greater profits for the individual. In other words, as a result of your belonging to a certain social class, you are privy to a network of people and relations that set you up differently than individuals who do not have those same social connections. Also this "capital" is determined by one's adherence to the dominant values inside the existing culture (Bourdieu, 1986; Dika & Singh, 2002). In other words, the dominant context subtly and not so subtly determines the acceptable forms of ways of acting, being, and seeing. Social capital thus serves as a way to reify the positions, norms, and mores of the dominant culture. In an educational context, the dominant position inside a culture might

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be supported by educational practices that adhere to this dominant position. For example, if individualism is a supported value of the educational context then educational practices will be modeled and enacted in ways to support this value. Students might be expected to be competitive, to work on their own merits, to separate themselves from others (or others' merits), and so forth. In contrast, in an educational culture or context that supports more cooperative values, students might be expected to work together towards more synergistic aims outside of individual accomplishments. Students might be expected to use their individual differences tied to their multiplicities of identities to help inform the larger aim of the educational goal. Regardless of whether the values are based in individualism or cooperation, social capital has a more rigid connection to whatever values are supported by the dominant context (Bourdieu, 1986; Dika & Singh, 2002). In this case, social capital is more static and not easily changed. For Bourdieu (1986), social capital was more fixed to one's social status tied to birth circumstances, gender identity, ethnicity, socioeconomic status, and so forth.

Coleman (1988), on the other hand, viewed social capital in terms of a possession of capital (much like money or durable goods). To Coleman, social capital—like an acquired skill—in the educational setting functioned to help students navigate the context better. For instance, if students (or students' parents) could access and understand certain ways of acting, being, and seeing then they, too, would be privy to access the golden carrots of education. In other words, birth circumstance, gender identity, ethnicity, socioeconomic status had less certainty on the educational outcome. The implication here is that as long as students learned "the rules of the game" then they too could be successful (despite their birth circumstance, gender identity, ethnicity, and socioeconomic

status). Social capital in this sense is more fluid and could be changed by participants inside the culture. The implication here is that students could tap into resources and ways of being, acting, and seeing to be successful in the dominant context. This functional view of fluid social capital tied to educational attainment in essence serves as a means to an end toward adherence inside the dominant context.

The observational vignette I described above points to both of these perspectives on social capital. Students were coming to the context with what seemed to me to be either fixed or fluid social capital. From my observations, white male students seemed to arrive to the context already having fixed capital and this capital was less variable to "market fluctuations." In other words, male students did not have to prove themselves on the offset and they could make social mistakes without being penalized. They could essentially be themselves without any fear of social repercussions. On the other hand, female students and students of color were more intentional in their ways of acting, being, knowing, and seeing. They had to prove themselves by separating themselves from other students. They had to "put themselves" out there in order to be seen. They had to be confident in their knowledge and what they knew to be seen as capable. Until they found this confidence, they sat quietly in their seats. Making an error in public or on a test would affect how they would be seen within the dominant context. Their social capital would be affected negatively and were marked by "market fluctuations." Using both Bourdieu's perspective on fixed social capital and Coleman's perspective on fluid social capital, I surmised that both fixed and fluid capital served to maintain the dominant perspective. White male students (and some international male students) arrived with fixed social capital because of their already known social status. They would be less

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likely to be questioned for coming to the context. Female students and students of color were arriving to context with fluid social capital because of their unknown social status. They would be more likely questioned for arriving to the context.

While Bourdieu (1986) and Coleman (1988) both point to social capital as affecting one's social position inside the dominant context, they were less direct in explaining how "knowledge" and "knowing-ness" impacted students' connection and subsequent success inside the context. Based on my observations, knowledge (pre-existing, ordained, acquired, or earned), or *knowledge capital*, impacted how students were perceived as they entered the context. White male students seem to come to context with pre-existing or ordained knowledge and did not need to prove one way or the other whether they had it or not. They seemed to benefit by grand narratives, which endorsed that "(white) males are naturally better at math." Female students and students of color seemed to come with acquired knowledge because of what they studied in high school. They needed to prove themselves time and time again. They had to earn knowledge capital through their mastery of content and by separating themselves from other students of their gender or ethnicity.

Knowledge capital, which is connected to but slightly different than social capital, in the classroom context seems to consist of two main conditions:

1) The comfort a student has with his/her knowledge in the classroom; and

2) The comfort the instructor or classmates has about student's knowledge and "knowingness".

In this sense, female students and students of color who knew what was going on, knew what questions to ask in order to interact, understood the content mostly and felt

confident in that knowledge, and had a similar status as their male counterparts in order to be called on by name in class became the more vocal females in class.

In my observation, Vickie's transformation in the above vignette made me stop to reflect. At that point, I conjectured that knowledge capital is fluid and could change over the course of semester. When I began my classroom observations about three weeks into the semester, three of the twelve female students seemed to be using their knowledge capital very effectively (except for one female student of color who tended to ask procedural questions about the class; only a few times had I noticed that she commented on the problem being discussed). What I mean by effectively is that these three females were interacting as much or—if not more—as the white male students in the class who overall blurted out answers, asked frequent questions, and were called on by name by the instructor.

To me, it seemed that white males already *had/owned knowledge capital* at the get go; they didn't need to prove their knowledge or understanding because it was tacitly assumed that they already had it before starting the class. In addition, it seemed that female students had to *earn their knowledge capital* as they continued class. In other words, they had to first feel confident enough about their comprehension of the material before they felt comfortable enough to interact in the class. Also, it helped if the female students knew the instructor in advance so that they, too, could be called by name. Instructors might feel safe to call on females they know in advance. Instructors then might intentionally avoid putting unprepared females on the spot. Female students then might avoid being embarrassed in class. This seemingly benign and helpful gesture by the male instructor, however, seemed to differentiate these female students from the male

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students in the class. At least to me, it seemed the instructor called on males regardless if they might be put on the spot or not. He didn't feel the need to protect a male student, who just might not be prepared (and I observed this lack of preparation by males on several occasions). Nonetheless, being called on by name in class by the instructor seemed to differentiate which students had an elevated social status in the class. I wondered if male students of color also had to earn their knowledge capital.

Surprisingly, in the teams-based class, female students seemed to be called on by name just as frequently as—if not more than—male students in the class (at least proportionally). The instructor called on everyone and put mostly everyone on the spot (except for the quieter "nerd" type of male student and international students)! Every student had to display a name tent card (a piece of cardboard folded in half lengthwise with their name on it, which could then be placed in front of them like a tent). Any student who forgot to display their name tent at the beginning of class received a warning from the instructor, "Are you in my class?" The students, heeding the warning, would then promptly get out their name card to display it. I interpreted this name card ritual to mean the instructor's intention to fairly call on all students by name. For the exception of Rebecca and Jesse, who he targeted more regularly, and the few "nerd" type of students and international students, who he targeted least or not at all, students across the board seemed to be called on more or less equally. Reflecting on what might be happening, I conjectured that students who had both social and knowledge had the social status in class to be called on, as if by random, in class. The female students, who had already proven themselves socially and academically and were seniors to prove it, started the

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class having both social and knowledge capital. They didn't have to earn knowledge capital like the junior-level female students in the lecture-style class.

Borrowing from Coleman's (1988) more functional view of social capital, knowledge capital does differentiate individuals and groups of individuals in maintaining the dominant context. For example, students who are good at networking and forging relationships (personal and professional)—in spite of their birth circumstances—as a form of social capital are able to separate themselves from other students (for example, nerdy male students or international students) who don't have it or haven't earned it. Female students, who have both social and knowledge capital in effect, have learned how to navigate in order to persist and be successful as future engineering professionals as is described in one interview excerpt:

> **Staff member** (in response to question why female students persist in engineering): Um, I'd say for the same reasons that the male students do but it's a little bit magnified because it's even a more unique—I mean getting an engineering degree sets you apart from everyone else, and if you're female doing it sets you apart even more. And I would say because they can. If you are good at science and math and you like that, um, you are not going to give up on that just because you come into a couple of, you know, roadblocks. And I think they persist because they're good at it. I think that they are not intimidated by issues that they may face in life in that profession. I think going through 4 or 5 whatever years of college in a male-dominated major helps them prepare for being in a male-dominated profession. And I think that if you're successful as a student you are just going to keep at it—and be successful.

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In other words, what female students know and how they use their knowledge matters especially in adhering to the dominant context.

So from a critical standpoint, why would there be differences between males' and females' knowledge and social capital in a culture of sameness? Knowledge capital is indirectly tied to meritocracy by focusing on individual's achievements and performances. What is perhaps troubling—at least to me—is that males (usually white males or Asian/Asian American males) already are assumed to have the pre-requisite knowledge and expertise to be in the engineering program. They don't have to prove that they are capable. They don't have to second-guess their ability to be in the program. As a result, their instructors, who recognize their knowledge capital unquestionably, call on these students at the start. Instructors do not know whether female students or students of color have the existing knowledge, and perhaps intentionally do not call on these students to avoid putting these students on the spot.

Female students and students of color, who are not as comfortable inside the context because of their seeming outsider status, might feel they have to prove their worth and their expertise. So, they might either come up with navigational strategies (such as talking to instructor after class or during office hours, going to recitations, going to Supplemental Instruction, and so forth) to help them gain status with their instructors, or they might choose to stay relatively quiet (and then never to be called on in class). Being quiet, however, means that they will remain relatively incognito in the class and subsequent classes. Being quiet also means they won't make mistakes in public, which might jeopardize how they are viewed by others (the members of the dominant context). It seems, then, that knowledge capital of members outside the dominant context is more

fluid (i.e., can rise and fall) compared to the knowledge capital of members of the dominant context, which seems to be more constant and less variable to knowledge fluctuations. In other words, getting an answer wrong publicly or doing poorly on exams can be damaging to a student who is not part of the dominant context because they will lose knowledge capital. A student from the dominant context who gets an answer wrong publicly or does poorly on an exam simply doesn't cause the students' knowledge capital to fluctuate. What I noticed, however, is that females who put themselves "out there" (perhaps because they instigated early on the aforementioned navigational strategies) quickly become respected by members of the dominant context, like Anne (described in Chapter 5). In this sense, these female students' knowledge capital becomes less variable—like their white male counterparts. They then become the students that all students turn to. Also, the longer female students and students of color remain in the program the less variable their knowledge capital became. They had already proven that they were capable, and their senior status was proof of their fixed knowledge capital.

In line with the modified Grounded Theory Paradigm Model, I will further show how knowledge and social capital serve as the intervening conditions for students' ability to successfully navigate inside a culture/context of sameness. Students either had knowledge and social capital at the start or they earned them, either by exposure or by increasing their insider knowledge. These forms of knowledge and social capital were invaluable to students as they navigated the discipline leading to greater earned capital; these emergent forms of knowledge capital will be explored next.

Forms of Knowledge Capital in a Culture of Sameness

Introduction. In this chapter's introduction, I examine how students *having knowledge capital* helps these students become more visible by their instructors. *Knowledge capital* (or "the comfort a student has with his/her knowledge in the classroom" and "the comfort the instructor or classmates has about student's knowledge and 'knowingness'") and in line with Coleman's more functional view of social capital was a way for female students and students of color to successfully navigate the dominant classroom context in spite of potential individual or group differences. Students in the engineering classroom context either earned knowledge capital or had it from the start. Regardless, this knowledge capital allowed them to successfully navigate the engineering classroom. From the data, I was able to identify four emergent forms of knowledge capital. These were:

- Prior Experience/Knowledge (college preparedness, content preparedness)
- Knowing where to get help (SI, tutoring, [name of multicultural student program]) to succeed academically
- Knowing the rules of the classroom/ environment
- Learning the rules of the game

I will examine each of these forms separately as connected to the data.

Prior experience/knowledge (college preparedness, content preparedness). In addition to math and science skills that were a prerequisite for choosing and staying in engineering (as explained in Chapter 4), female students had to be exposed early in their K-12 education to math and science, and particularly about the field of engineering. Also recall, adult mentors in high school guided both female students and male students of color in choosing engineering. One staff member had this to say about preparing

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female students for a possible profession as an engineer by reflecting on her own experience of not hearing about engineering when she was a youth:

> **Staff member:** I think that it is imperative that science education and engineering education get started in the elementary school because that's planting the seeds to girls, especially "Hey you can do this." I never even heard of engineering is a major until probably I got through college. But I think I had known about it in high school and even had a teacher who was willing to show me just some basic engineering, I think I would have been an engineer…But I think it is imperative that—that seed must get planted much earlier…So I think there should be a very strong, strong relationship between engineering departments and local high schools, or even actually local elementary schools…But that stuff really needs to happen in fourth grade...It needs to happen earlier than junior high.

Another staff member thought it was important to cultivate this awareness through scholarships and grants that promote female students to the engineering discipline, while at the same time female students need to resist stereotypes about females not being capable in math and science.

> **Staff member 2:** I think there's been more emphasis in the STEM majors—more funding, grants, scholarships, that kind of thing. Maybe, you know, an awareness that there is not a lot of women in the field—so people are really trying to promote that more toward women and girls. Um—getting away from the stereotype that girls are not good in math and that kind of thing.

Prior knowledge about engineering and/or having prior math and science expertise helped female students and students of color have confidence before they started the engineering

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discipline. Their exposure to a variety of math and science courses prior to college allowed them to willingly move into the discipline. When they arrived at college, they, at times, questioned their abilities and knowledge of math and physics, in particular. They had to push through classes where they would get Cs, or they would have to be okay about re-taking classes when they got less than a C. While their prior experience helped them to feel confident in at least pursuing the degree, they at times felt less confident in their abilities when they received non-passing grades in a class. Rather than taking the grade personally, however, they chose to ignore what the letter grade meant. They no longer pined for a great GPA but rather focused on getting by. This was a critical knowledge point for these students pushing through to their junior and senior years as engineering students.

Knowing where to get help. In the data, female students and students of color knew how to find the help to succeed academically. To recall in Chapter 4, Jasmine attributed much of her success to organized tutoring sponsored throught the [name of multicultural student program], tutoring, and Supplemental Instruction (SI). Adrian, Matthew, Madison, and Rebecca also attributed their academic success for getting support in these programs along with [name of out-of-state student mentoring program], Student Support Services, Learning Community support programs, and so forth. Knowing where to get help was vital as they navigated through difficult academic passages. They regularly spent extra time outside of class simply to keep up with the content of the class. Part of succeeding in the program meant that they had to accrue new and better ways of understanding. These additional programs outside their classes helped them get there.

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Knowing the rules of the classroom/ environment. In addition to formal programs to help students achieve academically and prior knowledge, female students and students of color who navigated more easily inside their engineering discpline communicated with their instructors and participated more in class because these strategies helped them build more knowledge capital. These two areas will be explored next.

Communicating with instructor(s). Students who got to know their instructors via office hours and participated in student organizations were able to better understand the rules of the classroom environment. By students going to instructors' office hours, students knew what to study, what to focus on, and how to move through the program. It also helped them make a connection to the instructor so that the instructor knew who they were and could relate to them on a more personal level. This personal connection to instructors helped these students build greater knowledge capital to help them negotiate more successfully. For instance, female students who made this connection could express personal troubles with their instructors without jeopoardizing their social standing, as Sarah conveyed:

> **Sarah:** I was able to go to their office hours and have a conversation and not feel
> I was falling behind for some reason.

Like Sarah, Matthew encouraged freshmen to go to office hours to get to know their instructors, especially when they had questions about the content. He emphasized how instructors could help students down the road (with graduate school for instance). Knowing the instructor was a pivitol strategy in being noticed and supported by these instructors, as Matthew described in the following excerpt:

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> **Matthew:** I would tell freshmen to—when your teachers say come to the office hours go to the office hours if you have questions…And just trying to encourage them to join [name of student organization] because it is really beneficial. You do get to network—you do get to talk to the teachers that you are going to have the next 3-4 years or however long you are going to be here. If you decide to go to grad school, you are going to have the same teachers—it is a great opportunity to just network with your teachers, professionals, other students, and everything—just to get them involve in this community.

In conclusion, communicating with instructors was a pivotal strategy for female students and students of color knowing instructors, which helped them to earn knowledge capital and to help them navigate the discipline more successfully. Their visibility to their instructors differentiated them from other students, who did not use this naviagational strategy. Female students and students of color who made a persoanl connection with their instructors knew they could talk to their instructors about strategies for the class as well as future prospects such as graduate school.

Participating in class. As referred to in the introduction of this chapter, white male students tended to raise their hands, blurt out answers, and were called on by name more often in the classroom compared to female students, male students of color, and international students, in general. While female students did participate, they seemed to do so almost reluctanctly until they began feeling confident in their knowledge. Female students who participated in class began to receive accolades and attention from their instructor and peers. One staff member had this to say about the importance of

participating in class and out of class and implying this is a way to earn knowledge capital:

> **Staff member:** Well I can't—I can't really gauge accolades directly in the class because I'm not—I'm not there, but I would guess it would be the student who asks a lot of questions during lectures and actually prepares for the lectures—doing the pre-reading or whatever problems are assigned prior to the lecture. And I think the student who verbalizes, who gets to know us in the administrative suite, who participates, who is involved.

Students quickly learned that—through their knowledge capital—participating in class was one of the ways that helped them get noticed by instructors. These students learned quickly that being noticed through their knowledge capital helped them be recognized by their instructors. Gaining greater individual recognition was a positive way they could earn knowledge capital, which subsequently allowed them to navigate the context more successfully.

Learning the rules of the game. In addition to knowing the rules of the classroom environment and knowing how to get formal academic support, students who knew the insider rules of the game also navigated their engineering discipline more efficiently. During my interviews, there were multiple references of students cheating to become efficient (and dealing with the high volume of learning material and projects) and downgrading the value of grades (Cs get degrees), which will be explored next.

Cheating for efficiency. In a context that values individual achievements and performance, it is ironic how cheating was prevalent especially in hard-to-pass classes or high demanding classes with many assignments. Students knew they had to pass these

classes, and if they didn't pass the classes there would be roadblocks from them progressing in the degree. They also had to manage the demands with other classes. Early on, students learned via insider gossip and interactions that cheating for efficiency was one way to manage the demands of being an engineering student. Students suggested that they used solution manuals and writing answers to homework problems verbatim because they had to manage what was on their student plate. One male student (whose pseudonym I will not reveal) shared how conflicted he was about using solution manuals for problems and how he rationalized their use in order to manage the demands of being a student:

> **Male student:** I will say this—you know—we are in our classes—there is a lot of solution manuals and stuff like that—and at certain points you've got to do what you've got to do so you go to the solution manuals—I just got to get this done. And it does hurt your ethics—and how you feel about yourself "Man"—it is a bummer because—I would like to know how to do this but like there's so much homework—"I just have to get going." We do have a small element of just getting the job done, too, as much as a business majors, too, especially in this degree— there is a lot stuff we have to do. "Oh you have the solution manual, well, alright—I have to get this done"…But it is still—a thing of like—ethical responsibility. You didn't figure it out on your own.

Reluctantly, he used solution manuals because he had to "get this (the assignment) done." When students have so many demands on their time it seemed logical that they would find resources to get them through the time obstacles.

Terri also described how students wrote problems down verbatim on their "allowed" cheat sheets but they ended up not learning the material. They did this so that they could do well on their exams in order to pass the class as she put it, "they know how to work the system." She preferred classes that tested on what she was expected to learn and know and also discouraged cheating, but she knew that students worked the system in order to progress through the degree, as Terri described in the following excerpt:

> **Terri**: This class is the one class that I got a highest grade for (pointing to [name of class] textbook) because you know, he really makes you study it. I mean—the material is not too difficult—but I mean, regardless. And I think he is about understanding—he is a good teacher—he's a really good teacher. But for the really low passing classes—and it happens—I know and you know it happens— the academic dishonesty—there are students that put example problems on cheat sheets—I mean you are allowed the cheat sheets but they put example problems on there. And well…they know how to work the system—I don't want to get my degree because I know how to work the system. I want to get my degree because when I am going into the field to wherever I am going to be hired—I need to be able to perform myself, perform by myself…I wouldn't feel good putting down the example (onto cheat sheets)—because I had no idea what was going on—and the people that passed—admit that they did not know what is going on in the class—but…Then it goes back to proving yourself—if I am going to prove myself then I need to understand what is going on, what is happening.

Terri, who valued understanding, because it helped her earn more knowledge (and perhaps subsequent knowledge capital) felt uncomfortable about cheating and students

who used cheating strategies. Even though, she could have benefited by similar strategies, she chose not to because she felt it would hurt her too much in the end. In some ways, she knew how "not knowing" material could affect her knowledge capital; she had learned the value of stabilizing the fluctuations of her hard earned knowledge capital. In the end, it was better she knew the material than not know the material.

Another male student also indicated that students had to know how professors gave tests or how they graded homework to be efficient, even though it might be unethical. Getting by with the bare minimum was what you sometimes needed to do in order to manage all the demands of an engineering student. In addition he mentioned that you had to put aside your focus on learning and instead focus on the diploma (or piece of paper) otherwise you might not be able to keep up with the time demands.

> **Male student 2:** You can be that guy that studies 50 hours for every test, or a hundred hours for the tests and still get a sub-par grade or you can be that guy that does the bare minimum and end up with the same grade. So for some classes you have to do that—have to say, "I'm just going to have to do the bare minimum because I know how this professor gives their test. I know how they grade their homework. I know how they do all this. And you have to take advantage of that. And you have to be. You have to be focused on not learning—you have to be not focused on what you are here for—learning and understanding stuff. You have to say, "I am studying to the test, I am study for why I am here for, for that piece of paper—for that grade after the four years that I am here for. I guess I would say not stressing on yourself and if you know you can get a B on the bare minimum then—as bad as that sounds—you will do it. You have to take advantage of it

because you have other classes that do require that you understand stuff…it's unethical stuff—and get the best grade. But that is essentially what you have to do—classes do the bare minimum and go that extra distance to be unethical and get the grade and move on. It stinks. But there are still, um, good teachers out here that are still teaching.

Like Terri, this male student did not like using this navigational strategy—that is, cheating for efficiency—because he would rather learn the material. In the end, he succumbed because he needed to push through. He then could focus on classes where he could learn something. Nonetheless, awareness of this strategy allowed him to be seen as successful so that his knowledge capital could become more stabilized.

The students above did not necessarily like that cheating existed and would rather focus on learning the content. However, students used cheating as a strategy for passing a class and managing time demands and, therefore, to be seen as capable. Cheating as an efficiency strategy seemed to run counter to the values of meritocracy, which rewards students for their individual performance and achievements. Students who used their knowledge capital to work the system knew how to get ahead. Unfortunately, working the system rewarded students who employed unethical behaviors; students who had an ethical mindset like the students I interviewed had a difficult time dealing with cheating for efficiency, mainly because the knowledge strategy undermined the value of individual merits. In a culture that endorses meritocracy, this discrepancy indeed seemed problematic.

Cs get degrees. Engineering students also learned to downplay grades and saw grades as an obstacle for getting through the program. To many students, grades did not

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necessarily reflect their learning. When Madison stated "Cs get degrees" (in the following excerpt) she no longer valued the meaning of grades. If she paid attention to grades, she would be too stressed and would not be able to push through. Personally she didn't like Cs but she has learned not to pay attention to them. In the end the grade in the class was not important but learning the material was, as Madison described in the following excerpt:

> **Madison:** I think it used to be more important—like in the—I have never been a straight A student—I am more of a B student—you definitely see at the beginning of college—the people who are A students—straight As—and you want that for yourself and you are kind of like not getting straight As —then as college goes on— a lot of are like Cs get degrees. Of course, we don't want Cs —but there are a few classes where I got a C and I am good….I mean I guess when I know I am just putting in a lot of time—and minimal sleep and not going out—and I am getting Bs and Cs—at a certain point you can't stress it—I feel like I always try to fix my grades and bring them up but I try not to look back too much— because it will make you crazy. Yeah—I don't know. I don't like Cs because they bring down your GPA too much—but I have definitely had classes where I have learned a lot—I worked really hard and I got a C. So it's like where does that leave you?...My classes that I have gotten Cs in—I don't feel like "Oh, I didn't learn enough. I feel like I learned a lot.

As I indicated earlier, students had to stop thinking Cs reflected what they knew. They couldn't take the C personally otherwise they might quit the program. They learned to accept Cs as part of their progression in the program. In a culture that demands

perfection or near perfection, Cs did not seem like an acceptable grade. However, students quickly learned that grades really didn't matter. As long as you the student passed (with a C) then you could move forward. They began to place less value on class grades. Some chose to focus on learning despite the grade granted. Other students simply focused on getting by.

Like Madison, Sarah also rationalized to herself about being okay with getting C's (instead of failing). She had to lower her expectations and she stated a C "is better than re-taking it (the class)."

Sarah: So kind of knowing—we knew going into it— it was going to be time-consuming but we didn't realize how it would affect all the other classes we have to work on. And not being able to do well because we don't have time to go to office hours or we don't have time to even think about the homework, you know. So we kind of just do it, even if we don't get it right. But it definitely takes a lot of effort and a lot of nights you have to be willing not to sleep…And for some people it takes longer to learn something than others. So just try and go through all that—it definitely takes a lot of effort. And I can definitely see the difference between like being in engineering or being an art major—where you can go out all the time, you don't have homework. You know you get to do so much more and be more involved. Whereas with this, you're trying so hard just to get average grades or to get a B in a class. Or you really just want a C because you feel like you are going to fail. And your expectations are, they are lowered definitely— going in you are not going to get straight As. So just knowing you might have to

take a C in class because you might've failed. So a C is better than having to re-

take it. You definitely have to think a lot like that.

In both of these instances, students learned not to trust the meaning of a grade because grades didn't necessarily reflect what the student knew and understood. In the end, they were okay with Cs because they could still graduate with an engineering degree. So while students were expected to perform and perform well, they quickly learned that grades were not representative of what they knew; as a result, they placed less value on grades. In a larger university culture that rewards students for their high GPAs, grades inside a professional degree such as an engineering degree became less important or less valued by the student. Nonetheless, the question remains whether Cs served to differentiate students who had knowledge versus those who didn't have enough. What seemed to be occurring was that knowledge reflected by grades was less important than knowing how to work the system. In the end working the system was a pivotal strategy for students progressing through the degree, even if that meant accepting a C.

Conclusion. Students earned importance by having or earning knowledge capital and as a way to navigate the dominant cultural context. In a culture of sameness, it would seem that all students arrive to the context with the same amounts knowledge capital. However, many students sooned learned "how to work the system," which might mean cheating for efficiency and/or for getting a passing grade. In additon, students also learned that "learning" was not necessarily the goal of the class. Grades did not always reflect student learning or the effort students were expending. Students found in the end that passing the class was what really mattered to progress. Students stopped caring about learning itself and focused instead on ways to know how to work the system. This

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knowledge capital, while not favoriable to learning, allowed students to push through the program. While meritocracy rewards indivdual accomplishment and performance on an equal playing field, students were finding knowledge strategies to push through—outside of an earned grade. This reality pointed to students using their knowledge capital, whether already owned or earned, to figure out navigational strategies toward their success and persistence. They were also using their social capital to navigate the context, which will be explored next.

Forms of Social Capital in a Culture of Sameness

Introduction. In a culture of sameness, social capital served as a way for students to make social connections with others in order to facilitate their individual goals inside the dominant context. To recall in the chapter introducton, students—who either already owned social capital or had to earn social capital—tried to differentiate themselves from other students so that they could stand out and/or be noticed. Social capital then positioned their individual merits in a more favorable light—to instructors, to their peers, and to future employers. In the following interview excerpt, the staff member said while knowledge (obtained via good grades and hard work) was important and was respected, social capital was perhaps rewarded even more:

> **Staff member:** (In addition to good grades) I would think also respect from their peers…there's that image that engineers are geeks and nerds, you know, the pocket protector. I think when they can still be, you know, cool and involved in other things outside of engineering and not fit that classic role—I think that's rewarding them, too—to not be labeled as an engineer but to still be one…I think—at least myself I felt as a female engineer—I had a little bit of that kudos

because you are up against a little bit more challenge, um, and I don't know that the females in engineering are necessarily considered, um, nerdy but maybe their equivalent battle is that females in that, in that major, in that career, are considered "bossy." I think I was once told, what was it, that I was basically the only female in an engineering meeting. And I was, ya know, I was not chiming in more than anybody else, but I was there to, you know, to do my role, and I think I was told by someone later on down after he got to know me that I was a "pushy broad"—that was the term. So maybe that is a female in that profession's in that major's burden is to not be seen as too "male"(laughter) and "too pushy".

Good students who were not the "stereotypical nerd" or were not "labeled as an engineer but still be one" were the ones that were "cool." Note that she made an additional interesting point of distinguishing male social capital from female social capital. Females who used their social influence were seen as "pushy broads" even though she, as an engineer at the time, was acting like everyone else (or the rest of the males). This revelation suggested that there was a social capital distinction along the male/female binary. It points to how there were possibly differences between how males and females could use their social capital inside the dominant context.

In this section, I will be looking at two main forms of social capital that helped female students and students of color navigate more successfully in their civil engineering discipline. They are:

1. Networking (with students, faculty members, professional clubs), and

2. Negotiating with their border identities.

These will be explored separately along with data to support these findings.

Networking (with students, faculty members, professional clubs). As data examples show in Chapters 4 and 5, networking is an important navigational strategy for female students and students of color to earn social capital leading to an elevated social status. Students networked to get to know their instructors, future employers, and peers. For the most part, students were joining a professional civil engineering club as their main networking venue. This helped them cultivate connections that they would otherwise not have. For instance, Jasmine felt the club expanded and solidified her peer connections and exposed her to a variety of people, as described in the following excerpt:

> **Jasmine:** [Name of student club]. That club has really— I joined last year—and I love it. That's how I met a lot of people through that program. Being able to go to the conference, too, which is what we are making the [name of project 2] for—So that conference is really—it really is intense. But you get so much closer that I go with. In a way it is supportive because you get to network with everybody and talk to everybody. That's my main support, too. And that is where friends come into play, too.

Like Jasmine, Rebecca found that networking in the student club helped her prepare for her future as a professional engineer, as decribed in the following excerpt:

> **Rebecca:** I think it helps with networking—I know I talked to my—I don't just talk to my teachers about stuff—we talk about the future and what I am interested in and where I would like to go.

Rebecca knew the importance of talking to her teachers to help her know how to proceed with the future. This navigational stategy of using social capital was pivotal to her success at school and future success as an engineer.

Sarah believed joining the student engineering club was one of the most important things she did. She not only made friends but was able to get advice from older students on how to approach teachers and which classes to take. She also found an invaluble connection to instructors who could relate to her on a more personal level and understand her overall work ethic. This personal connection would allow her to "have a conversation" when she was falling behind and renogotiate a schedule that would work for her, as seen in the following interview excerpt:

Sarah: I think one of the most important things that I did it was that I joined [acronym for student club] which is the [Name of student club] on campus. So my freshman year I met a lot of seniors that were in the leadership team, and I was able to make a lot of friends through that and a lot of connections. And I think that's really what helped me through is having people help me understand what I am supposed to be doing because you don't really know how at that point. So it was really important to make friends and groups—make sure that I'm friends with older students that have already gone through the class and get their insight. How a teacher teaches and kind of getting all the little tidbits that would help me out. So that was really important and I think establishing a relationship with my professors was also really important….So I did that and I was able to go to their office hours and have a conversation and not feel I was falling behind for some reason. So I think that really helped a lot because there were times where if I did do poorly they would already know what kind of student I am. So we would have a discussion of something going wrong or what is going on in my outside life. So

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I feel like they got a better understanding of how I was as a student and it helped me a lot.

Sarah felt that making social connections allowed her to negotiate better, especially when she was having academic troubles. Her ability to effectively use her social capital, which was earned through networking, was invaluable to her approaching instructors in the program.

Matthew also found great value joining a student club. He was able to get to know instructors on a personal level, which might help him get into graduate school. In addition, he enjoyed socially his experience in the engineering student club because it helped cultivate a sense of community, which was helpful when he spent so much time in the engineering building and it became "a second home." Below is how Matthew described the value of networking:

Matthew: I would encourage them to join the [name of student club]. I know it is a hard thing to do as a freshman. I joined my spring semester—because we had to have professional development points for a CAD class. So I just got to know the president—and you have to go to conferences. And it was a lot of fun. I would say to get more involved…You do get to network—you do get to talk to the teachers that you are going to have the next 3-4 years—however, as long you are going to be here. If you decide to go to grad school, you are going to have the same teachers—it is a great opportunity to just network with your teachers, professionals, other students—and everything—just to get them involved in this community.

Matthew, perhaps indirectly, knew the importance of using social capital to position himself more favorably wth his instructors (so they would know him and be able to write a recommendation for him).

To conclude, these female students and students of color greatly benefitted by networking. Networking provided the fertile ground for these students to earn social capital, which in turn allowed them to negotatiate their individual identities within the discipline in a more favorable light. They were seen as valued members by their instructors and peers as a result.

Negotiating with border identities. Border crossing, a post-structural view about pedagogy and schooling coined by Henry Giroux (1992) and further explained in Chapter 2, is a way to examine the interconnections between the dominant culture and students who may not inherently identify with the language, traditions, values, beliefs, and ways of the dominant culture. Students who identify and live outside/beyond the dominant perspective see contradictory aspects of the dominant culture, which are not necessarily seen by those who were born into the dominant culture. Contradictions are events or phenomena that seem inconsistent by at least one participant or a number of participants inside the culture or context. For example, a student might notice an inconsistency if one person gets one grade on an assignment and another student gets a different grade with a very similar or same answer. They might begin to question why they received a different score and entertain answers such as "well, it's because I am a girl, I am smarter, I am a favorite, the instructor doesn't like me, or the instructor made a mistake." In other words, the participant begins to question why she/he received an inconsistent score or was treated differently than someone else from the same context.

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These students see the contradictions and—because they see them—they are able to navigate the dominant culture by either engaging with culture "as is" or challenging the culture. Border crossing can be a powerful way to engage in agency, but it is not always the preferred route. deMarrais and LeCompte (1999) explain agency as follows: "Critical theorists refer to active involvement by participants as human agency and believe that despite the influence of oppressive reproductive forces, hope for transformation of society is maintained because of the existence of agency" (p. 25). In other words, students who engage with their own agency take charge of their actions and behaviors that help expose and hopefully transform the dominant context. For instance, they might actively examine why a group of students are getting favorable treatment or better grades for no apparent reason, and then they will try to do something about it if they perceive that this treatment is unjust.

Students with border identities might notice the contradictions but they might not do anything about them. They sort of—if you will—accept the culture along with its contradictions and learn how to push through the contradictory experiences. This latter point seems to support what I found in the civil engineering context for this study. Female students of color who had multiple identities affiliated with their ethnicity, their gender, and their "home" identity (see Chapter 3) at times saw these contradictions within the civil engineering context, although they did not use their agency per se to change the cultural context. What they were able to do, however, was to use this social capital to navigate the context more effectively using interactional strategies to help them push through the contradictions (this will be explained in greater detail in Chapter 7). In other

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words, they discovered strategies to deal with the contradictions they saw, experienced, and/or knew so that they could persist in the culture "as is."

The following three excerpts by three female students of color all showed how they used their border knowledge capital to discover the contradictory elements of the dominant culture. For instance, Sarah had a particularly difficult time, at first, entering college as an engineering student. She felt so culturally different—identifying more closely with her "home" identity. She initially felt alone until she befriended other students of color who, while ethnically different, could relate to what she was experiencing. Together these female students of color were able to get through and provide each other with social support. Nonetheless she felt pressure to work harder than the rest of the students (from the dominant culture) because she had to prove to her family and community that she could persist and thrive inside the dominant culture. At times, I felt sad about Sarah's story because she had to disconnect from her "home" identity and prove herself even more via her efforts so that she could thrive inside the dominant context. Here is an excerpt that represents Sarah's border knowledge, which helped her push through but also caused grief as she began embracing her professional identity as a future civil engineer:

> **Sarah:** I think it is just the way that I—I am not even sure how to say it—I just felt like it was the way I was kind of perceived, I guess—versus at home I didn't really have to worry about anything because everyone was just like me. Here it was different because now I was the one that was out of my element—where everyone else was really comfortable, I wasn't. And I didn't know anyone—and just trying to make friends, and things like that was a little bit different. And even

the friends that I have now, they're all mostly minorities. So I am friends with all the [students of color] in Civil Engineering, and they are my closest friends, because I think we could really just relate to each other a lot better. It was just different. It was the initial shock. I think it was that and being alone and not having all the friends that I have had, and trying to go through engineering. It was really difficult and not knowing what to do when I ran into a problem, I really didn't have someone to go to and say "Hey, can you help me with this?" …So I think by having that kind of background where my family, I guess, is stereotypical. Um, it was a lot of pressure for me where my family would say "Hey, we are really proud of you and really living vicariously through you, we are proud that you are going to college. Just a lot to say, "Okay, I can't disappoint everyone who would have gone to college." So just going through that I really feel that I had something to prove to show that I can do this here where everyone else couldn't do it. It was kind of more like to prove to myself—I am just trying so much harder than everyone else is. That makes me sound really bad…And it's also harder. My community is really-really close, and really, really tight knit….It (family support) does help me go forward—but at the same time it's also what is causing so much pressure. It's kind of like counteractive. I don't know?

While Sarah used her border knowledge to push through her engineering studies by finding a supportive social system, she felt social pressure to not only adhere to the ways, beliefs, and values of the engineering culture but to still connect and adhere with her "home" identity. The two cultural contexts were at odds, and she felt emotional

dissonance as a result. Rather than dwelling in the dissonance, however, she embraced her new social support to help her push through.

In my interview with Terri, I found two interesting insights about Terri's border identity as a female and as student from a different cultural background relating to non-white international students. Identifying with her female identity, Terri talked about how males joked with female students about getting As because they "have boobs." She regularly had to justify to male students why she received an A (which was related to her effort and not her boobs). She also spoke about how female students, who dressed more femininely or sexually, could make male instructors uncomfortable; as a result, she tried to minimize this discomfort by dressing more "respectfully" (androgynously). In other words, she was diminishing her femininity in order to accommodate the more masculine/male culture in order to be respectful, as is characterized in the following excerpt:

Terri: I have never—there is a joke—yeah, got an A because you have boobs. There's a couple of girls that embrace that make jokes about that too. But I really tried in the class—you know—that was the class that I did a notebook for—I put forth my effort and that was, "You just got a—(an A because I was female)." "No, I was in engineering like 3:00 o'clock in the morning. I earned my grade...I try very hard to be respectful of the teacher because—I hear from—I understand how it is on the other side; I am sure it is not easy to be around girls especially the way that they dress. If I am going to a teacher's office hours, I try to be respectful— upmost respectful—and as far as race. There is definitely—there are guys who are sexist or racist and sexist and racist—and you know.

Accommodating to what was expected in the dominant context was how Terri decided to use her social capital. She chose to dress more modestly and androgynously in order to be perceived more neutrally. However, she knew females used their femininity to position themselves more favorably with their male instructors. She wasn't comfortable with this navigational approach herself.

Also identifying with her border identity, Terri knew there were racist and sexist males in the program but she was also sensitive to how international male students, who might outrightly be perceived as sexist, were perceived in the program. Because of her border identity, she was able to see how the students were being unjustly perceived. For example, she successfully argued with other white female students who believed that all Middle Eastern male students were disrespectful towards women. Terri countered that Middle Eastern male students had always been respectful towards her (although could still be annoying, "but that's because they are guys") as shown in the following excerpt:

Terri: As far as race, there is definitely—there are guys who are sexist or racist and sexist and racist—and you know….I think it depends on the area they are from… I think with all stereotypes, something had to happen for someone to make a stereotype. Well, no—but. Like with the Arab students—yes, a lot of them douse themselves in cologne. A lot stink like cigarette smoke, but I mean—but you know—I have known girls that can't stand them because of their culture, but then okay, "What is their culture?" "They don't respect women." "Hmmm.Well. Hmmm. I don't know because I know an Arab is going to be more willing to open a door for me than an Asian"—but again that would be stereotyping because plenty of Asians having opened the door for me. I am just saying like—a race

perspective—how people perceive just because of what they think they know. Arabs in general—I have never interacted any of the Arab students—with any of the Arab male students that have been disrespectful to me. All the ones I have interacted with are gentlemen. Yeah—they get annoying—but that's because they are guys.

Using her border social capital, Terri was able to see the subtleties of context that wrongly ascribed how Middle Eastern male students appeared to be when, in fact, it was not really the case.

Rebecca also used her border social capital in a more engaging way inside the engineering cultural context. The last excerpt in this section shows how Rebecca used her own agency and border knowledge to reveal contradictions within the classroom. This particular male instructor wanted students to answer questions, but he at times humilated the students when they gave a wrong answer. Feeling confident with her border identity, Rebecca confronted the instructor to show how this humilation was not conducive to students participating in class, as seen in the following excerpt:

Rebecca: I remember my sophomore year we had a teacher who asked a question and this is where it is kind of like—we don't know if we are right or wrong, we are just not going to say anything. We don't know how the teacher is going to respond. And the teacher was like, "Oh no, you are wrong!" I was just like, "Wow! So that is why no one asks questions!" And I was thinking about it, Did I really say that out loud?" And he said, "Do you really think that?" "I really do. It is really discouraging for somebody like 'Oh, that is because you think you understand it. But, oops, you are wrong. Like wow, in front of the entire class, too.

So I—he was like, "Well, I will take that into consideration"…Yeah, everybody was like, "Wow, he is really taking that into consideration"…We talked about it—and he was kind of like, "Wow, I didn't know anybody felt like that." (she replied) "Do you think I need to say anything else, because I can."

Me: Do you feel that because of your identity—and how you align—that maybe you were able to be heard—if somebody else brought it, he would have just— peesh (dismissed) it?

Rebecca: Yes, I think after I have said a few things in some classes—some students are kind of like "Oh, well, it is okay she can do it—so I can do it." Regardless of saying because she is [a person of color] or she is a female. But someone else is doing it—so I can, too. So if someone is learning then that is cool.

Rebecca used here border social capital to actively confront the instructor who was not being very respectful towards the students. She actively engaged with him, and as a result he was receptive to being called out. Even though her border identity, to me, did help her to recognize what was going on, she still attributed the confrontation to her personality—not her identity as a female or person of color. She attributed her personality alone for why she was able to engage with the instructor and then become a role model for other students. While Rebecca's agency gave me hope, it also pointed to the culture of sameness, which validates the individual alone without pointing to agency related to identity.

Conclusion. Knowledge and social capital helped female students and students of color to gain insights and strategies to navigate the dominant culture. Students who

had prior technical knowledge, knew where to get help, and knew and learned the rules of the classroom environment—as part of their earned knowledge capital—were able to use push through and persist in the civil engineering program. These students could arrive with the context already owning knowledge capital because of their prior exposure to math and science, but they could also earn it. Female students and students of color seemed to earn knowledge capital while white male students seemed to come into the context already having it (and so these male students did not need to focus on earning it while they are in the program). Male students' knowledge capital was less fluid— meaning it would not change much over time. If they did poorly on an exam or answered a wrong answer in class, they still could keep their existing social status.

Female students' knowledge capital, however, was more fluid—where they could earn it and lose it quickly; they had to keep proving to themselves and their instructors that they were capable of being in the program. As females' knowledge capital increased and became more certain, instructors and peers began to notice a few "more vocal" females (because these female students consistently understood the material). At this point, their knowledge capital became more fixed like their white male counterparts. In turn, these female students, like Anne, were the ones who were respected by instructors and male peers alike. They had nothing to prove at a certain point, and like their male peers they could make mistakes. They could blurt out answers just as often. They were also called on more frequently than most other students. In this light, knowledge capital had a differentiating function to separate females who have earned it versus females who didn't have it yet or enough of it yet. As an intervening condition, female students who earned more knowledge capital had greater chances to be recognized

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and be included in the learning process. They also became more respected among their male peers.

Social capital, which could be earned via networking or negotiated using border identities, was also an invaluable resource for students in civil engineering and like knowledge reifies a culture of sameness. To recall, in a culture of sameness, students were seen as individuals who were recognized or valued by their individual accomplishments. The cultural context espoused that differences (racial or gender) were not relevant, and so students proceeded as if this is the case. Students were encouraged to act in certain ways in a culture of sameness. So as long as students were self-productive, hardworking, individualistic, and professional, they would fit well inside the dominant cultural context. Anything outside of these behaviors fractured the appearance of unity. Students, as a result, had to minimize racial and/or gender identities in order to fit in a culture of sameness.

A culture of sameness—at least in the United States—really becomes an endorsement of the dominant white male perspective that has been entrenched in the engineering discipline for centuries. So as long as "the different" conform to this way of being and acting then all will go smoothly. Anyone, any approach, or any program that puts this culture of sameness into question is subject to harsh reactions, such as "Of course we are open to all individuals in this discipline. We don't see color or gender!" And so, by focusing on the individual behaviors and actions of cultural participants, values of the dominant culture are perpetuated with participants adhering to the dominant context (ways of being, acting, and behaving).

Hearing that gender or race doesn't matter, female students of color came to the context believing that this is the case. They began to believe that it was through their individual accomplishments and performance that they would be successful. In time, they might personally experience or perceive that this culture of sameness was not what it seemed. They might begin to notice contradictions; but rather than doing anything about the contradictions, they started to conform to what was expected of them. They discovered that they needed to use their knowledge capital to be noticed or to efficiently navigate the system. They also discovered that they had to connect socially as a way to personally market themselves and to help them stand out in comparison to their white male peers, female students, and students of color.

Female students of color who came into the dominant context realized the need to increase their social capital in order to become more visible. They maximized their social capital by networking and negotiating with their border identities. They began to understand what was expected of them so that they could succeed inside the dominant culture. Their border knowledge capital, which was tied to their personal experiences and their "home" identities, was at times in conflict with their identity in becoming a professional. While these students saw the contradictions and were able to address ways to successfully navigate (e.g., getting/having social support to friends like them in the program, confronting gender and international stereotypes, and confronting instructors' instructional practices), they wouldn't do anything to challenge the contradictions. Instead they found ways to conform, which meant flattening the multiplicities of their identities towards *one professional identity*. With this said, they navigated using their

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expanded social capital in order to fit into the culture of sameness where the individual

was ultimately still the focus.

Chapter 7: The Impact of Actions/Interactions in the Face of Contradictions and the Consequences of Maintaining a Culture of Sameness

"I—I hardly know, Sir, just at present—at least I know who I was when I got up this morning, but I think I must have been changed several times since then."

(Carol, 2013, Chapter 5, para. 3)

Introduction: Explaining the Interrelated Components of the Model

Changing several times is related to liminality or threshold experiences that lead us to adulthood. Traditional 18-24 year old university students attend with one identity, usually tied to their "home" identity, and leave with either an altered "home" identity or a new identity altogether. When I write about consequences of a liminal experience, I am referring to educational rituals inside the educational context or culture that produce or lead to an altered or new identity. Students who enter a professional degree program, like civil engineering, are expected to graduate as professionals for that field. Professionalization, in some ways, is an attempt to alter/change the "home" identity in an effort for students to move seamlessly into a professional culture. Professionalization of the student is, in this sense, a flattening of identity so that these newly graduated students know what to expect and how to act and react in ways similar to all the other professionals within that same professional context while minimizing their multiplicity of identities (for instance, minimizing their personal diversity and uniqueness). This suggests that personal authenticity may not be possible in a professional context, which tacitly advocates for sameness (or everyone behaving/acting the same—like professionals).

With the focus on the individual in a culture of sameness, professionalization suggests that differences don't matter or are not relevant because everyone is and will be treated the same as individuals. In the end, the individual will be rewarded for maintaining their professional identity via their personal productivity and maintenance of the existing work culture. Nonetheless, differences do exist. Differences are exposed via contradictory events that show neutrality does not really exist; this is how contradictions begin to expose illusions of unity (Foucault, 1972).

In Chapters 4, 5, and 6, I explained causal conditions, the context/phenomenon, and intervening conditions in the modified Grounded Theory Paradigm Model (see Figure 2).

| Causal Conditions | → | Context / Phenomenon | → | Intervening Conditions | → | Actions / Interactions | ↔ | Contradictions |

| | | | | | | | | Consequences |
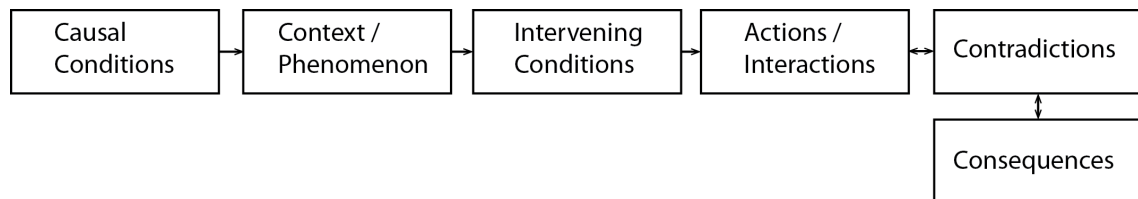
Figure 2: Grounded Theory Paradigm Model Revised

Causal conditions are the minimum conditions students usually meet before deciding to pursue and then remain in a civil engineering degree (such as having math/science ability/interest, liking problem solving/being organized, seeing the degree as an economic investment, liking to be challenged, and feeling socially supported). I explained the context/phenomenon in terms of cultivating a culture of sameness where primarily the merits of the individual are valued and the differences (individual and

group) are seen as irrelevant. Female students and students of color come into the context believing and supporting individualism and meritocracy—even when contradictory events cause them to question the context. The contradictions within the context expose fractures of what is seemingly neutral but is in fact not as neutral as it may seem. Finally, I explained how intervening conditions, which consist of students either having or earning knowledge and social capital, might help female students and students of color successfully navigate the context more effectively (albeit differently from white male students).

In Chapter 7, I will show the interconnections between 1) *contradictions* (events that make students question the contradictory culture of sameness), 2) *actions/interactions* (what students do in response to a contradictory culture of sameness), and 3) *consequences* (what students do to maintain/reject the contradictory culture of sameness). In a nutshell, female students and students of color have learned interactional strategies as a way to respond to the contradictions within a seemingly neutral context, which then leads to a newly formed identity connected to them becoming professional civil engineers in a culture of sameness.

Exposing Contradictions in a Culture of Sameness

  Introduction. Contradictions can point to fractures in unity in a supposedly coherent and neutral culture. Being hard working, personally productive, self-confident, and professional (unemotional) are all valued in a culture that celebrates the individual and where differences are seen as irrelevant. *A professional* and *being professional* are not synonymous. A professional as a noun is someone who has the technical knowhow, work experience, and personal competence to do the job. Being professional as a verb or

gerund enforces that individual must act in a certain sanctioned way—mostly by being cooperative, hard working, and productive, by downplaying emotions, and by not questioning outright how things are.   In this section, several phenomena experienced by students felt problematic as they were preparing to become professional engineers.   First of all, students across the board questioned their work/life balance after becoming professional engineers. They all pretty much embraced that hard work and personal productivity were necessary traits in the field. At the same time, they questioned whether or not they would have the stamina and stick-to-it-ness to do the long hours and work weeks, which would be expected of them, at the expense of a personal life. Second, some female students noted how playing up a gender identity could be beneficial in working the system. Up-playing gender—used by both females and males and along the male/female binary—was a way to accentuate gender attributes that were favorable to others in order to get additional advantages (e.g., favorable treatment, answers to homework problems, getting a good project, and so forth). Up-playing gender as a navigational strategy seemed to contradict the idea that gender does not matter in a culture of sameness. Third, several students were troubled about how international students were treated. They found that some instructors at times made fun of or excluded international students. Again, if difference doesn't matter, it is ironic that international students might be targeted differently. This targeting seemed to suggest that certain ways of acting and being are sanctioned (adhering to the dominant context) compared to "odd" ways of the international student. Finally, students who saw the inconsistencies and irregularities began questioning the existing politics and how things were done. They saw events and phenomena that contradicted values of meritocracy and focus on the

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individual. They began to notice that some students were being treated differently than other students. With this preliminary introduction, the following contradictions describe how students were beginning to question the espoused values, which highlighted all was not what it seemed.

Questioning work/life balance. One way that students questioned the context in regards to what was expected of them as engineers was by looking at their own personal contradictions. While these students liked to be challenged and to work hard, they also felt conflicted about the demands of the discipline especially related to what they personally had to give up. Every one of the students I interviewed had concerns about the work/life balance upon becoming professional civil engineers. Hard work, which was an espoused value of the dominant context, was expected of students and of future engineers. Hard work came into question because students had so little time for a personal life. It was as if only their life as professional working long hard hours would be really valued after they graduate. They all admitted the extensive effort required for their studies, but they also admitted that this same ethic would be expected of them in an engineering job. Only Adrian felt that the time expenditure would be less (because he would have weekends again). Terri was afraid of being an engineer after she becomes a mother because she would feel conflicted by the demands of performing her job and taking care of her children. She would like to do them equally well but realized that might not be possible. Jasmine wanted to foster romantic relationships but didn't think she will be able to once she starts her career. She felt that only after her career was well established would she then be able to pursue romantic relationships:

Jasmine: I know, just, I am going to care about my career more than I guess other things. It's probably where I will put most of my effort. I think eventually, you know, when you are young you do put a lot of effort in your career. You start out as "Okay, my career is established—let's move on with life" So I am pretty sure that is (the case).

Sarah, too, was very concerned about work/life balance once she became an engineer—hearing how hard her friends, who have graduated, had to work. She would rather not think about it and focused on just getting done with the program, as described in the following excerpt:

Sarah: I want to travel—but I just feel I am not going to have time, and say, "let me take 7 weeks off from work" when I have just started. So it is hard. I think being a student is nice because you have those stress for nine, eight months—but then you have a whole month of December and three months for summer. And you can just do whatever you want. It's nice in that sense because as a professional you won't get that. It's just going to be every single day the same. Hearing from students that just started in the engineering world or they have been in it for ten years, they don't spend the hours we've spent on homework. They spend more. Sometimes their work is not 40-hour weeks—but 60 weeks or 80. You have to cram a project before a deadline. Knowing that I could be doing the same thing now—in an office—being there until 1 o'clock in the morning…Yeah, I am a little worried—just trying to get all of that in there. Kind of doing the things I want to do versus doing the things I have to do and making them work together. I don't feel like they are going to be as possible as I want them to be.

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So. Yeah, it is definitely stressful to think about. I don't know. I can see things going not like the way I want them to.

Sarah felt that long work hours as a student were doable in the short term because eventually she would get breaks (summer mainly). She felt apprehensive about what would be expected of her in the field, where taking time off from work was really not valued. She would not focus on this big concern; otherwise, she would be tempted to stray from the discipline.

Madison questioned the American ethic of hard work when she talked to her friends from Sweden and Norway who all waited to pursue a professional degree after several years of traveling and exploring. Madison felt that pursuing a professional degree, like engineering, as a young nineteen year old didn't make much sense. She felt that the culture expects us to be productive members at the get go with little time to experiment with identity (not her exact words but identity experimentation is the gist of what she was implying):

> **Madison:** I have a lot of friends—well not a lot—well I have friends from Sweden and Norway—and they take a break for like three years—and then they go back to school when they are older….She was like, "I would travel—work different jobs and have fun and then go to school. And then you start your adult life." But here we jump in at like seventeen years old and we are at college…It's a lot of pressure. And you are like, "Oh my god, what am I doing?" I am still glad that I like engineering—because I see how kids get half way through—like, "Why did I pick this—engineering or like any major?" It's hard to know when you are that young…I guess maybe it's just the way our country was founded—Go-getters

and like—it got built so fast and people worked really hard—wanted things and

money as soon as possible. I think that has just kind of carried over.

Madison's story seemed to point to the importance a liminal/more structure-less

experiences that allow young adults to figure out what they want "to do" (as

professionals) without the pressure of pursuing a degree before being ready. At the same

time, she questioned the historical practice of working hard and building America fast—

as if this mentality is still being carried over today when it doesn't really have to be.

While she didn't feel able to change it, Madison did stop and reflect what might be

happening.

The questioning of life/work balance suggested that all was not what it seemed.

While students wanted to do well/perform well they also questioned the ethic of

"working all the time." However, as an engineer, there seemed to be the expectation that

students would be working many hours to prove themselves as professionals in the field.

Knowing this expectation deeply concerned students.

Up-playing binary gender roles. Earlier, I described how Terri explained how

females should modestly use their assets (physical appearance) to negotiate their position

with male professors. Female students who showed cleavage or curves were apt to get

more favorable attention from their male instructors. She indicated that it was okay to

"show it without showing it." Terri didn't have a problem when females up-played their

femininity. She indicated that that "pretty boys" also used their physical appearance to

negotiate favorable advantages with other female engineering students in the program:

Terri: There was this other guy—I mean he really did use the girls in

engineering—because he is one of the pretty boys, um you know—as long as he

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looks cute—he kind of got by—he did a couple of other things—it is funny to step back and see. I mean every—the issues that other majors have—we have as well. Just because we are engineers we are not exempt from them.

Um—you expect more. I mean he wanted to study with guys —he always wanted to study with girls—it's because they always gave him the answers. And then—when that ran out—he went to work with the guys. Guys are going to give a pretty boy answers—girls are going to be a little more—

Me: That happened when I was in school, too. (laughs)

Terri: It's the same stuff. History repeats itself.

I, too, reflected back to a time when a pretty boy also wanted me to be his study buddy in my biology class. Terri suggested that males are using their appearance, too, to get answers from the female students. They are just as guilty of positioning themselves to get ahead. Up-playing gender (along the male/female binary) inferred that students were specifically differentiating themselves from other students to be seen more favorably. This seemed contradictory to a culture that advocates for individual merits and performance, where differences were not seen as relevant.

Glaringly absent in the environment I observed was alternative identities outside of gender binary (traditional male/female roles). With the exception of one student who openly identified as gay, no one else could be identified (at least publicly via my observations) with a visible LGBTQ identity. I tried recruiting students from the LGBTQ community by presenting my study at a LGBTQ student chapter. I also advertised for LGBTQ students in a newsletter. However, I could not get the LGBTQ representation for my study I was hoping for. I wanted to see if hetereonormativity was an issue inside

the culture (as argued in Chapter 2) but—because no one self-identified—I could not examine this. I could only look in terms of the gender binary. Nonetheless, it saddened me that LGBTQ students might not volunteer because they don't want to be known for this identity. In some ways, it felt similar to the "Don't ask, don't tell" U.S. military policy recently overturned. However, that doesn't mean LGBTQ students feel comfortable "telling." While staff members said that sexual orientation should not matter, perhaps it does. Alas, I cannot argue either way in this study. With this said, one staff member consistently mentioned there was an openness to all students, including LGBTQ in engineering because there is and always will be a focus on the individual's worth in the profession as described below:

> **Staff member:** And here, we have so many people here who are, you know, in that so-called minority. They are on our staff and our faculty. And I just don't see it as a major—I mean it is always going to be a major social issue—but I feel that here students can realize that there is progress and this is where it starts, you know. Especially in engineering fields in this case, I feel that it is much easier to be yourself because, you know, engineers realize that it is just not an issue. Transgender, lesbian, and gay it is not—you embrace a view that is who you are, but you are all brilliant individuals ask what they bring to the table in the end. I think again that goes back to what my dad has always told me with his experiences, especially when—you know—being transgender was first, you know, an issue.

All students, regardless of sexual identity, were supposedly treated the same. It, however, seemed odd to me that there were no visibly open LGBTQ members (with the exception

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of one female lesbian) in the civil engineering discipline. It could be inferred that LGBTQ students chose not to announce their sexual identity because they may be penalized, directly or indirectly, for having this identity. It could also mean that LGBTQ students are not actively pursuing engineering because of the dominant context. Unfortunately, I was not able to support this finding in this study, and so these questions will have to be explored in a different study. However, what is interesting to note here is that the focus seems to be on sanctioned "sameness" where all students must focus on values of meritocracy, personal productivity, and being professional (or downplaying emotions) at the expense of alternative identities.

Undervaluing or excluding international students. In culture that advocated all students were treated equally, it seemed ironic that international students were at times targeted for their imperfect English language skills or for their "unusual" cultural behaviors. I am not suggesting here that all instructors in engineering are completely insensitive to international students. From my passive observations, there seemed to be a spectrum of instructors inside the discipline who are more open (academically and personally) to international student diversity compared to others. Nonetheless, several students of color I interviewed described how uncomfortable they felt about how some international students were treated by some instructors. These students of color, because of their border identities, perhaps felt more sensitively about how these international students were being treated compared to other students who might not have noticed. Earlier I mentioned how Terri described Middle Eastern students (which she called "Arab" students) being typified in stereotypical ways (such as being overtly sexist when in fact it

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was not the case). In addition, Jasmine shared how other non-native English students were targeted by one of her instructors in a past class:

> **Jasmine:** There is one professor from last semester—he made fun—no, he didn't make fun of—he was just really being a butt head with the Kuwaiti kids and the Saudi kids—and sometimes the Asian kids—the Chinese kids. Ya know, they have a hard time speaking English, and he will call them out on that some times. So I am like "leave them alone." On his eval at the end, I did comment on what he did. In fact, a lot of people did. I think he is retiring after this anyway.

Other students I interviewed also felt troubled by how international students were treated in their classes because these international students could not articulate as well as American students. In my own classroom observations, the instructor pointed out how non-English students needed to pay attention to certain engineering concepts that were derived from American slang. After class, he explained that Asian students had poor writing and communication skills, and—with good intentions—he was trying to teach them to get better by bringing certain concepts to their attention. This observation—in combination with what Jasmine and other students said—demonstrated that some instructors and other students were treating international students differently. In a culture that rewarded the individual and where differences were seen as irrelevant, it was surprising how often students, who were perceived as different, were targeted in more negative ways compared to the American students in the class.

Questioning the existing politics/culture/how things are done. Finally, students who perceived themselves or others being treated differently began to question how thing were done in the discipline. Students began to notice inconsistencies, and this

awareness was unsettling to them. One male student of color explained it to me in this way:

> **Me:** Well, I thank you for telling your story. I know you said some personal stuff, too. And you know this is who we are and what cultivates who we are and how we deal. So thank you for sharing that.
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> **Male student of color:** Yeah—I can't tell anyone else about the politics here. I can't tell anybody else how messed up about some of this is around here.

He didn't feel very optimistic about the program but rather questioned it. He would not quit because he had invested too much time and money in the program. However, you could tell that what he experienced did impact his desire to stay.

Another male student of color also described that the culture may not be what it seems. While he believed that female students contributed and are valued just as much as male students inside the discipline, he also felt that female students and students of color might feel sexist or racial pressures that white male students don't experience:

> **Male student of color 2:** A lot of men think that—like I said—they see this hard working women and they don't know what to do. There is still this housewife/husband coming home mentality out there. And when they see a woman that is working hard and doing flat out better than them—it can—there is a huge intimidation factor that comes into play.
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> **Me:** Do you feel it is subtle or overt?
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> **Male student of color:** It is becoming more and more subtle. As more women keep breaking barriers as they have been doing 20, 30, 40, 50 years—as they keep breaking barriers becomes more common place—when something becomes more

commonplace you just can't be blatant about it anymore. It's just like any civil rights movement that has happened in our country—me being a [man of color]—things have become a lot more subtle—which is dangerous—because then you don't who are your friends, who are your enemies.

Me: That's a provocative point.

Male student of color: Because some people don't like you but they can't say it but they will get you in another way. Like if they are your boss—"I am not going to promote him—even though I know he is better." And those subtle things—those are the things that hit you right here (points to his gut) because someone might spit at you and call you with every name they want to call you…But when someone knows how good you are and intentionally does not want you to flourish—that is when it hurts…because they will smile in your face and then you know—My mom warns about me about that every time, "Always remember you are a [man of color]." I am not the type of person to like—"the plight of the [racialized] man." I have never been that type of person—I know there are people like that out there—so I don't care who you are—but it is good to know. It is good to be aware of. I take that to heart when she says those kinds of things because it is still out there. And you have to be careful.

This male student's commentary about the subtleties of the culture seems to point to the power differences between females and men of color with—without saying so directly—the dominant white male group. He was uncomfortable about having to admit this, especially in a culture that supposedly values individuals in spite of racial and gender

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differences. Nonetheless, he acknowledged that discrimination, because of gender and race, was a real possibility.

Terri also began to question the professional behavior of males (students and instructors) in a mechanical engineering class she took. Terri described how one white male student cut in line to see the instructor when other students, including herself, had to wait in line outside the instructor's door. She wanted to meet the instructor to discuss strategies for passing the class, but the instructor was very dismissive. The interaction, at least from my reflexive viewpoint, seemed rife with sexual undertones as this instructor consistently gave her 69 points on all her homework and tests. A score of 69, with sexual undertones and all, is not considered a passing grade in engineering. A consistent score of 69 "on everything" that Terri received somehow felt wrong—at least to me. In addition, she was conflicted on whether or not her actions to confront the male student, who had cut in line in front of her, had a bearing on the subsequent uncomfortable interaction with the instructor. Knowing that she had no chance of passing the class, she re-took an online version of the course with a female instructor. While she passed this course with a B score, she was confronted with similar male power issues (a male student who self-appointed him the leader of the group with three other female students). In a culture that is supposed to reflect fairness and equality, these interactions seem to point that this might not be the case, as is indicated in the following excerpt:

Terri: Okay I was taking a class last semester…but I knew I was going to fail because—and I didn't understand how everything I got back—I got straight 69s. Ha, it is a funny number but I mean it's frustrating to be 1 point off from a C—I

mean constantly 1 point off from a C—homework I got 69, exams I would get a 69. I mean everything!

Me: Seriously?

Terri: Everything I did I got 69 and I didn't understand why and so I go to the professor—I asked him three questions, "Well, this is how I am studying, this is what I am doing, it doesn't seem to be working for me. Do you have any suggestions of what I can change—additionally what might help." He just sat there and shrugged, "I don't know"…And so—then I asked him—if it would be okay—regardless if I passed or failed and had to take it over the summer—I said that I really enjoyed the material, I get excited to learn—I was wondering, you know, in the future can I sit on a couple of your lectures? He just shrugged and said, "I don't know." How could you not know that—okay, I am done! Like before I went into meet with him, there was a long line—not a long line but there were other students that were waiting before me and waiting after me and I was next. Some kid just went in and asked him a question and that really pissed me off—because I waited my turn—and as he was leaving I was like, "Did you not see that there were other people waiting?"**…** "Well maybe you want to wait your turn because we have waited ours." And I thought I handled it professionally—but I guess I didn't'—I don't know. But that happened before I walked into talk to him (the professor). I don't know if that had something to do with it—but regardless if I have questions I am going to need you to answer them…

Terri had great faith in her abilities, and she negotiated her role by not letting the uncomfortable interactions and perceived differences get to her. She used a "let it slide"

strategy (which will be explained in the next section) so she could push through, even though she didn't particularly like what she was experiencing. Even when her high school boyfriend questioned her decision to go into engineering when she was having trouble with a particular math problem: "If you need this much help, maybe you should go back to English, you know." None of these interactions stopped her from pursuing her dream to become an engineer. They could have, but they didn't. In a few semesters, she will graduate. Nonetheless her success story of beating the odds is not as cheerful as it might seem; these combined interactions seem to show equality and fairness is not what it seems. In other words, students were being treated differently because of their difference. In a culture that supposedly supported the idea that difference did not matter, these contradictions showed that differences outside the dominant values were possibly more common. The context was not as neutral as it seemed.

Conclusion. In this section, the students I interviewed were experiencing contradictions that caused them to question the culture and practices of their civil engineering program. First, these students were concerned about the hard work, which would be expected of them, when they become professional engineers. They were happy to be in a well paying job, but they also knew the personal sacrifice that would be required to have a decent salary after graduation. They all felt that the effort they put in as students was similar to what would be expected of them when they became professional engineers. This was troubling; they were exhausted now, and so how would they handle this ongoing expectation as future engineers? Second, students were noticing that some students "up-played" gender roles in order to position themselves for favorable advantages. Male instructors generally treated female students, who showed off their

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curves or were noticeably attractive, more favorably compared to female students "who wore sweats." Terri felt it was okay to accentuate femininity (albeit modestly) to receive favorable treatment. Terri also remarked that "pretty boys" also played up their attractiveness to get certain perks from female students (e.g., answers to problems, partnering for test, and possibly sexual activity). Therefore, students who up-played their gender roles (at least along the male/female binary) were being treated differently because of their attractiveness. This seemed contrary to a culture that supposed supports the academic merits of the students. Third, the students of color in this study were troubled how international students were being treated. They didn't like when students who had difficulties with English were made fun of in class. This targeting of students made them feel uncomfortable. Again, if differences don't matter, why are international students being targeted differently than American students in the program? Because the fractures of unity were being exposed, students began questioning, "how things were done," even though this questioning did not cause them to leave the discipline. Some of the students of color, however, were tempted to leave.

Action/Interactions

As mentioned in the introduction, actions/interactions as related to the modified Grounded Theory Paradigm Model are what students do and how they interact with others in response to a contradictory culture of sameness. In this section, I will explore how interaction rituals and impression management (two interactional strategies borrowed generously from sociologist, Erving Goffman) are used by female students and students of color as they navigate the contradictions within the culture.

Interaction rituals in a culture of sameness. According to Goffman (2005), interaction rituals are a type of face saving that occurs when interactions with others are uncomfortable or cause discomfort. Goffman explains two functions of face saving in the midst of an uncomfortable interaction, 1) to avoid and 2) to correct. Avoidance means that the individual will try to evade future interactions of the same sort or with the same people. During a corrective process, individuals try to ratify and change the course of interaction so that it is less uncomfortable or no longer uncomfortable.

When female students and students of color encountered uncomfortable interactions in my study, I found that they used avoidance strategies rather than dealing with and then changing the interactional context. The two main interactional strategies that I found in the data were *letting it slide* and *minimizing personal emotions*. These will be explained next.

Before I get started, I do have something to note. In general from my observations, students seemed to be mostly comfortable in their interactions with other students and their instructors (at least the two classes I observed—although I can confirm that I saw uncomfortable and/or potentially sexist/racist interactions on more than one occasion). When I heard about uncomfortable interactions students experienced in the interviews, I tried to clarify if these were more isolated events related to a few instructors, and most agreed that was the case. Extremely uncomfortable events/interactions do not necessarily mean that these events are running rampant within the program. To follow up, I asked students if there might be a generational thing happening. That is, were older and more entrenched faculty involved in these uncomfortable interactions? The students did agree that more uncomfortable interactions involved older white male instructors, who

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did not seem to know that they were being racist or sexist during their interactions. Sarah, Terri, and Rebecca all stated in three separate interviews, "They don't know they are doing it." However these three female students of color also suggested that sexism and racism—or these uncomfortable interactions—occurred along a spectrum. In other words, some instructors and students will be more overt and some will be subtler, but all coming from the sentiment, "They don't know they are doing it."

One male student of color synthesized it best (earlier in this chapter) by saying that there was a danger when more subtle racism or sexism occurred in the workplace or inside the school setting. One thing is for sure, when racism and sexism is more overt, as a female student or student of color you know ahead of time what you are getting yourself into. You know that you are going to have to deal with the situation and not let things/events/interactions "get" to you. And so you navigate accordingly knowing the overt racist or sexist remarks and/or interactions might happen. As one staff member recommended females to do:

> **Staff member:** And I would recommend that they figure out where their boundaries are and try and make, try to be able to ignore as much as you're comfortable with ignoring because I've worked in a male-dominated profession for a long time. Before being an engineer I worked where it was all males. And I was, um, with them every day, and I—there is going to be some of that and you to have your boundaries, and you have to let them know what they are. But if your boundary is so rigid you are going to really have a hard time working with them because of the things I mentioned before about the nervousness. And, um, and you've got be willing—just like two guys are joking with each other or two girls

will joke with each other, you've got to be wiling to do a little bit with that. Not

to the point where you're uncomfortable and certainly not an inappropriate level,

but if you are looking for every action and every comment to potentially be racist

or sexist, you are just going to have a hard time.

Whether to avoid the issue is certainly debatable but is not necessarily the point. The

point to be underscored is that racist and/or sexist events do happen in a supposedly

neutral culture that honors the individual despite differences. As a result, female students

and students of color had to devise navigational strategies to handle potentially

racist/sexist interactions. These sexist and/or racist events (which includes jokes and

joking) were not isolated and will happen to a female student or student of color

eventually as Rebecca suggested, "I think it is a collective—like maybe everyone in class

will eventually will be picked on—the teacher will say something smart or just joke

around."

    Letting it slide. So how do female students and students of color handle these

uncomfortable interactions from males who don't know or don't think they are doing it?

Coming from a reflexive place, I personally had my own uncomfortable interactions with

both instructors (one dealing with my age and one dealing with my appearance). In both

situations, I chose to not let the discomfort get to me because it might affect how

successful I would be. After class, one instructor did apologize about making the

comment. The other instructor was completely clueless that he had crossed some

contextual "boundary" as the staff member in the chapter introduction described.

    In this study, I found that female students and students of color also used a similar

avoidant strategy. One female student of color called it "letting it slide," which seems an

apt term for this avoidant strategy. Letting it slide means that the uncomfortable words/comments don't stick to you; they sort of roll off and fall to ground. They can't affect you because they are not affixed to you anyway. If you didn't "let it slide" then your confidence might be negatively affected; you might become overly emotional and reactive, which might then be seen as unprofessional.

In the following interview except, Terri described "letting it slide" in detail. We had just spoken about how members of her community/family described her becoming an engineer as "cute." I responded to her, "Why is it cute? What is cute about it? I mean that is it— it's an odd statement. It just doesn't make sense." She inferred that "cute" was related to her being an engineer in a male dominated profession because "girls just don't do that." She followed up with another uncomfortable interaction with her white male friend, Brad (not his real name), who she sat next to in class who didn't want her to ask the instructor questions in class:

Terri: Lately I have been asked some things—like Brad will be like "calm down" when I am asking a question. I mean I sit in the back because I get to class later because I have to walk from north campus and I want to make sure that my question gets answered—like everybody else's…And he is like, "calm down." Like why is telling me to calm down—like I actually get this stuff—I am excited to study. And he is like, "Oh"—that's cute would be kind of like "Oh you want to..." I don't know…Then I asked him—I needed help taking off my sweater— and I usually ask someone to hold down this side because I have to wiggle out of it. And he was "excuse me!"—half-assed holding it. "Are you not in a good mood today?" and he was like, "No, I am fine." And I was like, "Okay." You don't like

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me asking questions. And he was like—"I don't know." I was just asking.

(reflects) I am having one of those where I really don't care—so usually I just let

it slide—like the "Oh, that's cute comment." I just let it slide…So I don't know

how to explain it. (pause) I can usually separate how I handle work from what is

going on in my personal life—I don't know where I was going with this is? Oh,

like if people reacting a different way, um, like usually I just—like act passive

about it.

Terri reflected that being "passive about it" by "letting it slide" was a way to not overly

react to the interaction because that was not professional. The personal could not

influence our professional lives and must be put at bay even when interactions were

uncomfortable (possibly racist and/or sexist).

Sarah also used the "let it slide" approach when she discovered her friend was

getting graded differently (with a more favorable score) compared to her and other

students who submitted the same answers to a problem. She described the instructor as

"not seeing" the preferred treatment he gave to some students over others, as is described

in the following excerpt:

Sarah: (in reference to her friend being treated differently than other students in

the same class) It's different—I don't know. I know she is kind of like—doesn't

think it is really that bad. Her boyfriend does. So he is like, "No. I don't like the

way he talks to you"…I don't even know what I would call it. I just think it's the

way that professor is versus other teachers that you have dealt with—and maybe

it's just different—because I don't think they see it either.

Me: They may not even know that they are doing it?

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Sarah: Right, right. So I don't think they exactly know that—you know, maybe it's more of the comfort level that we tend to have. We are used to being comfortable with some of our professors—and just like being in [name of engineering student club]—I am [a member] for that—so I have some of my professor's phone numbers—I can text them and say, "Hey, this is what I need for this." And like having that comfort level versus something that is just awkward. I think that it's just different. I don't think being close to the professors is a bad thing. But I think it is maybe the things that are said—like an implication of something that is said is different.

Me: By other students?

Sarah: Not to me, no. It's other students that—I guess I see it because I am—um—like the third party in the situation—to my other friends. And so they kind of see, "Okay, this student is being treated a lot differently than we are." And sometimes it is not—not exactly unfair—but it is just different. You know like they are going to be like.

Me: Does it make you feel like that person knows that they are being treated differently?

Sarah: Oh, no. They do. They do but—if they can say something about it or not is what is complicated—so we know that one student—she is kind of the person that the teacher picks as his favorite—like for a quiz—she got thing marked down less than we did—for the same questions wrong. And so (instead of) taking off six points, he would take off three. The fact that she mentioned it one day— "You know, 'hey so-and-so professor didn't make the quiz out of so many points

like he normally does'—but everyone else goes, "no, but he did." Our grades are

definitely what they are supposed to be. With her, it was higher. So her boyfriend

hated that. He was mad because he was like "that is not fair." Things like that—I

don't know if it is that—that it happens on purpose and he really notices. Or that

he does choose favorites and he kind of treats some better than others, which

would be a good question to ask him—but possibly weird.

Me: Maybe after you graduate (laughs).

While I joked about Sarah confronting the professor after she graduated, it really

wasn't a joke. This uncomfortable situation—of one "favorite" student getting a

different/better grade than other students—showed that neutrality (or grade objectivity)

did not, in fact, exist. Students might be graded differently just because of who they

were (social capital) or what they knew (knowledge capital).   Sarah, in the end, chose

to "let it slide" because she rationalized that the instructor just didn't know he was

doing it. Rather than confronting the professor, it was better to just let it go.

Adrian also used a similar avoidant strategy dealing with an instructor who

showed preferential and different treatment towards Adrian's girlfriend. He felt that

the instructor didn't like him because he was a "meathead." Meathead is a derogatory

term in itself and implies that this student wasn't academically suited for engineering,

but this how Adrian felt he was perceived. Adrian tried to engage with the instructor

but without success. The following excerpt described this uncomfortable interaction:

Adrian: I guess it just makes me kind of a little uncomfortable with like—I feel

like—uh, I will use one example of the class you are in. I feel like (name of

instructor)—the person he gives a lot of unfair treatment to (name of girlfriend),

she sits in the front. He makes remarks all the time. And he doesn't like me—I don't know why. I mean—eventually I stopped caring eventually. And then I just show I don't like you either. I just like it kind of makes me feel uncomfortable, I guess—maybe because I am just like her boyfriend. So it is kind of like— "Oh, why are you doing that?"—I don't know, I guess it is a little upsetting...I don't want to say anything far fetched but…I guess he just has a favorite. Because she is like this sweet girl, this little girl and like her boyfriend over there is just a guy. And he is just a big meathead and he doesn't. You know I don't really care about him but I guess she is just a female. I don't know because—I mean I have tried to be on his good side I went asking questions, ya know, and like—there is some things about him—that it feels kind of wrong that he likes her but not me. And I feel he doesn't like me because I am with her. Not like jealous—it is just something that eeks at you. Rubs you the wrong way, I guess.

Me: Yeah, that would be uncomfortable.

Adrian: Most of the other students have had that opinion, too.

Me: I have noticed it in class, too.

Adrian: And they came to you and ask you. And they look at me—when he says something to her. And I go "what do you want me to do?"

Me: So you just have to (look ups at the sky).

Adrian: Yeah.

Me: That is tough.

When Adrian responded to his friends with "what do you want me to do," he was not willing or able to confront the instructor. He was tied, by his grade in class, to the

teacher's authority. Confronting the instructor might mean setting himself up for failure (or less favorable grading). In a neutral culture, grades are supposed to reflect objectively what a student does/accomplishes in the assignment. An instructor's authority can influence, via a hierarchical power position, how students act, react, and behave. Adrian felt powerless to do anything about the situation even though it greatly bothered him.

In addition, Rebecca had to use an avoidant strategy when her instructor commented on her appearance. I reflected that I had to use the same "let it slide" strategy with the same instructor who commented on my appearance, too, so I could successfully navigate the uncomfortable context:

Rebecca: The day that he (her instructor) asked me if I could see the board because I wasn't wearing my glasses, I was like, "Yes, I am wearing contacts." "Well, I can see your bright beautiful face shining "—whatever he said. I was just like, "okay?… He said it the first few times—if it continues, I just let it roll off. A lot of people in class will say, "So what do you think of that?" "I don't know; I ignore it at this point. I figure he is just going to do it."… A lot of people have been saying, "Well, I have been thinking about it but I feel like it is closer to the line of being inappropriate." I mean I haven't let it affect (me)—if I am going to talk to him or something. If I do feel uncomfortable—and he had said something —then I would take somebody with me—just so it wouldn't go further than what it should be. But it hasn't affected the way I get my work done. If I have a question, I am going to ask him and I am going to email him—I will do that. I am not let him call me names in class.

Me: Going back—he is more of anomaly? He is not really what represents the rest?

Rebecca: He's not.

Me: Although there could be some variations out there—and could you describe what some of those are?

Rebecca: I think it is a collective—like maybe everyone in class will eventually will be picked on—the teacher will say something smart or just joke around. I'm—one of my teachers is the advisor—is the faculty advisor for [name of student organization]—and I had him for a class last year maybe, and we are close. I mean we joke around with each other. We went onto a [name of] conference with the other [members] and we just had fun. So I guess that—there's like we joke around—nothing like "grape lady, princess, or crazy" or something like that, just saying things like, "Yeah, that is funny. That's a good one." They talk about football—the guys talk about football, but he jokes around with everyone—it's not like he singles me out in class. So this is new for me also—well, in high school I did but that is another story. But in college this is first time.

Rebecca clearly felt uncomfortable about the attention she got from her instructor in class, but she felt powerless to change it. She acknowledged that this was the first "blatant" experience she had had like this. However, she suggested that "everyone" in class would eventually be picked on in the class. Blatant is just that—blatant. When the interaction is subtle, navigating may be more challenging. She inferred that there was somewhat uncomfortable/not-so-blatant joking that happened with another instructor during a student club event. While this instructor talked "football" with the

guys, the instructor interacted differently with her and other females by joking around, and so she would react, "Oh, that's a good one!" Again, the subtlety of the interaction and why she was possibly uncomfortable is hard to pinpoint. She was not accusing this instructor of anything inappropriate, but she inferred that she might feel uncomfortable if a certain line was crossed. In sum, these contextual boundaries are harder to navigate when they are not so visible or blatant.

When I talked to a staff member about appropriate/inappropriate interactions (comments on appearance, sexist jokes, and so forth) inside contextual boundaries, she responded in this way:

Staff member: So I think that is on an individual basis, um. One female student might like to hear that she looks "hot" today, and another female student might say, "that is not okay." And I think that that boundary has to be identified to be fair to everybody. It has to be fair to the female student. It has to be fair to the people that she has to interact with. You know, there is a certain level when it is not appropriate obviously. I am—just because someone laughs it off, it's still not appropriate, even if it's not offensive. And that might make somebody else uncomfortable, male or female. So, you know, it's kind of a vague answer, but I think, um, basic—basic rules of engagement anywhere, you know, in a place of business, it should be the same thing for students. And so that means you shouldn't really be commenting on someone's appearance. You shouldn't be commenting on someone's, um, you know, personal life, things going on. But you know, I think there is a matter of respect, and everybody respecting each other and, you know, people whether male-female, male-male, female-female, there is

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going to be times when that gets inappropriate and that's when, I think, the protocol for a female to know "what's the right thing to do now?" And I think that is pretty well handled. I've heard of situations where students have gone to the their instructors to say, you know, whatever in a group setting is not working right. I don't have specific examples of that right now, but I think that the professors are willing and able to step in when needed for something like that, um, but I probably hope that the kids can work it out for themselves. I think going through 4 or 5 whatever years of college in a male-dominated major helps them prepare for being a male-dominated profession. And I think that if you're successful as a student you are just going to keep at it—and be successful.

This staff member recommended students to deal with uncomfortable (sexist/racist) interactions in a "male-dominated" major by working it out on their own. She inferred that they must have strategies "to work it" before they go into the profession; it's not the place of the organization/institution to do anything about it. Being professional means that you may have to "keep at it" regardless of the uncomfortable interactions that may come your way.

Minimizing personal emotions, or "being professional". Throughout this dissertation, I have shared excerpts of students minimizing their emotional reactions and/or their personal emotions in order to navigate this culture more successfully. In support of minimizing emotions—a sanctioned behavioral approach of an engineering student, one staff member suggested that "being emotional" or "using the female card" is a more "female" response and should be avoided in a male-dominated environment (close

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to the sentiment of "be a man"). To her, being emotional was not professional, as described below:

> **Staff member:** So I think a majority of students handle it the same way a male woul, they would figure out what I need to do differently, how can I turn this around. And I think they're, there are there are some—where I have seen it—where there will be more emotional about it—and, um, and that would be, you know, a normal, more female kind of response to certain situations. But it's just like on-the-job or something, you can't use some things, you have to handle in a professional way. And so I think that in general that's what happens with problems. I would like to be able to answer all these questions in another year when I have had more experience.

Female students simply were not allowed to be emotional; they learned to cover up their emotions even if something really bothered them. They could not openly acknowledge that sexist and/or racist interactions (subtle or overt) were happening because they would be seen as overly emotional or be penalized for "using the female card."

Under a huge amount of pressure, Jasmine at times felt depressed but rather than showing her emotional state she hid it. She knew also to step away from the context when she was feeling down. Jasmine pushed through the pressure, despite the workload, but she has to step out of the context when she began to get depressed:

> **Jasmine:** Gosh, I have actually been—sometimes I get really depressed. I usually revaluate what's going on in my life, and I figure out why I feel like giving up. Because if it is just the work, that is not a legitimate excuse. Because, yeah,

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there's a lot of work. You can definitely do it. Yeah, you won't sleep that much—

sleep is for later on.

Me: (laughs) right right right

Jasmine: But I just take a step back and just ask "what am I here for." If you give

up now it's going to be a loss of money first of all. You are giving up—which is

something—it's not an option. Take a break—get away from engineering and do

your own thing. And that is what I do. When I am starting to feel down about it, I

am going to get out of this building. And I am going to do something I enjoy.

Jasmine's tenacity and self-confidence was what got her through the program. When she

felt depressed, she had to physically leave the context. She was not comfortable being in

that "emotional" mindset inside the engineering building, where she was supposed to

have self-control over her emotions and be productive. Rightly so, she had to step out

and feel human again:

Jasmine: Some people live her 24 hours, 7 days a week. I can't do that. I got to

take a step back and go downtown or get a pizza or hang out with some friends

Me: Just hang out—be a human, right? (she nods in acknowledgement, and we

both laugh).

Jasmine pointed to the notion that her professional and personal lives were separate. This

supports the idea that individuals may not be able to express their personal authenticity in

the professional world or as a professional. We put on professional masks to make it

seem like we are in self-control or self-confident when we feel like breaking inside.

When we step out of the context we can once again validate our personal authenticity.

These masks will be explored in the next section.

Impression management in a culture of sameness. Goffman (1959) offers a provocative social theory regarding the way we interact within certain contexts. We interact in ways that reinforce and maintain the social norms of the context we are part of. Goffman (1959) calls this intentional way of interacting as *impression management*. Impression management gets at the root of the discrepancies between our personal identities and our social roles with particular contexts. At times, we follow along willingly or unwillingly. At other times, we test the boundaries by revealing a little bit ourselves—either knowingly or unknowingly. The point, however, is that we are not always true to ourselves (personal authenticity) when we are in certain social settings.

In a culture of sameness, we need to adhere to how the individual is defined within this context. Individuals, for instance, in the engineering discipline should all be hardworking, tenacious, productive, and professional (minimize emotions). Individuals are not necessarily encouraged to exaggerate their personal identities. As mentioned earlier, flattening the multiplicities of identities is tacitly supported. Two ways that flattening of identities occur in the civil engineering context are 1) Minimizing gender/ethnic/cultural diversity/personal differences and 2) Keeping up with problem-solving appearances.

Minimizing personal differences in a culture of sameness. Earlier, I described how everyone (males and female students alike) appeared very similarly in class. They wore casual clothing consisting of t-shirts, blue jeans, and shorts with athletic shoes. I could barely see any differences between students. As I continued observing, I began noticing little differences. A large number of white males wore baseball caps almost daily. Female students and international male students rarely wore baseball caps. A few

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females wore short-shorts with either sandals or cowboy boots. When the weather got colder, some (not all) female students wore more form-fitting sweaters and long sleeve cotton shirts. Some female students even wore skirts on occasion.

What was interesting, to me, was how one instructor interacted with students when there was some variety in students' dress or appearance. During one classroom observation, one female student wore a tie to class and received a comment from the instructor saying, "It looked nice." To the same female student, he commented later in the semester about her "Paul Bunyon hat" but quickly changed the name of the hat to a "beret" (as if he didn't wanted to offend her with his offhand use of Paul Bunyon). In the same class, this instructor commented on one male's "bold" clothing. This white male student wore loosely fitting polo type shirts with bold stripes and colors with bright colored pants. The instructor, who had commented on his appearance before, called him "Where is Waldo?" (a pop culture reference of a male who wore bold striped shirts). I am not making this up. During another class, the instructor noticed an engagement ring on the hand of a female student. He asked her, "Are you married?" Flustered and turning beet red, the female student said that she was engaged. The instructor proceeded to say how he had seen her with her fiancé in the building and now knew they weren't study buddies. What is interesting to note is that students were toying with difference, perhaps subtly with dress. When this one instructor noticed a big or bigger difference of dress, he would note them out loud as if to say students needed to be careful with how they appeared (not to seem too different from the rest).

In the other class, flattened identities seemed to be encouraged via the sameness in dress. As you recall, one male student made fun of a female student for getting a

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manicure ("Oh, I thought you were a guy'). However, dress/appearance was also used to subtly differentiate students. Terri spoke about "showing but not showing yourself" or using her femininity in appearance/personal attraction to negotiate her position with male professors. Terri toyed with the idea that using your assets (your body shape/your physical attractiveness) was an interactional strategy in order to be paid attention to by professors. Female students dressed up more femininely when they talked to a male professor about an assignment. As long as it was modest and not too-sexually suggestive, then accenting femininity was okay for positioning oneself better in male-dominated context. Male instructors would, perhaps unknowingly, respond more favorably to more attractive female students.

Some students were subtly playing with rules with dress; however, most students were dressing similarly as if it was their attempt to fit in with what was expected. Students who flirted with "being a little different" were usually targeted in some way (usually in a joking manner). Joking or humor (see Chapter 5) served as a regulatory function towards assimilation and conformity, where students were expected to appear or dress similarly. By reacting positively or negatively towards students' "personal differences" in dress or appearance, instructors were reifying the ideas of sameness, knowingly or unknowingly.

Keeping up with problem-solving appearances. In addition to appearance and dress, keeping up with problem-solving appearances is another way to flatten identity. What I mean by keeping up with problem-solving appearances is that females students' agency is tied to how they can solve functional problems about their physical context (enhanced computer labs, functional or comfortable working spaces, key access to the

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building and so forth) and less about them fitting in socially as females inside the discipline. This way of acting is in line with flattening of identities in a culture of sameness because what is ultimately valued—in the end—is what you can do as an individual or a collection of individuals. With that said, female students worked differently on solving problems within the context. As one staff member explained, this was a way for these female students to be actively heard by others who could support their ideas/plans:

> **Staff member:** Men just, you know, they'll go—they can have a one-on-one conversation and feel "Okay that went far enough. I discussed it." Women just know that they need to be heard by people around them…(regarding one female student in solving a problem in the engineering building). It's all because of what she said—because she put herself out there. And I think she has made herself quite the leader in any given situation and it's not just her. And there's the quiet leader, the president of [name of organization] an example the leader who—she, she comes back again and again and politely says, "This really needs to happen. How can we make this happen?" They learn that they can use their personalities and can keep their personalities. They don't have to be these hardcore leaders, but they know how to use their natural selves, and, you know, they really bring their ideas to the table and they push themselves further and they get their ideas heard. And the guys do it, too, they just do it in different ways. And I didn't realize that until today. It's interesting.

These female leaders positioned themselves with other students when they proposed an idea or they came back until their ideas were eventually considered. If they were not

with other students, their ideas/suggestions might fall to the side. They strategically brought up ideas when other students are around. The staff member implied, however, that male students didn't have to position themselves so strategically. They could bring up their great ideas and/or plans and expect them to happen without being heard by others. The more tacit inference here is that males are "used to" being heard and their ideas being acted on, but females' ideas (by acting solely) are not heard, and therefore these females must position themselves with others or other females when bringing up an idea to a) get credit for the idea/plan or b) make sure the idea/plan gets implemented. Either way, females had to navigate differently compared to male students when presenting ideas to improve the setting.

Conclusion. Female students and male students were coming to the context of their engineering discipline expecting to be treated for their individual merits and performance. As they continued the program, they began to notice, either directly or indirectly, that some students were being treated differently from others. As they became aware of differences, they began to use navigational strategies such as increasing their knowledge and social capital to help them work the system. With that said, when they encountered uncomfortable interactions, with sexist or racial undertones, rather than confronting the person(s) involved in the uncomfortable interaction they chose instead to us an avoidant strategy (by letting it slide and downplaying their emotional reactions). By using avoidant strategies, they were really saying that "I am okay with how things are here and so I won't pay attention to it." In other words, they were conforming to the expectations of the dominant context where there was no place for emotional display or difference in identity. Using the female card or race card directly confronted how things

were (as supported by the dominant context), in a context that supposedly supported neutrality. Students needed to flatten their identities by becoming relatively "the same." While some students played with slight differences in dress, they did so by keeping "sameness" in mind. Sameness in terms of the dominant context and what was expected of them in becoming future engineering professionals was what really mattered.

Consequences of Maintaining a Culture of Sameness

While female students and male students were using mostly avoidant strategies during uncomfortable interactions, they were finding ways to rise above the inconsistencies, which allowed them to push through the discipline. While they were directly and indirectly acknowledging differences, they were not choosing to confront possible injustices but rather they were finding ways to elevate their own social status. What then are the consequences for female students and students of color who must then elevate their own social status in a dominant context that does not necessarily value their unique difference (outside of their professional identity)? In the data, it seems that the following consequences occur in the face of students elevating their social status within the dominant context: superhero-ifying, automating in reproducing professionals, and leaving/questioning the discipline. These three themes will be explored next.

Superhero-ifying. Female students and/or students of color were doing it all and then some. They were doing well in class but they were also getting involved in student groups, which demanded even more from them time-wise and stress-wise. Once they earned both social and knowledge capital, they were then recognized by their instructors and their peers. They also were recommended for highly visible projects, internships,

and even jobs. One staff member said it best by indicating female students in the program become "super women" (or super heroes):

> **Staff member 1:** Hmm. Wow. I think because—they persist because they're very determined. They are very smart. And have a lot of personal responsibility with their family members or relationships. So they're all super women. They are all very high achieving, high functioning women, who—they are going to get an engineering degree, but they're also going to have all these other things going on in their lives. And they are going to be successful at all of them. And they just seem to have more motivation. And I think because—still socially—there are not a lot of female engineers and especially in undergraduate school there aren't very many comparatively. So that's even more reason to be, "I am determined" — What's a more polite way to say it—stubborn. They are very persistent.

They were determined and would do what is needed to persist. Another staff member similarly said they have a "stick-to-it-ness." Unlike male students who might not have the same level of commitment, female students come to the discipline completely dedicated into becoming an engineer, as this staff member described:

> **Staff member 2:** I say that (um)—the way they maybe differ is that probably 100% of the females—close to it—are very dedicated and hardworking because—I feel—I think they know that it's a uphill battle already. Whereas maybe there is more male students who aren't as dedicated and committed, and are maybe just kind of floating through it—less (um) engaged. Maybe?
>
> **Me**: So why is there this uphill battle?

Staff member2: Just the basics, you know, it's, if you are going to be a female going into a male dominate, profession, major, whatever—you know you're going to get a little bit of resistance. And so (um) to me that (um) was part of the thrill, part of the challenge, "Yeah, I'll take it." "I will show you." But I think that it's not something that's a female will tend to just randomly decide she randomly wants to be an engineering student. Whereas I think there is a lot of males, more males, that are—that's an option for them—and "Oh, well, we'll just give it a try" but they're not necessarily as committed.

Finally these students must overcome the roadblocks that come their way, and this dedicated spirit sets them apart from their male peers and helped to prepare them for the profession, as described by yet another staff member:

Me: And why do you think female students persist in engineering?

Staff member 3: Um, I'd say for the same reasons that the male students do but it's a little bit magnified because it's even a more unique—I mean getting an engineering degree sets you apart from everyone else, and if you're female doing it sets you apart even more. And I would say because they can. If you are good at science and math and you like that, um, you are not going to give up on that just because you come into a couple of, you know, roadblocks. And I think they persist because they're good at it. I think that they are not intimidated by issues—that they may face in life in that profession. I think going through 4 or 5 whatever years of college in a male-dominated major helps them prepare for being a male-dominated profession. And I think that if you're successful as a student you are just going to keep at it and be successful.

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Time and time again, in my observations and in my interviews, female students and students of color were always showing they were willing to go beyond. In other words, they were learning to differentiate themselves so that they would be perceived equally as or better than the males from the dominant context. They knew they couldn't sit back and relax and not get noticed. They had to be constantly engaged in their constant "student state" always showing that they were willing to go the extra mile to be noticed. Being noticed meant that they were valued like everyone else in the program.

Automating in attempt to reproduce professionals. In addition to superhero-ifying to elevate their social status in the discipline, these students were learning what it meant to be professional. They were minimizing their personal feelings, they moved on without dwelling on their feelings, they did not complain, and they took care of business, as described by this staff member:

Staff member: I think that it could be because they've—they've learned to be themselves and people can like it or not. They don't seem like they really are gossipy type of women overall…Um—they have a way of, you know, in group projects they tend to get down to business, and they—they really take care of business. They don't let personal issues get in the way as far as I've experienced. I think that when a relationship ends, they don't dwell on it—whether it be romantic or a just purely friendship. They are good at—they know that everything comes to an end, and you have to move on and take care of business and move on to the next step. And I think that is applied when they move on to grad school or they move onto their careers. They know that the friendships they are making in undergrad are not always going to continue. But they seem to make the best of it.

> Again it comes back to what they are bringing to the table. Yes, friendships are great, but they are learning in their undergraduate years that they have to learn how to start business relationships with people who are going to help them get further—even if they end up going in different directions. Two individuals come to mind who worked very closely on a project for a year and half, and was like they were inseparable, and they—I believe they don't really now talk to each other at all anymore.

Female students were expected to remain professional, which meant using relationships to help them get ahead or elevate their social status in the discipline. They had to downplay their emotions and their femininity in order to not be perceived as "gossipy women" (who really had no purpose). They worked in an automatic fashion, where they pushed away their personal-ness in order to be perceived as successful students and to also elevate their social status. In other words, they had to adhere to the dominant context where values of hard work, self-productivity, and being professional (or downplaying emotions) were required of them. Any blatant act of display that countered these dominant values was seen as confrontation to how things were.

Also, they believed engineering was its own world where social justice issues were not necessarily seen as relevant, as Jasmine conveyed, "It's like stuff I don't pay attention to any more, because I am in here and everyone is predominantly Caucasian anyway. And the few minorities there are—we all just make fun of each other anyway. I don't know that class (ethnic studies class) was different. But it didn't make me go back (away) from engineering." So this "not paying attention" seemed to suggest that they

were okay with their professionalization as engineer because "that is just the way it is and there is nothing you can do to change it."

Leaving the discipline/questioning the discipline. The last consequence of female students and students of color who perceived themselves or others being treated differently in a culture was that they began to question the discipline. When a male student of color concluded in the interview—"Yeah, I can't tell anyone else about the politics here. I can't tell anybody else how messed up about some of this is around here"—he was showing his frustration and questioning his participation within the discipline. In his case, he did not plan to leave the discipline. But you can see that he was close. What this last consequence really means is that something in the context is somewhat amok and not what it seems. Students were actively identifying differences between individuals and inconsistencies, which caused them to question the discipline in the end.

Conclusion

Professionalizing students in preparation for becoming future civil engineers is a way to flatten identities and cultivate/reify a culture of sameness. The focus on the individual is the mechanism, which supports work-related values as students prepare to go into the field. Students are coming to the discipline ready to be challenged and prove themselves as individuals. They then discover that they and other students are being treated differently or more favorably. They encounter uncomfortable interactions along the way, but they choose to disregard or avoid these interactions; confronting the issue may be seen as "unprofessional" and cause them to lose social status. Finally, they are working harder than ever to be acknowledged and noticed inside the discipline. However,

they use this agency as a way to affirm the existing dominant context rather than confronting the context for the allowance of difference.

In chapter 8, I will synthesize my findings, offer conclusions, and provide final reflections.

Chapter 8: Pulling It Together

"Found what? " said the Duck. "Found it," the Mouse replied rather crossly: "of course you know what 'it' means." "I know what 'it' means well enough, when I find a thing," said the Duck: "it's generally a frog, or a worm. The question is, what did the archbishop find?" (Carol, 2013, Chapter 1, para. 3)

Introduction

In the end of a critical qualitative study such as this one, we sometimes end up with more questions than answers—much like the larger question, "what did the archbishop find?" We can never truly know what is happening in a context completely. However, we can come to a more nuanced perspective by looking critically and reflexively at seemingly "normal" or "neutral" contexts, such as inside a civil engineering discipline within a university setting. More questions than answers show that no cultural context is ever straightforward. We as meaning makers interpret what we see or feel either in ways that reify existing structures and cultural systems, or in ways that stop us to reflect—or cause us to pause.

Pausing is a good thing. Pausing lets us see the inconsistencies that might lead us to contradictions and injustices, which may be occurring within the dominant context. Without pausing, we go through life idling along as if things are as they should be. When things go wrong or cause us to question as we idle along, we sometimes blame ourselves for something we personally did not do or could not do. We then start "leaning in" or some other accommodating "deficit" behavior that supports existing ways of how we should act. Any form of resistance that counters the existing viewpoints/value system is seen as unprofessional, uncooperative, and, therefore, unacceptable. "Fitting in" as a

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professional is a cost to our personal authenticity as we accept the flattening of our identities in order to accommodate what our employers expect us to be.

I conclude this study with a hope to cause the reader to pause. There are no real answers; however, questioning existing contexts is a start toward unraveling the "illusions of unity" (Foucault, 1972) in a culture of sameness. In this final chapter, I will summarize my findings, share implications of this study, provide suggestions to administrators and students, and explore directions for future research. Finally, I will share some final impressions. Coming from a place of reflexivity, it is my duty to reflect on how I have been changed.

Synthesis of Findings

Intentional rituals of practice (such as, fast rhythm, huge demands on students, rigid course path, high stakes testing, and/or humor to differentiate or to regulate) encourage the professionalization of students—regardless of cultural/ethnic background or gender identity—toward collective sameness and away from individual difference (or personal authenticity). In a culture of sameness, the focus on the individual is used conveniently to reify relevant and supported values of the discipline in preparation of students becoming professionals. In the case of professional civil engineers, these values consist of the following:

1) *Equality* – everyone, in appearance, is treated the same;
2) *Being professional* – focus on being productive, cooperative, downplaying emotions/reactions, disengaging from personal-ness;

3) *Positivism/Logic* – focus on quantifiable problem-solving, which is seen as neutral. There is a logic and order to reality where math and science can provide valid/reliable explanations to problems;

4) *Personal Productivity* – focus on one's effort and hard work, which leads to professional success; and

5) *Meritocracy* – focus on rewarding individuals and their own individual efforts.

While there is nothing inherently wrong or bad about these espoused values in themselves, they are not as neutral as they may seem or as they are framed. The focus of these values seems to be on the individual and yet ironically these values do not support individual differences. In a culture of sameness, differences between individuals are not seen because they are not seen as relevant as one staff suggested, "It's almost like people say, 'you don't see color.' I really think that people don't see the gender differences as far as faculty, advisors, ya know. I don't think that females are treated any differently, which—I think—is a good thing."

A culture of sameness, especially within professional contexts, supports the notion of "the individual" in terms of personal productivity, commitment to the task/project at hand and the effort to the task/project at hand. A culture of sameness does not willingly sanction personal authenticity connected to personal difference or ethnic, cultural, or gender difference. Rather, a culture of sameness supports the idea that differences are not seen as relevant whereas certain professional ways of being or acting are. As long as an individual performs in a certain way then personal differences are no longer seen as a barrier (or more bluntly, a barrier to how things should be).

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Identifying the contradictions in a culture of sameness is one way to expose the "illusion of unity" (Foucault, 1972). In exploring the contradictions, I discovered that females and students of color were at times treated differently and in subtle ways. To me, this seemed contradictory in a culture that supposedly treats individuals the same. What I found in a culture of sameness were certain sanctioned behaviors and approaches, which helped female students and students of color to navigate more successfully inside the culture. For one, having or earning knowledge capital—which is defined as the comfort of one's own knowledge and "knowing-ness" inside the dominant context to navigate it successfully—is essential to students thriving in the context, and this recognition of capital helps students push through to the end. What is worth noting is the difference of knowledge capital between students. White males, in general, arrive to the discipline already having ordained knowledge capital because it is assumed on the offset that they have pre-existing knowledge or aptitude and/or have been adequately prepared prior to arriving to the discipline. White males don't have to work as hard to be noticed and they take their status for granted as one staff member shared:

> I say that (um)—the way they maybe differ is that probably 100% of the
> females—close to it—are very dedicated and hardworking because—I feel—I
> think they know that it's a uphill battle already. Whereas maybe there is more
> male students who aren't as dedicated and committed, and are maybe just kind of
> floating through it—less (um) engaged.

White male students who possess knowledge capital on the onset don't have to prove themselves and they can "float" along while still being viewed as capable. In contrast, female students and students of color in general have to earn their knowledge capital—by

getting noticed in class, by going to office hours, by networking more, by working harder, and so forth. Female students and students of color are not assumed to have knowledge capital at the onset so they must navigate differently to be noticed. They use their social capital—defined in this study as a "way for students to make social connections with others in order to facilitate their individual goals" (see Chapter 6)—in combination with earning knowledge capital to position themselves in ways to be seen by their instructors, staff, and administrators. For example, female students of color not only have to keep up with their regular/extremely demanding schoolwork but also have to participate in highly visible ways within discipline-specific student organizations in order to be seen. This is a way for them to earn greater knowledge capital via their social capital.

In face of being treated differently or perceiving themselves as different, female students at times participated in interaction rituals, which helped them push forward despite feeling uncomfortable or personally violated. Interaction rituals—again defined as "face saving that occurs when interactions with others are uncomfortable or cause discomfort" (Chapter 6)—served to validate the normative and sanctioned behaviors of the dominant perspective (in this case, the white male culture). In the civil engineering context, female and female students of color utilized these interaction rituals to help neutralize potentially harming interactions (either to themselves or to the individual(s) representing the dominant culture—or the white male perspective). In this study, these interaction rituals were represented by the following two themes:

1) Letting it slide, and

2) Minimizing personal emotions or "being professional".

Letting it slide is an interactional ritual used by a female student to minimize or avoid the uncomfortable interaction by not paying attention to it or not taking the interaction personally. When Terri said, "Well, it's okay. We will give it to you because you are a guy. We will just—I will let that one slide," she is confirming that letting it slide is preferable than confronting the possibly sexist, racist, and/or uncomfortable context. In addition, by minimizing personal emotions in an effort to maintain professional behavior, students are learning that emotions are not acceptable and not tolerated in spite of possibly sexist, racist, and/or uncomfortable interactional contexts. Students decide rather consciously to diminish how they feel and re-focus on the task at hand. They may blush inadvertently but they move on and get back on their feet to avoid looking unprofessional. These two interactional strategies both point to avoidance rituals that adhere to what is expected within the context of being professional in a culture of sameness.

Not only are female student and students of color using avoidance interactional rituals, they are also intentionally self-regulating how they present themselves within the culture of sameness. As a form of impression management (Goffman, 1959), female students and students of color are minimizing their gender, ethnic, and cultural diversity (e.g., dressing more androgynously in "American" casual apparel and behaving in way that is seen as "professional" such as unemotional and non-confrontational). They are also keeping up with problem-solving appearances. In other words, they focus on practical problems within engineering school but not on larger social issues such as gender identity, diversity issues, racial discrimination, and/or gender discrimination.

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But how is this culture of sameness affecting female students and students of color who have had to embrace a professional/sameness identity? One consequence is that they have to give up their personal authenticity for the sake of becoming a professional engineer. They become more automated as they minimize their feelings and their personal authenticity toward their acceptance of a professional identity. They have to separate their "home" identity from their "professional" identity. They have to switch—sometimes dramatically—their ways of being, acting, or speaking as they move between their community and their professional contexts. They have to heavily manage their personal identity/authenticity so that their "personal-ness" does not impact how they are viewed as a professional.

In addition to the loss of their personal authenticity when they become a professional, another consequence is that they have to rise as if they are superheroes. They have learned to use their knowledge capital and social capital in order to stand out, to be noticed, and to be seen for their individual accomplishments. They have learned to do it all—being social and knowledgeable without much help from their parents or their instructors. They rely heavily on their peer support—from students who are like them and who navigate similarly. They minimize their "human-ness" (e.g., feelings, emotions, hopes, and dreams) and forfeit personal/romantic relationships in order to actively engage in their role as a professional. They sense—and rightly so—that future bosses and/or instructors might think negatively of them using the "female card" (or tout being unjustly treated as a female and/or respond in an emotional way as "a female" tends to do) or the "race card" (or tout being unjustly treated as a person of color and/or respond in an emotional way as "a person of color" tends to do). They respond to racial, sexist, and/or

uncomfortable interactions by minimizing/avoiding their feelings so as not to be seen as using "the card" for some apparent social/power advantage. In a culture of sameness, using "the card" is viewed as an active protestation of how things are or are framed within the dominant context (or "white" male viewpoint in this study).

A third consequence is that female student and students of color will begin questioning the dominant context with questions like:

- What is expected of me to perform as an engineering student or future engineering professional?
- What must I give up personally as an engineering student or future engineering professional?
- Why am I uncomfortable here?

In other words, these students begin to question their personal identity as connected to their newly developed/developing professional identity. They question how things are done and their participatory role in the professional context. They question why they must undermine their personal authenticity, as they become professionals.

To conclude, female students and students of color are using agency but only in terms of reproduction "in the becoming of a professional." The biggest cost to them actively participating in this reproduction is that they give up a little of themselves/their authenticity in the process. As a result, they may feel distant from their home communities and "home" identity, which they left behind. They also may completely separate their personal lives from their professional lives in some sort of fractured "the real me" versus "the professional me." There is a price to be paid to become a professional engineer.

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Implications

So what does this all mean? The findings and interpretations of this study suggest that female students and students of color have to give up their personal authenticity in order to fit in as civil engineering students and future civil engineers. They have to adhere to regulatory aspects of the culture—which on appearance is focused on the individual but in reality is focused on sameness.   In a culture of sameness, students across the board are being trained as professionals with certain work ethic, behaviors, and attitudes in place before they go out in the field. They learn what behaviors are valued and which ones are not. In addition, female students and students of color learn that they must navigate the culture differently than the dominant "white" male student within the same context. They learn interactional/navigational strategies to be seen and not to be seen. They separate their personal identities from their professional identities so as not to be perceived as troublemakers or resistors. In other words, they actively and passively engage in their new alignment as an engineering student and as a future professional engineer.

We may wonder why the percentage of female students and students of color has not increased in the last thirty years until we begin to critically examine existing frameworks inside the dominant context. Programmatic solutions to fix the leaky pipeline—while well intentioned—do not point to the fact that something might be amok in the culture itself. In a culture of sameness, there is an inherent assumption that the culture is fine as it is and does not need to be changed. As long as students are being "objectively" measured as individuals, then they are being justly served. As long as there is a perception that students are all being treated the same or justly/fairly, then things can

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continue as they always have. When students come to the discipline unprepared to succeed inside the dominant context, students are the ones that need to change (and not the other way around). In other words, a culture of sameness promotes a consistency on how successful students should act, feel, and believe.

In conclusion, the results of this study offer a different perspective to a problem of why female students and students are not participating in higher numbers in a STEM discipline, namely civil engineering. The results point to the existence of differences among and between students based on ethnic background, cultural background and/or gender. Finally, the results show that the culture is not neutral even though a culture of sameness espouses that individuals across the board will be judged solely by individual accomplishments. In the end, individuals who adhere to norms of self-sufficiency, self-productivity, hard work, and neutrality are valued highly within this context. They are seen as the "successful" ones en route to becoming professional engineers. While these values are not inherently wrong, they do undervalue the role of personal identity as it relates to gender and/or ethnic difference. Female students and students of color are—in the end—the ones that must change the most and must adapt to the context the most to be successful.

Directions for Future Research

In Chapter 3, I acknowledged that this research study was limited in scope and timescale resulting in the harshest criticism of my research—which tends to be more ethnographic than anything else. As a working professional, I had to use vacation time to collect my data. I was able to complete a month and a half of classroom observations. In addition, I observed common areas before, between, and after classes. Although I was

invited to observe students who were working on a group project on a weekend, I was not able to do so. I acknowledge how relevant these sorts of "weekend" experience would have been in further supporting or possibly rejecting some of my conclusions.

With the above possible criticisms in mind, I would suggest that further ethnographic studies larger in scope and timescale should be conducted at the same field site (i.e. the civil engineering discipline at the same university). Being at the observation site for a full academic year while observing multiple classes during all student phases (i.e., freshman year, sophomore year, junior year, and senior year) would be very informative especially finding critical conclusions at the make or break transition point (or from sophomore to junior year). Also, doing a similar study with the same scope and timescale at a different university in the civil engineering discipline might be beneficial in validating, expanding, and/or rejecting some of my existing findings/interpretations. Next, a similar study in another STEM discipline (for example, chemistry) should be conducted to see if there are similarities or differences in patterns across STEM disciplines.

In addition, an ethnographic study in environmental or biomedical engineering would be a great counterpoint to the current study. With nearly 35% females in environmental and/or biomedical engineering as a U.S. average (Yoder, 2011), female students may be negotiating in more empowering and/or conceptually different ways in this discipline compared to other engineering disciplines where they are a distinct minority. Ecofeminism is a powerful mindset that engages males and females across the board in connection to protecting and conserving earth's species, resources, and habitats. Like medical professions, female students may feel more comfortable pursuing

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biomedical engineering. I would be curious if this mindset directly or indirectly impacts students who chose this discipline and whether or not this mindset separates these students from other engineering disciplines. I would also be curious if students of color, students who identify outside the heterosexual norm, and disabled students are more openly accepted/identified within the environmental or biomedical engineering context.

Finally, conducting a study where female students are the clear minority such as in electrical engineering or computer science with 5-10% female representation (Yoder, 2011) would be another informative way to validate, expand, and/or reject my findings. I would be curious if similar or different patterns emerged with a more extreme proportional difference between males and females.

All these suggested studies would further elaborate on the complexities within male-dominated disciplines and professions.

Engagement with Administrators, Leaders, Faculty, and Students

The findings from this study should be shared with administrators and leaders who can make policy changes at the discipline level. First, administrators and higher education leaders need to acknowledge that reaching female students and students of color is critical during the middle school and high school years. As a minimum condition, students who go into civil engineering must have an interest and ability in math and science and have been exposed to the engineering field in high school or earlier. We have to cultivate policy and programs that target these students early on. Second, it is my hope that this research can provide a counterpoint narrative to the leaky pipeline approach and other functional problem-solving approaches. I would like administrators, leaders, and faculty to see the complexities of the environment helping them to reflect in

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ways that will engage them in a conversation about what may be occurring within the discipline.

Returning to a point I made earlier, it is uncomfortable for faculty members, administrators, and educators to admit that they are somehow responsible for differentiating one student or group of students from other students. By espousing values of fairness and neutrality, we may be inadvertently supporting practices, methods of teaching, and communication styles that undervalue the diversity our students bring to the table and cause our "different" students to question the discipline. As Castagno (2014) mentions, our good intentions—while they may point to caring for our students—do not address social inequities that seem to entitle students who already have privileged social status by putting undue pressure on students who don't. So what can administrators, leaders, and faculty do? First, we need to engage in difficult talks about sexism and racism inside the discipline. We need to acknowledge the possibility that sexism and racism exist in our discipline and that sexism and racism (mostly subtle and sometimes overt) does impact our students' experiences, especially our female students and students of color. We need to acknowledge our own lack of awareness of "not knowing we are doing it," which is impacting students who feel different. We need to recognize that we may be inadvertently contributing to uncomfortable interactions with our students.

Second, we should question our existing beliefs, values, and ways of doing in supporting a culture of sameness that diminishes our acceptance and appreciation of our students' diverse identities inside an educational context. We need to dive deeply into what we are expecting our students to know and how they are supposed to behave as engineers. We need to question entrenched values because "that's just how it is here."

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Why is it supposed to be this way? Why can't it be different? What are certain values doing in support of students becoming engineers? Should these values be questioned?

Third, we need to look deeply within ourselves to see how we may be contributing to a learning environment that is more about students surviving and less about students learning. We need to cross-examine our lives as professional engineers and academic faculty in connection to our students. How should we look at student learning outside of how we were taught? Should we consider a different type of learning? How do our own personal and professional identities connect to how we are relating to our students? What are we expecting our students to know, explicitly and implicitly? Does it have to be this way, or can it be different?

Fourth, we need to engage our diverse students in meaningful conversations about what they are genuinely experiencing as students inside the discipline. Delpit (1988), a critical race theorist and researcher who supports the active method of critical engagement between instructors and students, writes:

> Teachers are in an ideal position to play this role (as critical facilitator), to attempt to get all of the issues on the table in order to initiate true dialogue. This can only be done, however, by seeking out those whose perspectives may differ the most by learning to give their words complete attention, by understanding one's own power, even if that power stems merely from the majority, by being unafraid to raise questions about discrimination and voicelessness with people of color, and to listen, not, to *hear* what they say. I suggest that results of such interactions may be the most powerful and empowering coalescence yet seen in the educational realm—for all teachers and for *all* the students they teach. (p. 297)

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We need to acknowledge our own fears about systemic change as we consider and honor our diverse students' perspectives in connection to the discipline. How can we facilitate these important conversations with our diverse students without unintentionally silencing these students in the process? And if we allow these discussions to occur without penalizing these students in the process, how will their perspectives inform us as we consider change and the future of the discipline?

Now let me turn to students. What can students glean from the findings of this study? First, female students and students of color need to give themselves a big pat on the back. They need to know that they are truly climbing an uphill battle by having to prove themselves over and over again. They need to acknowledge that mostly subtle and sometimes overt sexism and racism is occurring, and they should not be ashamed or dismissive about what they are experiencing. They should validate the support from their diverse peers to help them push through. Their friends are their greatest allies who can gently nudge them to keep moving forward. They need to know that the dissonance between their personal and their emerging professional identities is real.

Second, female students and students of color need to find the confidence to engage leaders and administrators on topics that propose a different reality, one that truly embraces diversity, diverse perspectives, and diverse identities. They need to be able to speak about their uncomfortable feelings and uncomfortable interactions without feeling penalized for unacceptable emotions. They have to acknowledge that avoidance interaction rituals such as "letting it slide" and "downplaying gender and emotions" are contributing to their adherence to a culture of sameness. They need to engage with their own sense agency in an effort to change the social context for the better of all students.

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They need to be willing to have those uncomfortable conversations with faculty and administrators when they feel threatened or marginalized, without fear of reprisal.

Third, white male students need to be aware that they are coming to their engineering discipline with an already elevated social status. Like faculty, they need to look critically at themselves in how they are interacting with fellow female students or students of color. They need to question if they are unintentionally or intentionally marginalizing female students or students of color in their classes or in their groups. They need to examine how their sexualized humor could be potentially marginalizing "different" students by supporting a heteronormative culture. They need to question their own existing beliefs and values, which support the idea "that's just how it is here." Why does it have to be this way? Could it be different? By engaging in difficult discussions, they may understand and appreciate the multi-layered perspectives female students and students of color bring to the table. They need to know that their willingness and openness to collaborate with female students and students of color is a positive first step but more is to be done to fully include female students and students of color inside the discipline.

Why I am Hopeful

All said and done, I am hopeful despite my somewhat grim findings about a culture of sameness. For one, an engineering career offers individuals a chance to rise from a lower socioeconomic status to higher one. In this sense, an engineering career is a positive indicator of individual social mobility in this country. In addition, civil engineering is about keeping the public safe and enhancing the lives of the public in the spirit of the common good. Individuals who have a strong civic-mindedness should

proudly use their problem solving acumen and creativity to help the public and enhance the safety of the public. Civil engineering works come together in a spirit of cooperativeness and not just from one individual's merits or accomplishments. Any public work (e.g., bridges, dams, highways, water works, etc.) requires individuals to focus on the project at hand and come together cooperatively—not from stroking of individual egos. Civil engineers make a commitment to the public and the public good thereby fostering community engagement and responsibility. They become the ethical gauge for business decision makers whose focus is on profits more than public wellbeing. While I acknowledge that civil engineers do go into defense industries and industries that could potentially harm the public, I do think most civil engineers have an ethic/a character like Matthew described to do good things for the public.

In my opinion any cultural shift away from a culture of sameness towards a culture of diversity promises a deep appreciation of the public and desire to make our functioning society better and safer. We need good, socially minded, and ethical civil engineers who protect us, the public, from undue harm. We depend on their ingenuity, their mathematical abilities, and their persistence as they approach public works and structural projects. With this said, the civil engineering profession must include creative, socially minded, and *different* individuals who love to solve problems for the purpose of serving the public good. In fact, individual differences point to the nuances of our complex society of relationships—a society consisting of mothers, fathers, children, singles, divorcees, relatives, distant relatives, friends, neighbors, colleagues, bosses, and so on who are all from different (ethnic, cultural, linguistic, gender, socioeconomic, religious, and disability) backgrounds. The civil engineering discipline (and profession)

needs to move beyond the focus on individual merits/competition supported by culture of sameness and instead move towards a more inclusive and cooperative culture of diversity where a variety of perspectives are cultivated and cherished.

Back Where I Started from, Albeit Changed

This study has been life changing in so many ways. Taking a reflexive approach to my study has caused me to reflect and look back at my own experiences as a young girl, high school student, undergraduate student, former employee in an engineering firm, STEM professional, mother, sister of a civil engineer, sister of a teacher, graduate student, and more. I found myself nodding my head to so many things during the interviews. I found myself blushing/reacting with students who I felt were targeted in more humilating ways or ways that were inconsistent. I cried. I laughed. I became confused. In my field notes, I reflected on past events that were similar to students' experiences. Sometimes I would even share my own past experiences with students trying to glean or help students discover a different perspective. As if peering through a looking glass, I used my insights and past experiences to tease out some of the complexities of the context.

All in all, what I thought I was going to discover is not what I discovered. I thought I was looking at a "female" issue with a feminist lens. However, I ended up discovering a larger issue about *difference*—with females in the subset—inside a culture of sameness. That was not the plan, but that is how data works with my constant churning, rechurning, analyzing, and re-analyzing ideas, which would at times haunt me in my dreams and take me away from my present reality.

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Much like Alice, I was a visitor, a participant, an outside observer looking in, and an inside observer looking out. From this place of reflexivity, I saw a world afresh and anew as I fell down that rabbit hole into a familiar but strange land.

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Appendix A: Two-Column Observation Form

Observation Date/Time _____

Observation Location _____

Pre-Observation Reflection:

Observation Description & Approximate Time Stamp	Qualitative Comments/Reactions

Post-Observation Reflections:

Appendix B: Female Students' Interview Guide for Semi-structured Interviews

- What brought you to the engineering discipline in the first place?
- How and why did you "make it" past your freshmen and sophomore years in engineering?
- How well do you fit in as a civil engineering student?
- How much effort is needed for you to be successful as an engineering student (and as a future engineer)?
- Do you have any concerns about balancing your career as an engineer and other aspects of your life in the future? Explain.
- Do you believe that your identity (as a female, as a lesbian, as a bi-sexual, as a female student of color, older female, for example) is valued in your engineering classes (including group work)? Explain.
- Have you ever felt that you or other students have been treated differently (by instructors and/or by other students) in your engineering classes or project/design groups? If so, how do you deal with the situation?
- Have you ever felt pressure to do something/say something counter to your identity (as a female, as a lesbian, as a bi-sexual, as a female student of color, older female, for example) in your engineering classes or project/design groups?
- Can you speak freely in your engineering classes and/or project/design groups? Why or why not?
- Have you ever experienced any forms of sexism (e.g., excessive teasing, sexist jokes, sexist comments, sexual harassment) and/or racism (e.g. racist jokes and/or comments, racial discrimination, racial harassment) that made you feel uncomfortable in an engineering class or project/design group? If so: What happened? How did you feel? What did you do about it?
- Have you taken classes inside or outside of the engineering that made you question the existing norms and values of the engineering discipline? If so, what happened?
- What have you done to change things you do not like?

Appendix C: Male Students' Interview Guide for Semi-structured Interviews

- What brought you to the engineering discipline in the first place?
- How and why did you "make it" past your freshmen and sophomore years in engineering?
- What does a successful engineering student look like to you?
- How much effort is needed for you to be successful as an engineering student (and as a future engineer)?
- How well do you fit in as a civil engineering student?
- Do you believe that your peers and instructors value you (as a person and/or contributor) in your engineering classes and in group-work? Explain.
- Can you speak freely in your engineering classes and/or project/design groups? Why or why not?
- Have you ever felt that you or other students have been treated differently (by instructors and/or by other students) in your engineering classes or project/design groups? If so, how did you deal with the situation?
- Have you ever felt pressure to do/say something in your engineering classes or project/design groups that did not truly represent you or your beliefs?
- Have you had any experiences that made you feel uncomfortable in an engineering class or project/design group? If so: What happened? How did you feel? What did you do about it?
- Have you taken classes inside or outside of the engineering that made you question the existing norms and values of the engineering discipline? If so, what happened?
- Do you have any concerns about balancing your career as an engineer and other aspects of your life in the future? Explain.

Appendix D: Staff Members' Interview Guide for Semi-structured Interviews

- Briefly describe your role at this university.
- How would your describe the general values, attitudes, and beliefs of an engineering student?
- Do the general values, attitudes, and beliefs differ between male and female students in engineering? If so, explain.
- How are students rewarded in engineering?
- Which students (or what type of student) receive(s) the greatest accolades or recognition in their classes or within the engineering discipline itself?
- How are female students supported in the engineering discipline?
- How are female students who may not identify with the dominant group (who identify as lesbians, bisexuals, students of color, older female students, for example) supported in the engineering discipline?
- Have female students come to you to discuss their relationships with other engineering students? If so, what happened?
- Have female students come to you to discuss their instructors? If so, what happened?
- Have female students come to you to speak about quitting their engineering studies to pursue another discipline outside of engineering? If so, what happened?
- When female students encounter problems in their classes, with their instructors, or with other students, how do you think they typically deal with these problems?
- Do you know of any instances of female students experiencing any forms of sexism (e.g., excessive teasing, sexist jokes, sexist comments, sexual harassment) and/or racism (e.g. racist jokes and/or comments, racial discrimination, racial harassment)? If so, what happened?
- Why do you think female students persist in engineering?

Human Subject
Informed Consent

College of Education, P.O. Box 5774, Flagstaff, AZ 86011, (928) 523-8761

Project Title: Female Students Navigating the Dominant Culture of a Civil Engineering Discipline

Dear Participant:
You are being asked to participate in a project conducted through **College of Education** at Northern Arizona University by **Sharon Gorman** that involves research. The researcher is required to receive your informed consent before you participate in this project.

SHARON GORMAN will explain to you in detail: (1) the purpose of the project; (2) what you will be asked to do and how long your participation will last; (3) how your personal information, if collected, will be kept confidential; (4) if you will receive any compensation; (5) the benefits; and (6) potential risks of participation.

Your participation in research is voluntary. If you choose not to participate, there are no penalties or loss of benefits or services that you are otherwise entitled. If you decide to participate and then withdraw or skip a question there are also no penalties or loss of benefits or services. Whether or not you choose to participate in this project will have no effect on your relationship with NAU now or in the future.

A basic explanation of the project is written below. Please read this explanation and discuss it with the **SHARON GORMAN**. Feel free to ask questions to help you understand the project. After any questions you may have are answered and you decide to participate in the research, please sign on the last page of this form in the presence of the person who explained the project to you. A copy of this form will be given to you to keep.

1. **PROJECT PURPOSE:**
The purpose of this study is to explore how female students navigate the culture of a civil engineering discipline where male students are the majority.

2. EXPLANATION OF PROCEDURES:
Data for this study will be collected using qualitative ethnographic methods such as passive observations in classrooms and/or in-person semi-structured interviews of female students who agree to participate in the study.

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3. CONFIDENTIALITY:
Your contributions in this study will be held with strictest confidentiality. No particular individual will be identified by name or by association when the data is reported from the observations and interviews in this study or in any subsequent academic publication. Pseudonyms may be used to identify individuals when these individuals' contributions add specific value to the analysis. Fictionalized individuals may be created from aggregate responses of students coming from more sensitive student populations (e.g. students of color, lesbian, bisexual, or transgender students) in order to maintain individual student's confidentiality. Data records, which may inadvertently identify specific students, will be restricted through password access. All audio recordings will be destroyed after they have been transcribed and the research project is completed.

4. COMPENSATION:
There will be no compensation for participation in the research.

5. BENEFITS:
Female students may gain a better understanding of the engineering culture that will allow them to negotiate the culture more effectively. Male students may gain a better understanding and/or sensitivity toward female students within the discipline.

6. RISKS:
There are no identifiable risks beyond normal risks of everyday life. In the event that anxiety arises as a result of being interviewed or observed, participants will be referred to the university's counseling program.

7. CONSENT:
I have read the above information about **Female Students Navigating the Dominant Culture of a Civil Engineering Discipline** and have been given an opportunity to ask questions. I agree to participate in this project, and I have been given a copy of this consent document.

I agree to be audio recorded for this research.   ___YES   ___NO

_____ Date _____
         Signature of Participant

_____
         Printed Name of Participant

_____ Date _____
      Signature of Research Representative

_____
      Printed Name of Research Representative

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The dated approval stamp in the header of this consent form indicates that this project has been reviewed and approved by the Northern Arizona University Institutional Review Board (IRB) for the Protection of Human Subjects in Research. Contact the Human Research Protections Office at 928-523-4236 if you have any questions about: (1) the conduct of the project, or (2) your rights as a research participant, or (3) a research-related injury. Any other questions about the research project should be directed to:

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