Science of Self: Self-authorship, social capital and women exploring careers in engineering

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Science of Self: Self-authorship, social capital and women exploring careers in engineering

by

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DEDICATION

This dissertation is dedicated to those who make my life meaningful in their selfless love and support:

- Monica, my daughter, whose old soul is beautiful and strong;
- Catherine, my daughter, whose love is infinite;
- John, my son, whose faith in what is good and right is noble and admirable;
- Nicholas, my son, whose energy and persistence is inspirational;
- Those enduring and supportive professionals whose vision and humanity never ends, especially Marisa Rivera and Larry Ebbers;
- Those very dear friends who listened and helped me laugh through some of the most difficult moments of my life, especially Jen Sabourin.
# TABLE OF CONTENTS

LIST OF FIGURES  vii  
LIST OF TABLES  viii  
ABSTRACT  ix  
PROLOGUE  x  

CHAPTER 1. INTRODUCTION 1  
  Background 1  
  Statement of the problem 2  
  Purpose of the study 7  
  Research questions 9  
  Significance of the study 10  
  Theoretical framework 13  
  Research Design 14  
    Constructive epistemology 14  
    Postmoderism 15  
    Fiction writing as research 16  
    Methods 17  
  Definition of terms 18  
  Summary 21  
  Organization of the dissertation 22  

CHAPTER 2. LITERATURE REVIEW 23  
  Gender and STEM majors 24  
    Masculine identity 27  
    Attrition 29  
    Themes in retention and completion 30  
    Community college role 32  
  Social capital 33  
    Social capital in STEM 34  
  Self-authorship 36  

CHAPTER 3. METHODOLOGY 42  
  Characteristics of qualitative research 42  
  Philosophical assumptions 43  
    Theoretical framework 43
LIST OF FIGURES

Figure 1. Overlapping dimensions of the self-authorship process 46
LIST OF TABLES

Table 5.1  Women’s initial SA and SC ratings  171

Table 5.2  Self-authorship expression matrix  173

Table 5.3  Characteristics of the phases in the development of self-authorship  176
ABSTRACT

This paper establishes a theoretical framework that will support a qualitative study of young women who, in their second year of college, struggled with and ultimately determined a career path after first considering engineering as both a vocational choice and an identity. Establishing Baudrillard (1995) as the primary theorist for this constructivist qualitative analysis, the intersection of self-authorship as defined by Magolda (2007) and social capital as defined by Yosso (2005) will be investigated as the theoretical basis for which to begin an affective understanding. Additionally, basic literature on diverse women in STEM (Science, Technology, Engineering, and Mathematics) will be collected, critiqued, summarized and interpreted before moving on to consider the ethical implications of this work. The research data analysis will be briefly mentioned before the summarizing discussion asks how the conclusions of the analysis can best advocate for changes involving both the participants engaged in the study as well as external readers of the work. Suggested contributions to education systems, evolving knowledge data bases, and practitioners will be considered.

Fiction writing as research was used to conduct this study. From the narratives, three themes emerged regarding students’ understanding of themselves, their personal power and STEM as both a factor in self-authorship as well as a power in its own right: (1) Balancing the scales--social capital as help and hindrance; (2) Finding the center of self; (3) STEM’s mystique. Seven suggestions for best practice in encouraging women to persist in engineering were provided.

Keywords: Self-authorship, Women in STEM, Social capital
PROLOGUE

Dear Readers, before you embark upon the journey I am about to lead you on, it is important that you consider the form and content of my dissertation. Writing a dissertation is allowing a vulnerability of the soul in a new and unique way. Once the journey is begun, it changes the person and, in a way, redefines them. I chose this risky path because it is my path. Just as the young women I have presented you with here, I too have come to my own crossroads and my own self-authorship continues to be shaped by social capital. So take a moment to read why I chose to take the road less traveled.

I Chose This Path

Because I believe that the important truths have always been revealed through story

Because I believe in the multiple dimensions of truth

Because I have seen truth buried when diversity of perspective is dismissed

Because I can bring new life and fresh perspectives that are valuable to research

Because this was the most significant learning experience of my life

Because while this path is unknown and scary to some, I have the courage to do it

Because life is about risks and trusting in our fellow pilgrims to embrace the foreign

Because this made me understand my subject in a revolutionary way

Because it doesn’t matter if I am successful by the measure of the academic world

Because I am successful in my eyes

Because I seek the truth, no matter how difficult

Because I will not lie about who I am or what I know or how I come to know it

Because I am me
CHAPTER 1. INTRODUCTION

Background

Throughout the world, college has become a foregone conclusion linked with success at the individual and national level. The United States recognizes this global awakening and is rushing to ensure that what was once the most educated population in the world does not fall to second place. Today, an ever-increasing number of American students are enrolling in post-secondary programs. Yet the concern that the United States continues to dip in technological prowess has been historically noted. A primary publication investigating this trend found that the declining amount of bachelor’s degrees awarded in engineering began in 1987 (BLS, 2003). Certainly the United States needs to carefully investigate why this is occurring or they risk losing their edge in developing technologies and advancing innovative and creative ideas in the STEM fields. Due to the significant lack of women interested or persisting in these fields, increasing their participation in STEM fields would drastically increase the total numbers. Additionally, the United States needs a work force that reflects its diverse population, not just a homogenous group of Caucasian males who have and continue to make up the majority of professionals in STEM. This applies to all fields but is particularly relevant to the field of engineering, the primary focus of this study. Multiple studies have noted that engineers of the future will need skills such as a creativity extending beyond traditional learned skills, the ability to communicate, and a willingness to work in teams (ABET, 2000, 2006; CAWMSSET, 2001; Lipp, 1999; NSF, 1997). Women and minorities can and should play a key role in addressing these needs but must be introduced and guided through a system that has traditionally almost exclusively employed men.
Statement of the Problem

Somewhat reassuring is the growth of women seeking post-secondary education. This, however, is only after decades of foregoing advanced education as a result of many factors including personal choices or societal influences. In fact, today the number of women enrolled in college usually outnumbers the enrollment of men. In 2010, the U.S. Census Bureau reported that 58% of all bachelor’s degrees awarded in the United States were awarded to women. According to 2012 data from the American Association of Community Colleges, community colleges throughout the United States enrolled 43 percent of all undergraduate students. Of these, 57 percent were female. The American Society of Mechanical Engineers is actively reaching out to middle school females and minorities in an attempt to broaden the diversity (Wepfer, 2013). Other organizations like the Women in Engineering ProActive Network (WEPAN) Knowledge Center have gathered information and resources related to women in STEM, as well as providing an opportunity for professional networking. Despite this good news, women remain largely under-represented in science, technology, engineering, and mathematics (STEM) careers in most industrialized countries throughout the world. In 2009, men earned a majority of bachelor's degrees awarded in engineering, computer sciences, and physics (82%, 82%, and 81%, respectively) (Blickenstaff, 2005; NSF, 2012). In 2006, only 34 percent of all United States graduate students in the sciences and engineering majors were women. Similarly, in 2006, only 25.3 percent of science majors in graduate schools were women and in 2007 only 18.4 percent of doctoral degrees in physics were awarded to women (Szelenyi & Inkelas, 2011). This has slowly changed as nearly half of the 611,000 U.S. S & E graduate students enrolled in the Fall of 2009 were women, but women continue to enroll at disproportionately lower rates in
engineering, computer sciences, physical sciences and economics (Science and Engineering Indicators, 2012).

Some critics of programs designed to increase women’s interest and persistence in STEM have suggested that women who elect not to follow a STEM path are choosing with the same knowledge of the fields as men. However, often neither men nor women are fully aware of future employment opportunities. In 2007, the Department of Labor found that 20 of the fastest growing occupations would require advanced training in math or science by 2014. If that is the case, anyone without a STEM degree will be at a disadvantage for employment opportunities, primarily women.

Other critics have perpetuated the faulty perception that female students cannot keep up with their male counterparts in higher-level math courses (Betz & Hacket, 1986). This has been a generally assumed claim suggested by Lawrence Summers while president of Harvard University, who infamously quipped that female underrepresentation in math and science is because of “different availability of aptitude at the higher end” (as cited in Fein, 2005, p. 1). Such ideas lead to the misconception that females should not pursue careers that involve higher-level math or science courses. Some female students have said they “wished someone had told them earlier that they could study engineering” (Starobin and Laanan, 2005, p. 35). In the same paper, Starobin and Laanan state, “a lack of social and academic support for female students to pursue STEM fields can impede their academic and career aspirations” (p. 32). Another perception that may keep women from working in STEM careers is a belief that STEM careers’ rigorous demands imply a harder time raising a family (Viradero, 2009). Frome analyzed the career aspirations of 137 female high school girls who graduated in 1990. Eighty-three percent of the women who originally said they were planning on entering a male
dominated career had changed their goal to a female or gender-neutral job within seven years. Frome suggested that, “Many male dominated fields are still inflexible in practice” (p. 35). This may explain why women, at a ratio of 3:1, leave STEM careers at a higher rate than men (Ceci, 2010). Women may perceive that the longer hours often associated with STEM jobs will likely interfere with family responsibilities.

Brainard and Carlin (1998) conducted a six-year longitudinal study and arrived at a disturbing conclusion: retention and completion rates by women in the STEM fields have lagged behind those of their male counterparts, and this retention rate had decreased by nearly 30 percent. However, the study also noted that STEM retention rates, overall, have the lowest retention rates among all disciplines. So, while STEM needs to improve all students’ persistence rates, in order to improve women’s advancement in STEM it is necessary to understand their unique challenges and implement strategies for addressing those challenges (Reyes, 2011).

Drawing from multiple studies by Starobin (2004), Starobin and Laanan (2005), Starobin and Laanan (2008), and Lloyd and Eckhardt (2010), four common themes or issues have been identified as affecting retention and completion rates in the STEM fields by women. First, the myth that male students are better at math and science than female students remains a social hindrance (Foer and Walden, 2009; Lubinski and Benbow, 2007). While no scientific study has shown a direct causal link, it has been noted in individual cases that positive support or enforcement by family, co-students, faculty, counselors, advisors, and/or role models from industry positively influences persistence. This encouraging interaction translates into determination, learning, and success. These authority figures become role models, mentors, and guides for the educational path the student has laid out. Second, a clear
pathway or educational plan is needed for students to follow which supports young women’s interests in engineering (Kekelis, Andcheta and Heber, 2005; Kekelis, Ancheta, Heber, and Countryman, 2005). Advisors and the support network need to be fully aware of each step in the path to success; a plan that balances workload, manages time, and maintains meaningfulness of the program is crucial. Having all content related to the central focus keeps the student engaged in studying, putting content into practice, and learning and demonstrating application. Third, a positive learning environment has to be present that balances leadership responsibility, peer-led team learning, peer tutoring, and student-teacher interaction. Starobin and Laanan (2008) proposed that these elements working positively together build self-esteem and confidence in the female student. It is important that STEM female students take a course with high expectations, requiring them to utilize higher order cognitive activities with frequent participation in faculty interactions, both in and out of the classroom. Learning the material and course content, successfully leading and working with others, and comprehending complex conceptual knowledge will likely result in positive engagements and a successful outcome. Changing from the traditional lecture-based course to one filled with application and real-life opportunities is an active learning strategy demonstrating the active part of strong STEM pedagogical practices. Fourth, establishing the previous three conditions enable female students to believe in one’s self, increase self-confidence, and establish positive attitudes of success. Once these practices are experienced, the student will continue along their educational path and reach their goal.

An example of a response to many of these findings is the FREE project (Female Recruits Explore Engineering) operating from 2006-2009. Using NSF grant funds, high school women identified as strong students in math and science were introduced to
engineering by meeting engineers, visiting engineering workplaces, and practicing engineering themselves (FREE, 2010). The population consisted of mostly minority high school women who had excelled in math and science courses. Yet, by the project’s end, only 22% were considering pursuing engineering, despite the NSF based intervention grant providing mentoring, academic planning, and career and college explorations into engineering. The project was extended to include four years after high school graduation and will end in the spring of 2013. The researchers are following the FREE women and collecting longitudinal quantitative and qualitative data in an attempt to determine what causes women to persistently follow or leave STEM fields.

The AAUW analyzed studies focused on women in STEM. In 2010, *Why so Few?* was published by AAUW as an extensive collection of all the research findings from two decades of questioning why women were poorly represented in the STEM professions. The conclusion was that women’s success in STEM fields involves social and environmental factors. As a result, NSF funds many national initiatives such as ADVANCE (Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers). Individual universities like Iowa State University, Purdue University, Syracuse University, and the University of Wisconsin, Madison, among many others, have responded to the recommendations of the AAUW study and formed learning communities for women in STEM extending into the young women’s residential, social and academic experience. Alumni are recruited to assist in the new female engineering students’ networking. Yet, none of these programs have substantially balanced the engineering program’s male/female ratio. Research suggests that in the past women who began in engineering and did not continue, believed they were not capable of persisting (Brainard & Carlin, 1998; Nauta & Epperson,
Women who do persist as engineers confirm this pattern (Rittmayer & Beyer, 2008; Zedlin, Britner, & Pajeres, 2006). Using a model of self-efficacy (Bandura, 1986, 1997), Rittmayer and Bayer (2008) contended that if a female student believes she could meet a challenge, she can actually do it. Yet, how that confidence can be gained for young women considering engineering continues to challenge institutions and educators everywhere.

The three foci--self-authorship, social capital, and STEM--have been connected in pairs but never in a triad. Researchers have obliquely discussed the relationship between forms of social capital and STEM pathways, but it is difficult to quantify the multiple forms of social capital and therefore primarily address the issue in terms of socio-economics or other demographic characteristics. Additionally, Vondracek (1995) theorized that self-authorship might be achieved through integrating career choice and personal identity. Further, self-authorship development allows an individual to both recognize social capitals they possess and those they lack (Martinez-Aleman, Rowan-Kenyon, & Savitz-Romer, 2012). This study looks at self-authorship, social capital and STEM career choices as interlinking concepts.

**Purpose of the Study**

The purpose of this study was to better understand the barriers young women, who had the advantage of being recognized as gifted in the field of engineering and participated in an introduction to engineering program designed to foster the desire and ability to pursue an engineering career, still have to face before obtaining an engineering degree. Due to the extensive studies done on the under-representation of women in STEM from a traditional quantitative or a traditional qualitative perspective, this study was designed to delve into
existing research and my own experiences as a daughter of STEM parents, a graduate researcher on a women in STEM project and a long time English professor in order to illuminate how young women chose or did not choose to become engineers. Existing work on how women come to know and choose engineering is rich, but it lacks an effective narrative to explain why. Researchers skilled in their field have collected and analyzed data and statistics, but appear to fall short in their ability to handle narrative. This study’s experimental approach can bring new, fresh understanding of young women who are capable in STEM but may not choose STEM careers. This study intentionally approaches the problem of too few women persisting in engineering by enriching existing quantitative data with humanity behind the numbers. Ultimately, the purpose of this study is to be accessible to audiences outside the academy and inspire them to breathe new life into old research familiar to most STEM educators and solve the problem. This study questions how internal, personal factors influence career decisions instead of pursuing external factors more suitable to quantitative research. The stories appearing here reveal how young women considering a career in engineering define themselves, using the principles of Magolda Baxter’s self-authorship theory and utilize social capital. There is a paucity of literature investigating women’s voices in the STEM pipeline whose capital is found wanting for success in achieving a STEM degree. This study was designed to examine the social resources and experiences informing women who were ostensibly “given” this information when enrolled in an introduction to engineering NSF program.

Recognizing that the narrative analysis of a limited amount of individuals does not necessarily speak for every woman who has or has not chosen a STEM field, this study explored various capitals the women had as resources using both social capital theories and
self-authorship theories, creating a context to understand the career and educational choices made three years after completing high school.

**Research Questions**

This study seeks to examine the intersection of self-authorship and social capital and STEM career selection of young women who had participated in an introduction to engineering high school program intended to remove barriers to an engineering degree. By answering the following questions, this study attempts to generate additional knowledge designed to close the gender gap among students pursuing STEM majors:

1. Using Fiction Writing as Research (FWR), what social capital did the young women bring to college after participating in an introduction to engineering program during their last three years of high school?

2. Using Fiction Writing as Research (FWR), how did the young women’s self-authorship and social capital evolve three years after participating in the introduction to engineering program?

3. Using Fiction Writing as Research (FWR), how does the use of Social Capital affect the young women’s self-authorship as a STEM or non-STEM student three years after graduating from high school and participating in the introduction to engineering program?

**Significance of the Study**

The need to better understand why there is a paucity of women in STEM was addressed in the current research. Through experiences as a professor who interacts daily with young women considering career options, exposure to extensive literature on this topic
and graduate research experience working on the introduction to engineering program, the present researcher’s study offers a unique way to understand young women’s search for self using social capital and career choice. Engaging in progressive fictional research as writing methodology (FWR) allows the reader to appreciate young women’s angst revealed through their own voice. Unlike traditional methodologies typically striving to obtain binary conclusions, FWR engages the audiences’ imagination to holistically empathize with the young women’s situations.

The fictional research as writing content was based on the young women who were afforded a venue to reflect on their developing career choices as past participants in an introduction to engineering high school program. In this manner, the researcher assisted in coding the guided interviews as well as guided Facebook questions answered within a virtual community of past program participants. This recent creation of social media allows researchers a unique opportunity to observe the private lives of participants in a public space, adding to the understanding of why women choose or do not choose STEM fields. Taylor (1997), a recognition theorist, described the importance of knowing the uniqueness and distinctiveness of a group’s identity in order to construct a “new understanding of the human social condition” (pp. 233-234), implementing new meaning to an old practice or principle. This is necessary as the United States implements and supports policies encouraging the participation of women and minorities in STEM fields. Having a better grasp of how self-authorship and Social Capital intersect in the career choices of young women who have been engaged in previous programs intended to increase their ultimate choice of STEM as a career, will enable the modification of current national and institutional policies to promote an increase of diverse backgrounds in essential STEM fields.
This narrative research is based on thick, rich descriptions of young women in unique situations including the more invasive structured interview space, the communal, less invasive space of answering open ended questions in a virtual community environment, and finally a very free space within the relatively new setting of Facebook. These various environments will give researchers greater insight into the career choices of mathematically and scientifically gifted women.

The use of fictional writing as research for a methodology to conduct this study recognizes the very limited understanding positivist traditions have in the non-traditionalist perspective, believing that all research “is fictional in the sense that it involves either the observer’s or the subject’s accounting of what has occurred, of what something means” (Denzin, 2001, p.153). Yet, as a researcher, I have consciously avoided the trap many qualitative researchers fall into, in particular those who attempt experimental research such as this; the “trap” is the focus of the study and becomes the defense for the methodology chosen. Instead, I use Howe and Eisenhart’s (1990) contention that there is “no good reason for educational researchers to attempt to legitimate an alternative paradigm so that it might peacefully coexist with positivism” (p. 3). This study is done in accord with Denzin’s (1997) “6th moment” of ethnographic research that assumes the researcher creates the lived experience, he/she does not capture it. Recognition of this is honest research. Additionally, the 6th moment recognizes that the research text’s truth is compromised in any form of methodology chosen. The experimental qualitative researcher accepts this most completely and moves forward with the assumption.

Banks and Banks actively engage in the conversation revolving around their own fictional and social research by stating, “Fiction threatens the whole research enterprise.
Research, no matter how qualitative and interpretive, rests on fundamental beliefs in reliability, validity, and objectivity in reporting…a need for the narrative to be free of the researcher’s imagination” (Banks & Banks, 1998, p. 17). In place of this, fiction consciously chooses to see even qualitative research’s greatest trademark method, the interview, as fraught with positivist assumptions. Not only can the interview not be repeated, thus showing validity issues due to the inability to have a replication of results, it’s a dialogue that is itself a “re-memorying” and interpretation between the speakers. The questions are framed by one converser, answered by another, and comprehended again by the first. Fiction works to honestly confront this silent reality, often ignored, and, through a crafted world of characters and events, finds truth that is as valid as the positivists and the traditional qualitative researchers’ while also being honest in the ability for anyone--researcher, audience, or participant--to really know an objective truth.

Finally, this study will add to the literature that has been conducted on less specific undergraduate populations related to self-authorship (Abes & Jones, 2004; Abes & Kasch, 2007; Creamer and Laughlin, 2005; Pizzolato, 2003, 2004, 2005; Torres, 2009; Torres & Hernandes, 2007). This new construct for understanding human psychological development is necessary because it affords an individual the opportunity to learn how to learn for herself instead of concentrating on what to learn (Baxter Magolda, 2009). Young women who are appropriately developing self-authorship can critically analyze information, disagree respectfully, no longer fear other’s reactions, and make responsible choices (Baxter Magolda, 2009). All of these are life-navigating skills. The better policies and program incorporate the importance of self-authorship, the better they will be positioned to “eliminate those features of institutions that are necessarily stressful or inhibiting, and ultimately, to create those
features that will challenge students toward active learning, growth, and development” (Strange & Banning, 2001, p. 4). The significance of the current research study was founded upon a desire to construct a new understanding of women at the fulcrum of career choice to better inform policies and educators in encouraging not just the increase of women and minorities in STEM, but considering the importance of incorporating self-authorship as a theory within those policies and practices.

**Theoretical Framework**

Baxter Magolda (2001, 2009) made significant contributions to the theory of self-authorship as a concept in general and as it relates to undergraduate students. Even though self-authorship had been discussed within disciplines such as psychology, Baxter Magolda built on this traditional view to refine and expand the concept across cultures.

Baxter Magolda’s many publications incorporate social capital as a part of self-authorship development and revelation. Hamer and Rossum’s (1984) work in the six-stage model of students’ views on good teaching was a guide to Baxter Magolda’s work in self-authorship of students. It was later crafted into a six-stage learning-teaching concept model, again influencing the self-authorship conceptual framework and theory. This framework intersects Baudelaire’s postmodern framework for Social Capital, later categorized by Yosso (2005). To view Social Capital as currency, is to highlight the precarious nature of minority and lower socio-economic women, already disadvantaged in choosing and persisting in STEM fields, to have additional disadvantages in fundamental self-authorship incorporating STEM. Establishing Baudelaire as a primary theorist, Baxter Magolda’s self-authorship and Yosso’s definition of Social Capital, this study will begin to answer the research questions using FWR as a methodology.


Research Design

The research design employed in this study was inclusive of constructivism and postmodernism using the theoretical frameworks of social capital and self-authorship. This study employed fiction writing as research (FWR) to interpret experiences I have had as a professor at a four-year institution, a two-year institution, a graduate assistant within a National Science Foundation grant funded study which incorporated semi-structured interviews, Facebook responses to researcher’s questions, and an unstructured observation of the women’s personal Facebook postings and interactions. Additionally, my own experiences regarding social capital, self-authorship and STEM career paths informed the narrative as well since my third year of college was a year of significant changes in my own self-authorship and social capital. This set of narratives is a snapshot of four women’s processes in choosing a future and recognition of the barriers all women face in being able to choose a career and identity freely.

Constructivism epistemology

Constructivism is a cognitive theory first named by Piaget (1965). He disagreed with the previous belief that learning happened when the student was given a concrete set of truth or knowledge concepts from the master. In other words, the student mind was most successful in the degree to which it could become most like the master’s mind. Piaget instead believed that students needed to construct meaning out of situations. In this singular act, the learner partakes in a creative “constructing” of the truth. In many ways, Piaget follows Kantian logic in understanding that “the categories are not there at the outset” (Otte, 1998, p. 426). Instead, the student not only constructs the world, but himself as well. This is very
different from Aristotelian and traditional positivists’ understanding of knowledge as becoming aware of what already exists. Instead, what exists only exists in the manner in which it is perceived and defined by the observer. Without this shift in understanding, the post-modernist movement would have been impossible. However, by moving knowledge from a tangible, knowable omnipotent truth to primordial goo that becomes clay for mankind’s imagination, constructivism allowed for post-modernism to again reshape how research can be conducted.

Within the realm of research, Crotty (1998) defined constructivism epistemology as meaning obtainment through construction rather than by discovery. Meaning is only created through conscious engagement, not as an objective truth that the individual approaches. This study aimed to construct meaning through story. The introduction to engineering program participant stories were constructed through the author’s experience of analyzing collected datum that consciously engaged the study participants via personal interviews and Facebook artifacts.

**Postmodernism**

Postmodernism was defined as researcher interest centered on multiple realities, with each variance of knowing equally valid (Esterberg, 2002). Bourdieu’s theory of social capital (1988) oriented both the particular NSF grant program as well as the analytical narrative. Baxter Magolda’s self-authorship theory intersected by Yosso’s further development of Bourdieu’s Social Capital theory resulted in a theoretical framework and perspective that enlightened the methodology.
Fiction Writing as Research

Before understanding Fiction Writing as Research (FWR), it is important to understand what methodology fathered its inception: narrative analysis. Social science researchers have recently embraced narrative analysis. It is particularly well suited to this study as it takes into account that the “narrative fabric” of the self and the life of all humans is narratively structured (Freeman, 1997, 1998a, 1998b). Much of narrative analysis is inspired by the philosopher Paul Ricouer (1981a) who suggested the importance of narrative inquiry in research. To give the reason for narrative inquiry’s ability to further insight, Ricouer (1981a) notes four premises: 1) “meaningful action is an object for science only under the condition of a kind of objectification which is equivalent to the fixation of a discourse by writing” (p.203); 2) “In the same way that a text is detached from its author, an action is detached from its agent and develops consequences of its own (p. 206); 3) our actions are interpreted by others as “our deeds escape us and have effects which we did not intend”; and 4) that human action is an “open work, the meaning of which is in suspense (p. 208). Upon accepting these premises, it becomes clear that human experiences are literary texts and should be read as such. Narrative analysis allows researchers to consider two distinct dimension of the human narrative: the “episodic” which are the events that make up the story the researcher can observe, and the “configurational” which allows patterns to be seen and multiple meanings to be made from the single but infinitely complex story. (Ricouer, 1981b).

A unique sub category of narrative analysis recently developed is Fiction Writing as Research (FWR). While still relatively unknown, it is based on the post-modernist movement
that fueled the continual appreciation of qualitative methodologies. Using this analytical
stance, I endeavored to construct an understanding of how the fictional women I crafted by
my observations of very real women used their social capital and developed self-authorship
to choose a career path. This narrative snapshot of their third year of college allows for a
rich understanding of how their past experiences as NSF grant program participants informed
their choices as young women of limited social capital continuing to author the self in
choosing engineering as a career path or something different.

Methods

Using Crotty’s (1998) description, methods are the tools used to carry out the
research and analyze data in relationship to the overarching research question. For example,
in order to understand if the young women fully understand their STEM and non-STEM
career choices. Then, to determine if policies should be modified through the new knowledge
gained by this FWR study based on my experience employing meaning construction, semi-
structured interviews and Facebook artifact analysis within the NSF grant program. Use of
social capital model enabled discursive form to take place in an effort to identify how
academically gifted young women make STEM or non-STEM choices.

Definition of Terms

The following terms were defined for use in this research:

*Community College:* Two-year public institutions in the United States (often called Junior
colleges, technical colleges, or city colleges) focused upon providing higher education and
lower-level tertiary (college and university) education and granting diplomas, certificates,
and associate’s degrees (Beach, 2011; Brint & Karabel, 1989; Cain, 1999; Mellow & Heelan, 2008).

**Engineering:** Engineering continues to develop a variety of diverse pathways. In this study, engineering was defined by 12 of the most common undergraduate engineering programs: aerospace, agricultural, biological systems, chemical and biological, civil/environmental, computer, construction, electrical, industrial and manufacturing systems, materials, mechanical, and software.

**Social capital:** As conceived by Bourdieu (1986), social capital refers to those resources any individual can access for gain. Regardless of the individual’s inherent genetic or developed ability, an advantage is given with increased social capital connecting the individual to more powerful networks. Other currencies individuals possess in Bourdieu’s construct include economic (financial resources) and cultural capital (the ease networks are traversed due to the individual’s commonalities in knowledge and mores) within the category of social capital. To alleviate confusion, social capital will refer to the single form of social capital while Social Capital will refer to social capital, economic capital and cultural capital combined. Drawing on Bourdieu’s social capital theory, this analysis will also include the discussion of Yosso’s more specifically categorized theory of social capital as follows:

**Aspirational capital:** Aspirational capital is the degree to which families and individuals allow themselves to imagine possibilities. This requires imagination but also the support within the community that encourages and believes in the ability to first possess the dream, then to work for the dream and finally to achieve the dream. Gandara’s work captures it as “the creation of a history that would break the links between parents’ current occupational status and their children’s future academic attainment” (1995, p. 55). However,
this requires letting go of control and may even suggest that the family of origin’s cultural values will be shifted, changed or forgotten.

*Linguistic capital:* This term “includes the intellectual and social skills attained through communication experiences in more than one language and/or style” (Yosso, 2005, p. 78). This is not limited to the simple attainment of fluency within a language but being a cultural library holding rich oral history and cultural world-views including the process of understanding one’s audience. In Marjorie Faulstich Orellana’s (2003) work with bilingual students, she finds that students who are expected to translate from the school to parents and community members and back again are given tools that include “vocabulary, audience awareness, cross-cultural awareness, ‘real-world’ literacy skills, math skills, metalinguistic awareness, teaching and tutoring skills, civic and familial responsibility, [and] social maturity” (p. 6). This set of skills is valuable and yet can entrap students into a responsibility they are required to maintain, despite personal goals.

*Familial capital:* Another expansion on Bourdieu’s theory of cultural capital, this term “refers to those cultural knowledges nurtured among familia (kin) that carry a sense of community history, memory and cultural intuition” (Yosso, 2005, p. 79). This facet of cultural capital also transfers many values of the community to the individual who in turn forms conscious awareness of education and occupational choices (Elenes, Gonzales, Delgado Bernal, & Villenes, 2001). With the richness of the family, the individual is gently and unconsciously led to careers that are familiar and expected in addition to reinforcing communal bonds (Morris, 1999).

*Yosso’s social capital:* Social capital within Yosso’s cultural capital is different from the social capital of Bourdieu which would encompass all six of Yosso’s cultural capital
elements. Here, Yossos discusses the subset of social capital as “networks of people and community resources” which may or may not allow a student to go on to higher learning. In a dominant culture, a student may have social contacts and community resources that allow the student to be aware of the need for a scholarship, the existence of a scholarship, the proper preparation for the scholarship and finally the support that it is part of all community members’ experience. In a minority culture, a student may have social contacts and community resources that allow the student to be aware of other resources but perhaps not the resources necessary to gain entrée into the Academy experience.

Navigational capital: Navigational capital “refers to the skills of maneuvering through social institutions” (Yosso, 2005, p. 80). This can be as simple as understanding how to read bus schedules, which is likely to be far less a capital a dominant culture member will possess or as complex as the ability to persist despite resistance from a racially biased institution such as a university (Solorzano & Yosso, 2002). It could also include a student’s ability to navigate the higher education system. In any case, both the minority and the dominant cultures possess navigational capital, but in different currencies. The minority cultural currency can be exchanged in the dominant marketplace at a less appealing exchange rate than the dominant cultural currency.

Resistant capital: Resistant capital allows any individual to resist inequality. This skill engages both the ability to oppose subordination and the ability and willingness of “maintaining and passing on the multiple dimensions of community cultural wealth” (Yosso, 2005, p. 80). It is important to recognize that resistance may be ultimately self-defeating, and in fact, energize the system further to reproduce the existing inequalities (Delgado Bernal,
Still, Yosso remains hopeful that resistant capital can be transformative if the community maintains motivation for members to act against inequities.

**Summary**

Existing research on women in STEM attempts to increase women’s participation in STEM fields. Though self-authorship is a term that has been evolving researchers’ understanding of how the self is crafted, there is currently no literature that directly addresses how self-authorship applies to women as they consider STEM fields. Baxter Magolda’s (2010) work serves as the self-authorship theoretical framework used in this study.

An additional theory of Baudelaire’s social capital as a singular currency and Social Capital as an inclusive theory will additionally provide a framework to intersect with self-authorship theory as narratives reveals how the young women determine their careers. These two theories guided the researcher’s understanding of the inexorable relationship between women’s personal development, the currency they enter college with and the process by which STEM fields are chosen or not chosen.

The methodology of FWR as defined by Rolfe (2002) and Wade (2008) was used to investigate the primary research questions that involve constructivism and post-structuralism epistemology employing a self-authorship and Social Capital theoretical perspective. This approach enabled the researcher to construct a new understanding of what has become thoroughly researched. As a result, new meaning could be made of the current situation many talented young women find themselves in when determining their career and, in many ways, how they will author the self.
Organization of the Dissertation

This dissertation is presented as a Prologue, a series of five chapters, and an Epilogue. The Prologue explains why I have chosen a nontraditional approach to studying a field that values traditional research. Chapter 1 provides an overview of the study and introduces the guiding research questions. Chapter 2 presents a review of the literature addressing three areas of research: (a) gender and STEM majors, (b) social capital, and (c) self-authorship. Chapter 3 elaborates on the methodology used in this research: the research study’s theoretical framework, constructivism epistemology, and postmodern theoretical perspective. FWR is expanded upon and additionally provides insight as to how it should be read by focusing on the researcher’s role and positionality, ethical issues, delimitations, and limitations. Chapter 4 presents the narrative. Chapter 5 suggests themes and an interpretation of the narrative study. It further provides a context of FWR coupled with constructivism as well as providing recommendations for future practice, policy implications, and researcher reflexivity.
CHAPTER 2. LITERATURE REVIEW

In my younger days, when I was pained by half-educated, loose, and inaccurate ways which we all had, I used to say, 'How much women need exact science.' But since I have known some workers in science who were not always true to the teachings of nature, who have loved self more than science, I have said, 'How much science needs women!'

(Maria Mitchell, 19th c. Astronomer)

The amount of research concerned with the lack of women in STEM is remarkably abundant. The challenge became how to extract the most important studies while not overburdening the audience. A second challenge was the lack of research available on self-authorship, a relatively new concept intersecting with social capital and an evolving concept. The third challenge was the nearly non-existent research done on young women who have been given social capital throughout their educational experience within a STEM oriented federal grant program. Finally, perhaps due to the nature of the STEM subject, the bulk of researchers focused primarily on quantitative studies, thus presenting a fourth challenge. Knowing very little qualitative research has been conducted regarding the choices of women in science was daunting; it suggests the positivistic orientation of the STEM audience interested in such studies may be less accepting of an unfamiliar FWR qualitative design.

Despite these challenges, literature was obtained that discussed women in STEM, self-authorship and social capital.

The review of literature is divided into three primary subsections: (1) gender and STEM majors; (2) social capital; and (3) self-authorship. The literature for this chapter was sought from a variety of empirical sources. It included, but was not limited to, peer reviewed journal articles, doctoral dissertations, meeting and symposia paper presentations, and scholarly books.
Gender and STEM Majors

Women in STEM have been studied for many years. Though this study’s focus is on women in engineering, earlier research has been not been as specific; it is this research that can help frame the resulting dialogue of today’s researchers. One of these early studies involved Kahle and Meese’s study of young women in science education (Kahle & Meese, 1994). The finding suggested that in women’s opinion, science was not an interesting or appropriate study for females and minority students. This is in keeping with a historical reality of women’s education in America. Thomas Higgenson (1882) suggests this injustice in his book, Common Sense About Women:

Why is it, that whenever anything is done for women in the way of education it is called an “experiment,” – something that is to be long considered, stoutly opposed, grudgingly yielded, and dubiously watched, -- while if the same thing is done for men its desirableness is assumed as a matter of course, and the thing is done? (As cited in Palmieri, 1997, p. 173)

It is suggested that the founding of Ivy League institutions like Harvard established the birth of higher education in America as a masculine institution, affording a male right to its privileged male student population. Unlike the coeducation that was unquestioned throughout the grade school years where both boys and girls were encouraged to study, critics found it was difficult to accept women’s educational career extending beyond that level. Common reasons explaining this opposition include the fear that women would outperform their male classmates, as well as the fear that women’s education would lead to a transgression of societal norms such as their neglect of the traditional maternal role (Wechsler, 1997).
Despite such fears, the population of women seeking higher education grew from 21% in 1870 to 47.3% in 1920 (Wechsler, 1997). This large influx of women caused university officials to become concerned with the idea of “natural segregation” that was becoming apparent in course enrollments. Female students were the significant majority in liberal arts courses. Men were far more likely to be in political economy classes and avoided liberal arts courses, even when male students were gifted and interested in them (Weschler, 1997). This phenomenon was very similar to today’s heavily male science course enrollment but was causing alarm for the opposite reason. University officials were concerned that men were avoiding courses where they were in the minority. Women were affecting males’ course choices and, ultimately, their careers (Wechsler, 1997). Concerned officials hoped for a decline in female enrollment.

Regardless of the patriarchal institutions’ worries, women kept enrolling and graduating. Women earned 55 to 57 percent of all college degrees in the wartime period of 1944 to 1946 (Marklein, 2005). That statistic drastically dropped at the end of World War II when men returned home, but by 1991, women again outnumbered men (Mather & Adams, 2007). By 2010, women made up 57 percent of the college student population (Doyle). And yet, women still make up only 17.5% of the undergraduate engineering population (National Science Foundation, 2008) and 9% of the engineering workforce (Bix, 2004; Trenor, 2007).

Reasons for the poor representation of women in engineering are plentiful but are often in line with Brainard and Carlin’s (1998) suggestion that women suffer by having a “lack of self-confidence, poor advising, and not being accepted in their department” (p. 374). Institutional support for women in STEM has been lacking. In addition to the noted opposition of women in higher education, historically top engineering programs have been
closed to women in the past, including Rensselaer Polytechnic Institute in Troy, New York, and the Massachusetts Institute of Technology (Bix, 2004). It is especially rare for women to take the number of math and science courses that would best prepare a student for engineering requirements. Blickenstaff (2005) finds that women are particularly unlikely to take calculus in high school. Because first year engineering students are required to take calculus, women are immediately disadvantaged and therefore less likely to consider entering an engineering program.

Realities such as this can be seen as supporting the prevalent myth that women are not intellectually suited to STEM studies. Lawrence Summers, while president of Harvard University, infamously quipped that female underrepresentation in math and science is because of “different availability of aptitude at the higher end.” Such publicly presented ideas from an educational authority continue the misconception that females should not pursue careers that involve higher-level math or science courses. In fact, Sadker & Sadker (1994) reported that many believed the lack of women in engineering was because they were genetically incapable of excelling in science and math. Since then, multiple studies have proven there is no empirical evidence that either gender is more successful in math and science throughout primary and secondary school (Hyde, Lindberg, Linn, Ellis, & Williams, 2008; Leslie & Oaxaca, 1998; Monaskersky, 2005). Other research has found neither gender has a greater intellectual testing ability based on IQ test results (Blickenstaff, 2005). Such evidence of the equality in STEM capabilities between the genders denies the previous reasoning that women are underrepresented in STEM fields because they are not intellectually able to succeed.
**Masculine Identity:** Barton (1988) concludes there are few role models and after school programs for young women which would encourage science as a desirable activity for anyone other than boys who enjoy objective fact gathering. Additionally, social capital from the young women’s originating communities emphasized the identity of women found in traditional female roles that did not include study in the hard sciences and subsequent careers (Barton, 1998). This is problematic when coupled with Eccles’ (1994) findings that a career path is strongly influenced by a person’s expectation for success. With few females to provide evidence that women can be successful in these fields, the more entrenched STEM fields become as a male domain, and are not suitable for the feminine perspective.

Engineering in particular is viewed as masculine (Kennedy & Parks, 2000). Their research makes this commentary:

…the accepted Draconian dichotomy between the sciences and femininity has brought about the problems of today for female science students. Science is impersonal. Women are personal. Science is objective and women are subjective. Science requires logical, analytical investigation. Women’s methods are viewed as intuitive and holistic … From these archaic notions women in science have to deal with a dual identity: To be a real woman was to be unscientific; to be a real scientist was to be unfeminine (p. 532).

Kennedy and Parks then suggest that the underrepresentation of women may be an effect of having to choose between a feminine identity and a career in a field that has claimed a male identity.

The historically male presence in the STEM fields gives way to another argument originating from a modernist and post-modernist theory that challenges the value of the
dominant and ultimately male understanding of science. Science itself became an object of criticism, as the feminist critique demanded the field become more open to questions that can be both raised and answered (Keller and Longino, 1999). Further, science was accused of seeing the world in sterile, fragmented ways that could be solved with the acceptance of a diverse set of perspectives, including a feminine one. The very make-up of the scientist population asserted that the studies were based on white, European, middle-upper class male experience (Harding, 1986; Longino, 1993; Smith, 1987; Hartstock, 1983; Rose, 1983; Millman & Kaner, 1975). Feminist researchers suggest that science should make room for a feminine understanding of scientific study, allowing the masculine binaries to give way to a more organic and relational understanding (Hartsock, 1983; Rose, 1983). Such a critique required an acceptance that science is not value-free as was commonly claimed. The masculine bias was evident, and reflected the positionality of the dominant group in society and the field (Millman & Kanter). The limitations of science are seen by how relationships are discussed in methodologies and findings: objectivity vs. subjectivity; the scientist as knowing subject vs. the objects of his inquiry; reason vs. the emotions, and mind vs. the body (Harding, 1986).

Harding’s claim that science is limited by its manufactured binary concepts proposes that the epistemology of science is insufficient to deem any conclusion as “pure”. However, with the increase of female scientists, the entire field of science could greatly enhance the fullness of both questions asked and conclusions drawn (Barton, 1998). Standpoint theory, originally put forth by the sociologist Patricia Hill Collins (1986), suggested that discoveries were themselves limited by the experience of the inquirer. As a result of seeing discovery from an “individual centered” perspective, the positivism which defined science was
challenged. If such an approach became seen as valid, not just the methods of inquiry and concluding would change, but also the way the scientist speaks, listens and understands, ultimately becoming accepting of the “other” (Devault, 1999). It was through these various “waves” of feminist critique that widespread support for women in STEM arose. Yet the question remains, how could women best be introduced to the sciences if the enduring male bias among practicing scientists is not eliminated?

Educational professionals’ recommendation from the constructivist vantage point see all learning to be a social process, as knowledge is constructed by the student, not bestowed upon them by a teacher (Cummings, 2001). Women’s ability to see concepts relationally would thrive in such an environment. Eisenhart and Finkel (1998) further discussed the importance of introducing women to the sciences in a way that allows more time to resist oppressive constructs that may psychologically restrict women from choosing science. In so doing, the disadvantages inherent to females who are equally academically capable of scientific inquiry are dissolved, as they are given support and context appropriate to the social capital and self-authorship the study will bring them.

**Attrition:** Still, this influence is not yet pervasive among current female students. Many have said they “wished someone had told them earlier that they could study engineering” (Starobin & Laanan, 2005, p. 35). In the same paper, Starobin and Lanaan state, “a lack of social and academic support for female students to pursue STEM fields can impede their academic and career aspirations” (p. 32). However, women who do pass through the barriers, graduate, and obtain a STEM position have a significantly higher attrition rate than their male counterparts (AAUW, 2010). Rooser (2003) attributes this to the desire for women to have children even as they excel in the workplace and must confront the
historical role of domestic responsibility that largely falls upon their shoulders. There is a pervasive belief that a STEM career’s rigorous demands imply that the STEM professional woman is certain to have a harder time raising a family (Viadero, 2009). Frome analyzed the career aspirations of 137 female high school girls who graduated in 1990. Eighty-three percent of the women who originally said they were planning on entering a male dominated career had changed their goal to a female or gender-neutral job within seven years. Frome et al. (2006) suggested that, “Many male dominated fields are still inflexible in practice” (p. 368). Women may perceive that the longer hours often associated with STEM jobs could interfere with childrearing and other household responsibilities. One possible solution suggested by Frome et al. is that employers need to offer flexible work schedules and offer childcare for employees.

A six-year longitudinal study conducted by Brainard and Carlin (1998) revealed a disconcerting discovery that women are not enrolling in proportionate numbers to men, nor are they retaining their STEM positions at the same rate as men; the graduation retention and completion rates by women in the STEM fields have lagged behind those of their male counterparts. The study indicates the retention rate has decreased by nearly 30 percent. However, the study also notes that overall STEM retention rates are the lowest among all disciplines. So, while STEM needs to improve persistence rates among all students, in order to improve women’s advancement in STEM it is necessary to understand their unique challenges and implement strategies for addressing those challenges (Reyes, 2011).

Themes in Retention and Completion: Drawing from multiple studies by Starobin (Starobin, 2004), Starobin and Laanan (2005), Starobin and Laanan (2008), and Lloyd and Eckhardt (2010), four common themes or issues have been identified as affecting women’s
retention and completion rates in STEM fields. First, the myth that male students are better in math and science than female students remains a social hindrance. It has been noted in individual cases that positive support or reinforcement by family, co-students, faculty, counselors, advisors, and/or role models from industry positively influences persistence, however, no scientific study can specifically support this contention. This encouraging interaction translates into determination, learning, and success. These authority figures become role models, mentors, and guides for the educational path the student has laid out.

Second, a clear pathway or educational plan needs to be set for students to follow. Advisors and the support network need to be fully aware of each step: a plan that balances workload, manages time, and maintains meaningfulness of the program is crucial for success. Having all content related to the central focus keeps the student engaged in studying, practicing content, and learning and demonstrating application.

Third, the need for a positive learning environment has to be present. During their time in college, female engineering students have had a significantly negative association with their cognitive development due to what has become labeled a “chilly climate” on campus (Pascarella, Whitt, Edison, Nora, Hagedorn, Yeager, & Terenzini, 1997). Some studies have suggested this same “chilly climate” exists for females upon obtaining engineering positions (Brainard & Carlin, 1998; Morris & Daniel, 2008; Whitt, Nora, Edison, Terenzini, & Pascarella, 1999). Hewlett et al. (2008) found that women engineers describe the professional engineering environment as hostile and macho. It is an environment in which women are marginalized and excluded. Instead, engineering programs needs to balance leadership responsibility, peer-led team learning, peer-tutoring, and student-teacher interaction (Brainard & Carlin, 1998). Starobin and Laanan (2008) propose that all of these
elements working positively together build self-esteem and confidence in the female student. It is important that STEM female students have a “high expectations” course requiring the utilization of higher order cognitive activities and frequent participation in faculty interactions, both in and out of the classroom. Learning the material and course content, successfully leading and working with others, and comprehending complex conceptual knowledge will likely result in positive engagements and a successful outcome. Changing from the traditional lecture based course to one filled with application and real-life opportunities is an active learning strategy demonstrating the active part of strong STEM pedagogical practices.

Fourth, the building of the previous three enables female students to believe in self, increase self-confidence, and establish positive attitudes of success. Brainard & Carlin (1998) suggest a primary reason women leave engineering is because they believe they are performing poorly in the courses. This self-belief is commonly termed self-efficacy in behavioral therapy (Schunk & Pajeres, 2002; Zeldin, Britner, & Pajeras, 2008; Zeldin & Pajeres, 2000). Vogt et al. (2007) found that “self-efficacy was the best predictor of overall success in engineering” (p. 361). If this confidence can be instilled, the student will persist and continue in their education path/goal and completion.

Community college role: While many programs are intended to support female four year students interested in STEM, community colleges are the likely institutions where STEM persistence as a whole, and female STEM students specifically, will grow (Hagedorn & Purnamasari, 2012). Not only are community colleges projected to grow, they have a larger female than male student population. The existing literature concludes that community colleges have a track record of serving STEM students in a learning environment that can
support the four themes affecting retention and completion rates (Smith, 2012). It makes community colleges ripe for researchers interested in women and STEM to explore. This conclusion is even more evident given the social capital required for success at a two year institution is notably different from that required for a four year institution (Wells, 2008).

**Social Capital**

Social Capital can be seen in broad and narrow terms. For this study, social capital will be seen as a Bourdieuan concept that involves both self-authorship as well as the perception of STEM as social capital as well as the resulting desire to seek out STEM fields for career choices as a power currency in itself. Yet, social capital is also used by Yosso (2005) when discussing it as part of her cultural capital construct. Additionally, social capital unique to STEM is also separately discussed and related back to Self-Authorship as well as the larger concept of Social Capital.

Bourdieu’s (1977) discussion of Social Capital conceptualizes culture as a currency. Though all cultures have a currency, not all currency is exchanged at the same rate. The dominant culture can continue holding power by devaluing other cultural currencies and as such the dominant culture’s more valued currencies can be transferred from generation to generation, allowing for a reproductive system that continues to alienate the other. Using the term “habitus”, Bourdieu contends with a system that sets up individuals to internalize how they should act and what expectations should be set according to the many external variables attached to the individual as a result of their community membership. It is the generational continuation of socializing that limits the possibility for individuals, and the individual creates his/her own prison, capable of moving the walls only within the same confining blueprint dimensions of fellow community members. The communities all value a variety of
things, but the dominant culture’s values will always set the exchange rate of one cultural community for any good.

Using Bourdieu, Yosso states that community cultural wealth is created from “at least six forms of capital such as aspirational, navigational, social, linguistic, familial, and resistant capital” (Yosso, 2005). These are important to understand and define as separate, unique entities that make up the cultural capital.

So, as Yosso uses Bourdieu’s Social Capital concept to elaborate on cultural capital, Bourdieu sees it as involving social capital, a term borrowed by Yosso as well, but in this sense separates this idea into two different categories including, first, the recreational social networks and secondly, the professional social networks. In both groupings, all members have social capital, but again, the social capital is not equal in its ability to transfer from one social group to the next.

Bourdieu also discusses economic capital: a term not directly addressed in Yosso’s six elements but one that is currency in its most literal sense. Individual’s access to money and material possessions is another form of social capital for Bourdieu. Yosso would not dispute this but suggests it is the direct result of combined cultural capitals.

**Social Capital in STEM.** Social Capital has been discussed in STEM literature, though often researchers do not use the term itself. For example, familial capital and economic capital are concepts that have been studied to determine if either has an influence on women’s choice of careers. Studies have shown that if a woman is raised in a family with higher socio-economic status, she is more likely to choose a traditionally male career path like engineering (Salami, 2007; Trusty, Robinson, Plata, & Ng. 2000; Dryler, 1998). Women’s family of origin’s socio-economic status also positively affects women in choosing
to pursue a college degree (Leppel et. al, 2007). Trusty et al. (2000) also concluded that women who originate from a higher socio-economic background will want to maintain this status, and are therefore likely to choose higher paying occupations, which also tend to be heavily male dominated. The pursuit of, and persistence in obtaining an engineering degree for the privileged woman is also a result of simple family support (Hammrich, 1998; Steineke, 2004). The privileged parent has gone through the college selection and completion program, has seen the importance of learning to work within institutional systems and has experienced the benefits of the process. Women coming from homes whose parents have not experienced college are not able to be as supportive simply because the parents do not have the knowledge to support them. Yet parental influence has a major impact on their children’s selection of a major and resulting career choice (Bleeker & Jacobs, 2004). Again, this disadvantages women who may be interested and gifted in STEM fields like engineering but do not have sufficient social capital to make that choice.

STEM as a social capital in itself is mentioned in Ovink and Veazey’s (2010) work on underrepresented minority undergraduates. While acknowledging the great dearth of minorities (Bell, 2008), Ovink and Veazey argue that these students are disadvantaged in the lack of social capital that shuts them out of the academic community, including socialization, networking, and undergraduate research projects. The very “habitus” of the incoming students from non-dominant communities unfamiliar with the academy subtly denies access to students whose abilities may be appropriate to STEM disciplines. In fact, as Yosso implicates, the very cultural values of any one community may act to negate an individual’s ability to succeed within the Academy (Goddard, 2003). The notion of hard work as a cultural value may prompt a student to prematurely take a job generating immediate income
rather than completing an education. It also might suggest the preference for blue-collar values in producing tangible goods over the knowledge economy seen in many STEM careers. This influences students who are members of non-dominant cultures to have a pre-formed lack of desire to seek out STEM fields as careers since the fields are not only seen less favorably than other tracks. It also inherently values STEM careers with an understanding of social capital hidden from the conscious transfer of these values. Neither the student nor his family and community can articulate why STEM holds more or less social capital, but it may nevertheless limit the student in his/her choices. So far methodologies have focused on self-authorship and social capital as constructs. It is now important to understand these concepts within the framework of women being introduced to, and considering STEM careers.

**Self-Authorship**

Self-authorship is often confused with the term *self-evolution*. Self-evolution is a broader theory while *self-authorship* is a “phase of development within the lifelong process of self-evolution” (Boes, Baxter Magolda, & Buckley, 2010, p. 4). Instead of the entirety of evolving a notion of self, self-authorship is defined as those moments of development when the individual relies on the internal generation of beliefs, values and loyalties. This internal reliance occurs in healthy development. A maladapted individual would have used external beliefs, values and loyalties for this same moment. If internally turned self-authorship occurs, individuals can take responsibilities for thoughts and actions, hold conflicting feelings without succumbing to mental crisis, and have integrity when performing self-evaluations that use internally created criteria. Magolda, Creamer and Mexzaro’s (2010) work uses the
self’s ability to be conscious of knowledge construction, with identity and relationships key to becoming capable of self-authorship.

Boes, Baxter Magolda and Buckley (2010) identified the idea of self-authorship separately from the traditional definition of self-evolution. *Development and Assessment of Self-Authorship* work to first define self-authorship and to recognize it as a human reality not limited to any one culture. The work looks at Piaget’s (1965) study of childhood development, which is, as mentioned earlier, an early proponent of a constructivist epistemology. This assumes that knowledge is constructed through interpreting experience. This creative act opposes a more positivist approach that sees knowledge as a large and external truth that eventually fills the individual’s mind. Using Piaget’s theory allows self-authorship researchers to recognize that the structured self is not set and static, but developmental and changing over time (Piaget, 1965). In that sense, though there is a moment in the developmental arc that is preferable, there is not currently an established age where self-authorship ends or cannot grow further.

Another important theory that informs self-authorship is Kegan’s (1994) use of the terms “subject” and “object”. Subject becomes the “elements of our knowing or organizing that we are identified with, tied to, fused with, or embedded in” (Kegan, 1994, p. 32). This differs from the object that Kegan recognizes as those things that can be consciously considered and articulated. In a sense, they are separate from the individual in that they can be used as “objects” in relationship with one another whereas the “subject” cannot be seen as separate from the self. As the person develops a better-established sense of self-authorship, more concepts can be moved from the subject to the object. Additionally, as self-authorship strengthens, the external influence becomes less and less a subject and more and more an
object. The internal voice instead begins to claim influence on belief, identity and relationships.

Though Magolda, Creamer and Mexzaros suggest that cultural differences need to be studied and that previous studies cannot be generalized to all peoples, they note that three theoretical developmental dimensions of self-authorship are used as a go-to construct when studying any culture. These three pieces are the epistemological, intrapersonal, and interpersonal development. The first, epistemology, is discussed as understanding how any individual comes to know, and how that conceptualization of knowledge changes reasoning processes (Hofer, 2004). Individuals in the early stages of epistemological development will see authority figures as a knowledge sources (Perry, 1999) and knowledge is itself absolute (Baxter Magolda, 1998). This will grow into a relativistic stance in which the individual realizes knowledge is not always as clear-cut as they first thought (Belenky, Clinchy, Tarule, & Golberger, 1986). The epistemology that allows for the highest level of self-authorship is when the individual becomes aware of contextually forming ideas about the world and is able to maintain a commitment within the relativism perspective (Perry, 1999).

The second piece of self-authorship, intrapersonal, asks, “Who am I” and causes the individual to be self-reflective unlike the highly analytical requirement determining epistemology. The third and final dimension is the intrapersonal dimension that asks the individual what relationships are wanted. The person must be capable of establishing and negotiating relationships to pursue this third dimension. Both intra- and interpersonal development is directed to the individual, relying on her own center to determine a sense of self. Judgments are made based on her own set of values and meanings. Self-authorship can only occur after all three dimensions are developed. Baxter Magolda places significant
emphasis on the importance of an individual’s self-authorship development due to its ability to empower the individual (1999). Knowledge sources can be challenged regardless of who the authority may be or if the knowledge is drawn from the dominant culture. Baxter Magolda offers that self-authorship is inherent in both the process and the intended outcome of education.

Pedagogically, these concepts can be elaborated upon to make sense for the learner. For example, in the Six Stage Model of Learning Conceptions, ideas that Saljo (1979) had first grouped into five categories are used including (1) learning as the increase of knowledge, (2) learning as memorizing, (3) learning as the acquisition of facts, procedures et cetera which can be retained and/or utilized in practice, (4) learning as the abstraction of meaning, and (5) learning as an interpretive process aimed at the understanding of reality. These were later translated into six conceptualizations including: (1) increasing knowledge, (2) memorizing, (3) reproductive understanding/application, (4) understanding the subject matter, (5) widening horizons, and (6) growing self-awareness (Van Rossum & Hamer, 2004). Bringing these conceptions into self-authorship, “the first three are basically reproductive and quantitative in nature: learning lacks real personal involvement; knowledge remains unchanged by the learner, and vice versa” (Hamer & Van Rossum, 2010). At this level, the learner has not been able to move knowledge to a subject mode that can be understood as externally accessible and maneuverable. Yet, the last three allow, even demand, the skills that are initially involved in the creation and completion of self-authorship, but goes beyond Saljo’s basic five and plays with the notion of Kegan’s object and subject. These extend the individual into an existential development requiring the self to make the entire subject the object. At this point, all becomes external and maneuverable. There are no realms of
knowledge that are untouchable due to the structure they provide the subject. The self remains intact despite this apparent act of deconstruction, which paradoxically arrives at the moment when constructivism may begin.

Interestingly, Pizzolato’s study (2004) determined that the greater the deficiency a college student had to navigate the dominant community, the more likely they were to have developed self-authorship at an earlier age. Expressing “provocative experiences” that this population of students experienced to be a key factor in pushing them toward self-authorship before, and in the transitional entrance to college, Pizzolato saw that students’ equilibrium was challenged prior to this experience. This built on Ladson-Billings’ (2000) work that discussed the diverse individuals as having an “outsider status”. The outsider status allows the student to have a wider-angle lens. In other words, the outsider can see the social power structure more clearly than those who are members of the dominant culture. The outsider, upon becoming a college student, then holds a double consciousness (Ladson-Billings, 2000) of being both outsider and insider, which grants access to a vision of multiple choices that an insider would not see.

As evidenced, self-authorship is similar to internal power, as both focus on the ability of any individual to construct their own meaning and define themselves. However, researchers stress the uniqueness of self-authorship among other well-known internally focused theories. “Self-authorship differs from agency because it is not about behavior; it differs from self-efficacy because it is not about self-confidence. Self-authorship is about the cognitive process people use to make meaning” (Creamer & Laughlin, 2005, p. 14). Instead of the focus of internal power being based on seeing power dynamics and holding to personal choices, regardless of socially preferred choices, self-authorship’s goal “is to empower
people to overcome domination” (Baxter Magolda, 1999, p. 19). This is inclusive of the self that first needs internal power to empower others.

These powers, once found, can energize the social capitals every individual possesses. Once the individual finds internal navigation, all six of the social capitals can become engaged in internally guided choices. As such, the young women’s stories that follow will reflect the ability level of every individual girl to utilize her social capital as currency. Self-authorship, particularly in the earlier stages of development, is arrived at from a context. That context includes the currency awarded it due to the individual’s place in society and membership within any one culture. And so the intersection is bilateral as each informs the other.
CHAPTER 3. METHODOLOGY

No two plants are exactly alike. They're all different, and as a consequence, you have to know that difference. I start with the seedling, and I don't want to leave it. I don't feel I really know the story if I don't watch the plant all the way along. So I know every plant in the field. I know them intimately, and I find it a great pleasure to know them.

(Dr. Barbara McClintock, 20th c. Nobel Laureate)

Characteristics of Qualitative Research

This research study uses a qualitative design. Such a design offers a different construct of reality than a traditional research study. Instead of the positivist assumption that reality exists and the observer participates in, observes and experiences reality in order to come to know it, qualitative studies operate on the assumption that reality is not directly available but is, at least in part, constructed by the individual (Lincoln & Guba, 1985). While logic is still important in qualitative studies, it is primarily inductive rather than deductive logic. Using hundreds of threads, indicators of the participant’s reality, the researcher finds new insights that can build upon established theories or create one anew (Merriam, 2002). Merriam (2002) goes on to note the researcher is not just the voice, but also the instrument itself that collects and analyzes the data.

Whereas quantitative studies attempt to remain as objective as possible, qualitative studies look at the human condition subjectively. Not consistent enough to be reduced to binaries and numbers, a human’s complex thought process is neither linear nor exact. This complexity is even further confused by interactions with others whose thought process is equally multifaceted. Yet, this is how meaning is first made by the participant and then further explored by the researcher/observer in either qualitative or quantitative data collection (Esterberg, 2002). The individual is analyzed within an even more complex and rich system
that is society itself and the multiple communities within any one society, all of which work
to make meanings that are conflicting and diverse (Crotty, 1998). Merriam (2002) describes
this meaning as thick and rich descriptions that more accurately reflect reality as perceived in
its multifaceted, organic wholeness.

**Philosophical Assumptions**

*Because philosophy arises from awe, a philosopher is bound in his way to be a lover of myths
and poetic fables. Poets and philosophers are alike in being big with wonder.*

*(St. Thomas Aquinas)*

**Theoretical framework**

*Self-authorship.* While self-authorship is a relatively new theory, it is driven by
broader theories developed in the study of self-evolution. A primary theory is based on
Piaget’s (1952, 1965) study of children’s cognitive development. His four developmental
stages were then taken by other researchers and further utilized in studying the development
However, all are based on the constructivist and post-structural world-views that contend
truth is created, not unveiled (Lincoln & Guba, 2000). “Constructivism provides a lens for
understanding how adolescents and adults interpret and learn from their experiences because
it focuses on the meaning that is made of the experience from an individual perspective”
(Boes, Baxter Magolda, & Buckley, 2010). It also allows for variations within any one
individual’s development. This variance is not an allowance that more objective constructs
concede to.

Several other developmental theories support self-authorship’s theory including
Kegan’s (1982, 1994) adult developmental theory. His work sees that coping, a key element
in human development is greater than a skill. It is the way that people begin to frame their
knowledge of the world. Instead of binaries, there are continuums that allow for a variety of situations to remain in the neutral area. Reality is shaped in different ways by different guidelines due to experience, not inborn truths.

Berger (2010) draws upon Kegan’s work to name the four different forms of mind, or stages of thinking that develop over time. In the first phase which Berger calls the self-sovereign mind, the individual is able to describe themselves in concrete, tangible ways but cannot identify who they are in terms of more abstract concepts like loving, giving, or trust-worthiness. When trying to interact with others, they cannot integrate other perspectives with their own. In fact, they have a difficult time realizing that others may even have a different perspective than their own.

The second stage of development Berger terms the socialized mind. This level of development enables the individual to realize other’s perspective. This stage of development additionally allows for the adult to value relationships as intrinsically worthwhile, not just for what the individual can get from them. Though a far more advanced stage than the first, the individual still relies heavily upon his or her original system of knowing that entirely informs the individual’s choices. It is unlikely that the individual will, or can, deviate from his or her own epistemology.

Individuals who have graduated to Berger’s third stage, the self-authored mind, are freed from this limitation of a single system. “They have an internal set of rules and regulations–a self-governing system–that they use to make their decisions or mediate conflicts” (Berger, 2010, p. 248). At this point, another great leap has been made. The individual is capable of a mental flexibility. She sees her values can be maintained but used
in different ways according to the situation. The rigidity of the first and second system has become more organic and respectful of other’s realities.

The final form, a self-transforming mind, accepts that the systems used in the previous stages of development, even the third, are systems that are not complete. No system is capable of fully being sufficient on its own. As a result, adults at this level can recognize multiple systems, respect individuals that operate within that system and even accept that their system will continue to bend and transform as they continue to be introduced to new people and new systems of thought.

Berger (2010) as well as Kegan (1994) offer a suggestion that developing self-authorship means to move through systems of knowing from being unseen, or unconsciously used, to being seen and consciously used. Instead of it being hidden (subject), these systems are powerful and the cause of most decisions, and they become apparent to the individual. When this happens, ideas, opinions, beliefs, etc. can be examined and a conscious choice rather than an unconscious acceptance is possible. The individual is freed from what has been placed on her as a system of knowing. She has full ability to choose, or not to choose, values that may conflict with her original construct.

Baxter Magola’s (2010) work sees these stages as the self-authorship process, not to be confused with Berger’s self-authorship mind. Separating the way people see the world into three categories including epistemological dimension, the intrapersonal dimension, and the interpersonal dimension, Baxter Magolda’s theory of self-authorship required that all three dimensions be changing as the individual’s self-authorship process continues to move forward. Some personalities rely more heavily on one area of the three dimensions. For example, when making decisions or determining their perspective, different questions are
asked by individuals depending on their basic preference. Each question aligns with one of the dimensions. In Baxter Magolda’s studies, some individuals relied heavily on, “How do I know?” or the epistemological dimension when seeing self. Others relied heavily on asking, “Who am I?” or the intrapersonal dimension. Still others asked, “What relationships do I want?” relying on the interpersonal dimension. Baxter Magolda (2004) graphically represented this as seen in figure 1 below:

![Overlapping dimensions of the self-authorship process](image)

Figure 1. Overlapping dimensions of the self-authorship process (Baxter Magnola, 2010)

Of course, the dimensions making up the self-authorship theory are not as clear-cut as such a theoretical construct implies. Instead, they mingle and grow at different rates. Progress in one dimension does not guarantee progress in another dimension. Magolda (2010) sees the progress of each dimension as being uneven, though in her studies, the imbalance that occurred when one area grew over another area did seem to force the dimensions that were
behind to catch up. Her work with individuals using qualitative research, grounded theory and narrative inquiry led her to understand the evolving theory of self-authorship in the following way:

Collectively the longitudinal narratives reveal multiple possibilities for how the epistemological, intrapersonal, and interpersonal dimensions of development intersect as participants moved through trusting their internal voices, building internal foundations, and securing their internal commitments. Gaining access to multiple pathways through the three elements based on participants’ default dimension and how they move among the dimensions to respond to the questions of their lives offers a rich perspective of how self-authorship may evolve (p. 42).

It is when individuals find these three dimensions to be harmoniously developed that the individual has integrated the three questions: “How do I know”; “Who am I”; and “What relationships do I want.” Ultimately, a well-developed person will experience a contented security in their understanding of self and surroundings.

*Self-authorship in student learning.* While self-authorship is useful in multiple contexts, this study is investigating women exploring STEM as students. Therefore, it is important to understand how self-authorship links with learning itself. In 1970, Perry published a work entitled *Forms of intellectual and ethical development in the college years: A scheme.* The investigation was based on Piaget’s belief that development moved through stages. However, what Perry found in the study’s results was a surprise:

Perry and his colleagues were looking for, and expecting to find, personality differences, in particular aspects of the authoritarian personality notions popular at the time. Instead of stable individual differences in personality, what Perry and his
colleagues found was a consistent education journey… that traces a fall from a world of Absolutes and Truth into a world of contexts and Commitments in which one must take stands and choose as a way of making meaning in one’s life through identity choices (Moore, 2002, p. 19).

So, as a student moves through his education, so will he move through his ability to process and understand ideas that are more complex in their relativity. Moore suggests that there are nine positions of intellectual development. Each position moves the student toward a greater ability to incorporate multiple perspectives and ways of knowing.

According to Hofer and Pintrich (1997), Magolda’s work on how college students interpreted educational experiences was part of a larger movement investigating epistemological development including Perry’s work, as well as Belenky et al. Later, that same focus would move to how epistemological assumptions influence the thinking and reasoning process (King & Kitchener, 1994) and argumentation skills (Kuhn, 1993). Another direction that would come out of epistemological development research is how it may influence comprehension and cognition for academic tasks (Ryan, 1984; Schommer, 1990). This study will focus on college student’s interpretation of educational experiences. Therefore, it is also necessary to understand how learning conceptions are linked to self-authorship.

In Hamer and van Rossum’s (2010) six-stage model of students’ views on learning and good teaching, self-authorship is in the fourth stage. It is past Stage One when students view learning as a transfer from teacher to student. It is also past Stage Two when students still view learning as a transfer, but with the understanding they have the ability to select from the body of knowledge presented and prioritize what to learn. In Stage Three, students
are still selecting knowledge, but are now selecting and prioritizing based on what will be necessary to them outside of the academic setting. Stage Four students, however, experience a major shift in learning. Now, instead of reproducing what has been given to them by some authority, they abstract meaning. The process and the product differ in that the process is to understand, but the product is to change the way the student thinks. Beaty et al. describes it as follows:

[To] have a process of thought that sort of “sets in motion” when you look at something….looking at something new in a far more logical way, and seeing the steps and the moves towards arriving at some sort of conclusion….learning is thinking clearer….Perhaps it is just the skill you have learned of thinking more coherently (1997, p. 159).

Just as Baxter Magolda discusses independent knowing as part of self-authorship theory, so too does the Stage Four student believe her own voice to be as valid as the authoritative voice that had previously been reproduced. This idea is further pressed by Hammer and van Rossum (2010) when the student recognizes that their voice and other’s voices are coming to a variety of conclusions, not just one. It is a time that discomfort becomes an opportunity to learn more, and further. In the Sixth and final stage, the student sees learning as a personal and continuous process. It becomes more about realizing who the student is. This stage fits within Baxter Magolda’s self-authorship stage of trusting the internal voice and foundation. The student sees herself as controlling what will occur to her. It is no longer left up to others who have more power but the student’s ability to determine her future.

Self-authorship, in this study, is connected to young women who are selecting career choices while in an academic setting. However, this selection is limited to a great degree by
the social capital the women bring to the decision. The students’ self-authorship is informed by, or intersects with, students’ social capital.

**Social Capital**

Female STEM student challenges are seen using a social capital theoretical framework as well as the self-authorship framework. Pierre Bourdieu’s seminal work *Distinction* (1984) looks at cultural artifacts and cultural knowledge as a significant determining factor in any individual’s ability or inability to rise in society. Instead of seeing capital as a tangible and measureable idea or even human capital which, though less tangible, is measureable as it refers to skills and capabilities that are valuable within a society (Schultz, 1961; Becker, 1964), social capital refers to the relationships which assist the individual in a similar way. Through social capital, individuals are able to better utilize their more tangible capital. He defines it as “the sum of the resources, actual or virtual, that accrue to an individual or group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition” (Bourdieu, in Bourdieu & Wacquant, 1992, pp. 119). This notion reflects a firm construct of social inequality, not a generous human community that all can rely upon (Gauntlet, 2011).

The individual defined as the *actor* has a subjective experience defined as *habitus*, and the world external to that experience defined as the *field* interact, but there are often negative results of this interaction because of social capital. Bourdieu sees social capital primarily as a tool used by the elite to exclude others from entering the powerful circles of society. Social capital, for Bourdieu, is unlikely to be changed by the individual herself, due to it being largely determined at birth. Yet, social capital requires interaction of individuals
for it to be passed on to the next generation of any one social construct. If the individual chooses not to pass the social capital on to a family member, a co-worker, a community member, etc., social capital cannot be obtained by another person due to the actor choosing not to give. Again, Bourdieu sees social capital as a tool used by the actor to exclude, since the actor has no incentive to do otherwise:

[Social Capital] is an important resource for individuals and may affect greatly their ability to act and their perceived quality of life. They have the capability of bringing it into being. Yet, because the benefits of actions that bring social capital into being are largely experienced by persons other than the actor, it is often not in his interest to bring it into being (Coleman, 1988, pp. 118).

Therefore, social capital is likely to only transfer among heterogeneous people due to the heightened likelihood of the actor being incentivized by personal affections for the individual, the desire to have others similar to himself continue to succeed, and the increased interactions with an individual who has similar habitus and exists in a similar location within the field. Still, Coleman’s construct inverses Bourdieu’s by suggesting that social capital is not always a negative used to keep people out, but a positive that individuals can use to obtain greater things.

Coleman’s work in education found that if a student has higher education expectations placed on her by her parents, has two parents at home providing support, the student is more likely to be academically successful (1988). Thus, these relationships between student and parents are social capital necessary to be successful in school. In place of Bourdieu’s actor, the student here is called an agent, with the field being the institution. If the agent can follow the rules, norms, and obligations of the field, which are understood and
made obtainable via social capital, the student will be able to persist and gain further social capital. Those agents who could not follow the rules, norms and obligations of the field will be unsuccessful due to a lack of initial investment social capital.

When discussed in relation to the STEM student, rules, norms and obligations include the recognition of what academic prerequisites are necessary prior to becoming a STEM major, realizing the level of academic rigor, and understanding how to acquire study skills, time management, and course planning. The field of a STEM major varies from the field of a family in many ways. A primary difference is how the information is exchanged. Information allows the agent to change as it provides “a basis for action” (Coleman, 1988, p. 104). Social capital provides the roads upon which information can be transported. If the agent does not have access to those roads, or cannot recognize them, the agent is unable to receive information, and therefore has no basis upon which to act toward a particular end.

Dika and Singh (2002) recognize that Coleman’s conceptualization of social capital relies heavily upon families. Successful families, and thus primarily those who have already journeyed such paths, can show or make roads for the student to acquire the information advising correction action. Inherent in social capital is the limitations many face in moving among Bourdieu’s fields. Unlike Bourdieu’s understanding, the social capital limitation is neither an intentional nor unavoidable force excluding others. Instead, with awareness, institutions themselves can act to give social capital to others. Stanton-Salazar and Dorbusch (1995) claim that within the institution of education, social capital acts as the “social relationships from which an individual is potentially able to derive institutional support, particularly support that includes the delivery of knowledge-based resources, for example, guidance for college admission or job advancement” (p. 119). As such, institutions that want
to give sufficient social capital for students to be successful need to understand the barriers disadvantaged students have, and the ways in which barriers can be overcome by various populations of disadvantaged students.

Social networks accessible to families are a part of the social capital construct (Portes, 1998). All kinds of social networks are beneficial in some way, but because they act as roads upon which information can be transported, the networks need to either get to correct information centers or connect with other roads leading to the information center. These social networks or roads are difficult to reach for many students, including women, but particularly culturally diverse women and women from lower-socio-economic backgrounds. These populations tend to not only lack familial capital having access to the post-secondary STEM social networks, they also tend to experience school environments whose ability to help access those post-secondary STEM social networks are equally lacking (Stanton-Salazar & Dornbusch, 1995; Stanton-Salazar, 1997). Privileged families can access the information directly, as well as support the student in navigating existing social networks leading to the needed information. Students who do not come from privilege are not able to do either, if at all (Lareau, 2003). Institutions can fill the role of bridge builder, thereby giving all students access to the social capital necessary for STEM success.

Institutional agents. Instead of assuming Bourdieu’s static social capital theory advantaging the elite, institutions can act as social capital agents (Horvat et al., 2003). Multiple programs have been crafted to address the need for STEM social capital to be accessible. NSF has provided millions of dollars in grant funds to a variety of programs intended to give social capital necessary for STEM success. Knowledge, skills, and resources in STEM post-secondary work are all necessary within successful social capital transfer
programs (Mehan, et. al., 1996). Tierney and Hagedorn (2002) noted program foci of particular use to students including mentoring, tutoring, academic and career counseling, as well as post-secondary experts reaching out to parents and teachers in an intentional bridging of social networks between high school and college.

Students from lower socioeconomic backgrounds only have access to these complex networks within The Academy through teachers, counselors, and college representatives. Therefore, for this student to have the social capital sufficient for post-secondary success, schools at secondary and postsecondary levels must intentionally provide it (Venzia, et al., 2003). Female students are equally dependent upon high school teachers and counselors when determining their career direction (Ware & Lee, 1988). Students who are both from a lower socio-economic background and female have a severe disadvantage that limits the likelihood of attending post-secondary education, and even further limits the chance they will pursue STEM majors. This study will use these themes throughout the FWR research and analysis on social capital and women in STEM, regarding how it affects their self-authorship and the pivotal moment in choosing their major.

**Constructivist epistemology**

To gain knowledge and understanding from qualitative research generally, and from FWR specifically, the reader must accept a constructivist epistemology. Such an epistemology has been the very basis that Piaget, Baxter Magolda, Bourdieu and numerous others noted in this study have used to see new ways of understanding, seeing, and, in essence, construct reality. This belief, or world-view, is described in Boes et al, (2010) to be that “individuals make meaning in the space between their experiences and their reactions to them” (p. 5). Crotty (1998) described it in a similar way, suggesting that the unique
individual experience should be celebrated, instead of sterilized as positivists had done, calling it the “meaning-making activity of the individual mind” (p. 58). Constructivism is complex, with several voices claiming the title of constructivist but having significant disagreements regarding what exactly that might mean. D. C. Philips (1997) categorized the constructivists into three primary groups. The first group, made up of Piaget and Vygotsky, are “concerned with how the individual learner goes about the construction of knowledge in his or her own cognitive apparatus; for other constructivists, however, the individual learner is of little interest, and what is the focus of concern is the construction of human knowledge in general” (Philips, 1997, p. 7). Philip’s second group of constructivists asks, “When knowledge is constructed (whether it is in the mind or cognitive apparatus of the individual learner, or whether it is a public discipline), it is the process one is influenced chiefly by the minds or creative intelligence of the knower or knowers, together perhaps with the ‘sociopolitical’ factors that are present when knowers interact in a community” (p. 7). This group’s most famous member is John Locke. The final group of constructivists argue that “The construction of knowledge is an active process, but the activity can be described in terms of individual cognition or else in terms of social and political processes” (p. 8). Dewey and, again, Piaget sought to better understand learning through this lens.

This study is interested in how the individual learner constructs knowledge, actively and with a focus on the individual cognition, falling within the third group of Philip’s constructivist categories. This too is an epistemology followed by Baxter Magolda in her self-authorship studies. I will engage in making meaning from the experiences I have had first and second hand, those I have observed as a graduate assistant on a large research study, and those I have heard told filtered through the described experiences of young women.
Postmodern theoretical perspective

Postmodernism might best be described as a loosely grouped set of theories that have in common the assumption that knowledge is subjective. Esterberg (2002) furthers describes postmodernism as being aware of multiple versions of reality. The researcher is required to accept each different way of knowing as valid. Prasad (2005) recognizes that all of the postmodernists strongly disagree with the validity of a grand narrative or metanarrative. Unlike positivism, Marxism, or critical theory, all of which are considered modernist traditions, postmodernism does not assume that there is any “existence of some concrete, tangible, or authentic reality that has an existence outside language and our own imaginations” (221). An example of postmodern theoretical perspective would include the classic novel *The Sound and the Fury* by William Faulkner. In three of the four chapters, the novel has the individual train-of-thought monologues of three brothers. One brother has severe mental challenges, a second is a suicidal teen and the third is a liar. All brothers are unreliable and time is not chronological. Meaning is found in interpreting the spaces that are left unfilled and completing puzzles that are unsolved. The novel is a detective story but the reader is the detective and, like the postmodernist, the reader detective will never know anything for certain.

The reader is participant and observer, creator and audience, disoriented and yet exactly in the heart of the character’s minds. Such a novel reveals postmodernism’s plurality and fragmentation that may have been seen in earlier novelists like James Joyce. It remains in keeping with the idea of postmodern pastiche, which uses contrary genres within a single creation (Bauman, 1992). Another way to consider postmodernist perspectives is to recognize “the close affinity between artistic and intellectual genres within the postmodern
tradition” (Prasad, 220). Like postmodernist art, postmodernist thinkers consider the mimetic representation a lie. It is a false illusion that cannot be reached by the human experience due to the multitude of realities that may exist at any one moment in time; much like Faulkner’s multiple voiced pastiche. All suggest that the codes of the Academy are abstractions and, in many ways, ongoing power structures that exist as a result of adherence to the positivists’ claim that truth exists separate and apart from the individual.

Foucault, a significant voice in the development of postmodernism, sees power as part of the energy that ties together and flows through society. He claims that “power produces: it produces reality; it produces domains of objects and rituals of truth. The individual and the knowledge that may be gained from him belong to this production” (194). With this, Foucault’s postmodernist stance nicely dovetails with the previously introduced notion of social capital. Social capital is this notion of power that Foucault defines. It is the power to create reality for the individual. Only the social networks, the roads upon which social capital is accessed, limit this reality.

**Methodological Approach**

*Then I asked: “does a firm perswasion that a thing is so, make it so?” He replied: “All poets believe that it does, and in ages of imagination this firm perswasion removed mountains.”*  
*(William Blake, from The Marriage of Heaven and Hell)*

**Fiction Writing as Research**

In choosing to use fictional research writing (FRW) as my methodology, I realize I have chosen the path less traveled by traditional doctoral students or even qualitative researchers. It is through a variety of circumstances that led me to this decision and yet, upon reflection, I believe that it was the soundest methodological approach to expose new truths
surrounding the continuing abysmal lack of female STEM, but in particular, engineering students and professionals. While this is an area most researched by the very individuals who come from the quantitative backgrounds or a more traditional qualitative background, which often relies heavily upon the quantitative research epistemologies, theories, methodologies and methods, it is rarely an area those researchers from a background that has prepared them for experimental qualitative research find appealing. Yet, the diversity called for earlier in Chapter 2 is evident in this phenomenon. How can a continuing question be answered if diverse research epistemologies, theories, methodologies and methods are not only tolerated, but welcomed?

Upon first glance, FWR is so unfamiliar to members of the STEM community that it is unlikely an invitation will be offered. Instead, those with the unique capacity and interest to entertain the decades old questions of female participation in STEM with a fresh perspective are obliged to do so. If asked why, the American philosopher Richard Rorty (1989) challenges the grand narrative saying:

Great scientists invent descriptions of the world which are useful for purposes of predicting and controlling what happens, just as poets and political thinkers invent other descriptions of it for other purposes. But there is no sense in which any of these descriptions is an accurate representation of the way the world is in itself (p. 4).

As a constructionist himself, Rorty’s conclusion is that, due to the limitations of language, any argument becomes, in essence, a “language game”. This game is the creation and adoption of linguistic symbols for ideas that are any one individual’s or group of individuals’ cobbled together construct of reality. Scientific research then cannot be true simply because it
is itself supported by the fault-riddled language of man. Rorty’s claim for truth is when one statement is accepted by another because it is recognizable in our own experiences.

In discussing how truth can be arrived at, Wilhelm Dilthey, a German hermeneutic philosopher concerned with scientific methodology, suggested that the quantitative paradigm attempted to explain, and the qualitative paradigm attempted to understand phenomenon. However, a third goal is necessary for questions to be answered in full. This third goal is affective understanding. This is an extension of the qualitative paradigm in the sense that understanding is still sought, but instead of cognitive understanding it is an emotional understanding.

An example of these three levels of understanding would be an instructor who seeks to answer why a particular female student is struggling to persist in her STEM coursework. The instructor would need to have some generalizable scientific information about what quantitative data has been found to explain the broad phenomenon of the relatively few women in STEM fields. While necessary, it is a disconnected understanding that does not relate to the student the instructor may be concerned about. So, that instructor would also need to be able to relate to that individual’s challenges. Cognitively, the instructor would be able to have an understanding of that student and her general thought processes about her career field. This is certainly less disconnected as it suggests a professional relationship would need to be established. However, the final emotional understanding would be the closest and likely most effective way to assist the student in determining a career path. Instead of understanding the student’s concerns as an empathetic bystander, the instructor can now sympathize with the student, acknowledge and share the emotional turmoil involved in the decision process. Comfort and assurance can be given in a deep and authentic way.
The teacher now has multiple layers of knowledge to understand the student’s plight and give career guidance and emotional support.

For those involved in understanding how to encourage students to persist and excel, the barren graphs and charts reflect an objective reality that seems to evade experience. Despite numerous years of attempting to balance the proportion of women to men in STEM, the research has claimed findings and made recommendations that remain largely unsuccessful. At this juncture, it would seem wise to pursue a new path toward understanding the goal. Rolfe’s (2002) suggestion is to consider how fiction writing is a solution to this problem. A teacher must want to cognitively explain and understand the phenomena her student is a part of. However, more is required to be able to influence that individual or group of individuals. “Her aim, then, is not merely to satisfy her intellectual curiosity, but (as far as possible) to understand how it feels to be in her clients’ shoes, to understand from the inside rather than from the outside, to vicariously experience it” (93). The objective, positivist approach to research would possibly be able to answer this need if, and only if, the observer experiences the same reality as the observed. However, within the constructivist paradigm, this is never the case. Reality is constructed. Reality varies according to the individual. Therefore, something more is required. This something more is either the actual experience of the individual herself or it is the vicarious experience that occurs through the imagination when engaging in story. Unlike research reports, story allows the reader to become the character, if only for a brief time.

Of course, another criticism comes from the various ways a “story” can gather data. Different authors work in different ways and many of these ways are unsettlingly foreign to the quantitative or traditional qualitative researcher. These researchers would argue “the data
were not collected in a planned and rational fashion, second, that they were not analyzed in a methodical way and third, that the ‘study’ was not written-up dispassionately and objectively” (95). But to the first point, it could be argued that much of scientific discovery occurred accidentally and without a planned method. To the second point, it may be suggested that the affective understanding sought cannot be obtained through a typical analysis. Oliver Sacks, a neurologist who built off the reflections of the Russian neurologist A. R. Luria, noted that for understanding humanity “the scientific and the romantic in such realms cry out to come together—Luria liked to speak here of ‘romantic science’” (Sacks, 10). Both are necessary. Neither is complete on its own.

The third point can be denied by responding with a quote from one of the fathers of the postmodernists, Foucault who admits, “I am well aware that I have never written anything but fictions. I do not mean to say, however, that truth is therefore absent. It seems to me that the possibility exists for fiction to function in truth, for a fictional discourse to induce effects of truth” (p. 193). Like Rorty, Foucault disputes the positivists claim to have monopolized truth. Instead, they have one manner of explaining, and perhaps even understanding, a reality. The poet has yet another. Neither invalidates the other. Similarly, Nietzsche (1973) claims that science is an interpretation of reality, it is not a full explanation of that reality. It is one of many conceptions of truth. Thus Ziman, a physicist, commented that it is fiction where the answers to humanity’s questions lie:

In the search for reliable knowledge about, say, the psychology of sexual relations, do we turn to a book expounding the evidence for “exchange”, “reward” and “balance” models of love? Or do we read again our Anna Karenina, or Madame Bovary, or Pride and Prejudice, or Proust, or Saul Bellow, or Patrick White? The novelist, with
his sensible ear and discriminating eye, articulates the universal elements in our emotional lives, and teaches us more about mankind than any formal theory (p. 185). This affective knowledge given freely by story is absent in quantitative and traditional qualitative studies. It is not an accusation of any particular paradigm being right, but all three are necessary to move forward in explaining, understanding, and feeling our way to effective solutions.

As a composition instructor, I emphasize the importance of showing and not telling the reader what is central to the meaning. This understanding of showing is discussed by Alvermann and Hruby (2003) when they assert how research process and product is vital for the qualitative writer. Fictional writing’s purpose is to show, to give the reader the skin of the other, the sight of the character. It is through this purpose that a more accurate telling may occur in the affective sense of truth and knowledge.

Methods

FWR as a methodology allows for a wide assortment of methods. While I have continued to use Crotty’s description of methods, which are tools that carry out and analyze the data in order to answer the research question, it is with a wide array of methods in the collection of the data.

As a graduate student, I was involved in the coding of data gathered from a longitudinal study which provided a program introducing young women to engineering and then following them for four years after high school graduation. The primary investigators used semi-structured interviews meant to answer the research questions that I have posed in Chapter Two (Esterberg, 2002). The NSF grant’s primary investigator intended to not just ask questions but to listen and follow the interviewee’s train of thinking. In so doing, the
primary investigator, who had continued a relationship with the young female participants as well as mentored the women who saw the investigator as a role model and a resource, worked diligently to offer an authentic voice true to the participant’s experience. Yet, by inhabiting the role of an additional researcher and coding the transcripts from these interviews, as well as from the young women’s Facebook pages, I had the ability to hear a larger story than the investigator could have heard as another involved in the relationship.

However, in FWR, scholars like Laurel Richardson (1997) encourage researchers to see the writing research as a method of discovery itself. Her own work in sociology values the imagination as an important element of the researcher’s study and findings. Eliot Eisner, an emeritus professor of Art and Education at Stanford, suggested in a debate with Howard Gardner (Donmoyer, 1996) that a work of fiction could and should be submitted as a dissertation. His keynote address to the 1996 Conference on Qualitative Research in Education asked that the educational research community find new ways to research, as the old ways deny the arts where much of human knowledge is warehoused. As a result scholars like Rishma Dunlop did exactly that. Later, she wrote that her FWR dissertation was written following the general form of the Bildungsroman, which is “generally the story of a single individual’s growth and development in the context of a defined social order. The growth process, a quest story, is both an apprenticeship to life and a search for meaningful existence in society” (2002, p. 217). Another scholar, Deborah Ceglowski, had intended to use field notes for her research on school policies but found them to be insufficient. The variety of truths she was discovering was not evident “cognitively, emotively, and physically” in the field notes (p. 191). Again, her ability to show the reader and not tell the reader these truths was increased by the use of fictional narratives.
My research work began as a graduate student involved in the NSF grant funded study but I quickly found my background as a writer, reader, analyst and instructor of literature gave me access to a form that could represent the truths I was uncovering in new ways. The epistemologies that I found essential to my research work were best opened up in the act of FWR. Through this method I could show the reader in new ways: Jasmine’s story of a mixed race woman from a higher socio-economic family who found her gender a stumbling block despite other privileges she was born with; Chrysti’s story of a rural woman who came from a lower socio-economic, though educated, family who recognized her own disparity in social capital; Marie’s story of a Hispanic woman from a first generation family who could not imagine sacrificing family capital for educational capital; Xi’s story of living up to her family’s desire of gaining social capital through education. All of these young women are created from the various stories that have been collected, voices that have spoken into the void where no quantitative researcher would have been able to collect empirical data in an objective, replicable way but were still worthy, in fact in need of being heard and understood and contemplated in the discussion of education policy changes that are yet to come.

This methodology gets at several researchers’ beliefs that educational research must be accessible to the practitioner, the individual who stands outside The Academy but fights daily, knee deep in the trenches where research conclusions are most needed but often least understood or implemented (Alvermann & Hruby, 2003; Banks and Banks; Ceglowski, 1997; Denzin. 1997; Richardson, 1997). FRW is accessible and interesting to the reader outside The Academy. In my own personal experience in teaching composition, the stories of writers writing are equally instructive to my students as the texts that technically lay out the process.
It allows rich discussion that, in Krizek’s view, moves the reader from passive knowledge recipient to active co-discopper of knowledge. This view is similar to a particular literary criticism theory, reader-response theory which posits, “only in context, with a reader actively involved in the reading process with the text, can meaning emerge” (Bressler, 2007, p. 80). FRW encourages readers to go beyond numbers or statistical theorems to engage the reader to engage with and trust the researcher has a deep, human connection to the phenomenon discussed in the text. This goes beyond traditional qualitative research and becomes valuable in the character emersion the reader experiences.

**Data collection and IRB**

Discussed here is the more familiar, technical research experience as a graduate assistant of the primary investigator of the NSF grant based study. Though this information is not directly used and no formal documentation was referred to for this study, I believed it important to still discuss the traditional research process involved when I first began the dissertation investigation process.

**Interview and Facebook data collection**

Based on Seidman’s (2006) recommendations, the primary investigator began each interview by reminding the third party transcriptionist and coder of the interviewees’ larger historical backgrounds, briefly summarizing the recent events the investigator/interviewer had learned in the preceding interviews, and retelling the interviewee of the project’s larger research questions which loosely guided every interview. All interviews were conducted in person, lasting between thirty and ninety minutes and were digitally audio-recorded and later transcribed by a graduate student for analysis. The primary investigator locked all digital
audio-recordings, transcriptions of interviews and Facebook data, and participant identifiers in a secured server. All paper copies were stored in a locked office.

**Unobtrusive measures**

Esterberg (2000) notes the importance of unobtrusive measures in data analysis. My analysis uses this gathering method as the primary source of data for this study. These unobtrusive methods involved my experiences of instructing young women at a community college whose interests lay in engineering. Additionally, I returned to journals I had personally kept as a young high school and college woman while determining my own path in life according to my voice, despite the resistance of a father who had a degree in mechanical engineering and a mother who had a degree in nursing. Because as a researcher I had relinquished all access to NSF grant funded project data and no human subjects were directly involved in the fiction writing as research methodology of data collection and analysis, no Institutional Review Board (IRB) approval was required to complete this research project (See Appendix A).

**Additional safeguards implemented to ensure confidentiality**

**Participating site**

In order to avoid any identification of students who were involved in the NSF grant funded study or students I had contact with as an instructor, additional safeguards were taken. These included keeping the FWR location as two fictional institutions in a fictional Midwest town in order avoid any identification by locale and keeping the NSF grant funded program unnamed in order to avoid compromising the grant’s data integrity.
Participants

So that I could insure all individuals whose stories I heard, coded or participated in had complete anonymity, all individuals discussed are fictional characters. Each character is made up of a collage of the students whose data I worked on through the NSF grant funded program as well as students who I had contact with as an instructor at a community college and four year university, as well as my own experiences in self-authorship and social capital.

Approval

With the description of the research methodology and methods as well as the additional confidentiality safeguards in place, the Chair of the IRB committee stated the proposed research project was not required to have IRB approval (see Appendix A).

Research Sites and Participants

Prior to the dissertation writing process, I was involved as a graduate assistant in a NSF grant funded research project. Upon the request of the primary investigator, I was given de-identified grant data from interviews and Facebook pages to code in response to the research question posed both in this study as well as the larger NSF grant proposal. My access to the data at this time was within the IRB approval granted to the primary investigator upon the initial request to pursue the grant proposal data collection and analysis.

Purposive sampling and intentionality

Neither purposive sampling nor intentionality is used in a traditional manner for FWR. Yet, those individuals who made up the composition of any one of the four fictional characters were chosen initially by participation within the NSF grant funded study and those whom I came into contact with over a thirteen year period as an English instructor at both a
four year university and a community college. I selected individuals, or broadly speaking, a sample of those individuals whose backgrounds, abilities, and goals met the purpose of my research questions. My methods of this broad “sample” were meant to “intentionally sample research participants for the specific perspectives they may have” (Esterberg, 2002, p. 93).

So that the audience may better understand the sample group from which I impressions, I (a) coded the Facebook postings and interviews of young women involved in the NSF grant funded study, (b) took field notes on three young women in my community college whose interests were currently engineering, (c) drew from over 20 young women who were considering engineering throughout my faculty time at a four year university, and (d) tapped my own experiences as a young woman exploring self-authorship and career concerns.

This loose definition of a sample group allowed me to craft characters “from which the most can be learned” (Merriam, 2002, p. 12). All were young women who had self-identified as interested in engineering as a career, graduated from high school, and had completed their sophomore year of college.

Due to the nature of the methodology employed in data collection and analysis, those individuals whose characteristics play some part in the creation of fictional characters did not need to be notified. Each of the four main characters and any additional minor characters are entirely fictional. Any consistent resemblance of characters to actual persons, living or dead, is purely coincidental.

**Research sites**

Because FWR is based on my multiple experiences and neither the characters nor sites replicate any one individual, no research site can be identified by the reader. All
participating sites make up elements of the fictional sites written-up, and I intentionally avoided any specific descriptor linking any character or any experience to a specific, identifiable institution.

The research sites where either the NSF grant funded project participants were attending or where the researcher collected the experiences involved two universities and four community colleges located in the same geographical location within the continental United States of America.

All of the research sites were either four or two-year public institutions that granted one- and two-year certificate awards, Associates Degrees, Bachelor Degrees, or graduate degrees. All were accredited by the Higher Learning Commission (IES National Center for Education Statistics, 2012).

**Coding of NSF Grant Data**

Though I did not use the NSF grant data specifically to comment on or analyze in its original form, it remains important to understand what more traditional research experiences were that informed my research. Here, I have abbreviated my experiences as a graduate assistant on the NSF grant funded project. Data had been collected since the girls’ 10th grade, the year they had been selected as young women who had strong STEM potential. The primary investigator followed the young women by crafting and participating in the STEM introductory program, conducting several interviews with the young women, as well as collecting social media data. Interviews were face-to-face and ranged from approximately 30-minutes to 1-½ hours with each faculty member. They were audio-recorded digitally and later transcribed into a Microsoft Word© document and then moved into ATLAS-ti© within one to two weeks after the interview concluded. Facebook data was collected on a monthly
basis and also moved into ATLAS-ti©. As a graduate student, I was given the transcripts to code. Open coding techniques were used to identify themes that emerged from the data. While I did not use this data specifically, I reflected in daily journals on the experience. These journals allowed me to connect with themes of self-authorship regarding whom the young women were choosing to become. This data informed my study as an experience.

Similarly, journals which were taken from my own experiences as a young woman struggling with self-authorship, social capital, and considering STEM careers were read with the same coding themes that had been used within the NSF grant funded program. Journals written periodically throughout my teaching career were also utilized in the same way. Though these researcher journals provided not just content, they also provided the appropriate form the FWR should take.

Data Analysis

**Goodness and Trustworthiness**

Using seven of Merriam’s (2002) eight strategies for validity and reliability, this study attempts to meet many of the requirements set by a traditional qualitative researcher. However, it is important to be aware that fiction writing as research is an emerging, experimental methodology and, as such, does not pair absolutely with many of the assumed strategies.

The first strategy listed by Merriam (2002) is triangulation. This is using “multiple investigators, sources of data, or data collection methods to confirm emerging findings” (p. 31). My experiences drew on general impressions of six women whose interview and Facebook transcripts I coded as a graduate assistant on an NSF grant funded study. These
interviews were performed by the primary investigator of that study as well as other graduate assistants. My experiences with young women interested in STEM as an area of interest included numerous students who I had the privilege of working with throughout the past 12 years of teaching within a secondary and post-secondary context. There were multiple sources of collection methods (semi-structured interviews and personal journal entries).

Merriam’s second strategy is member checking which is “taking data and tentative interpretations back to the people from whom they were derived and asking if they were plausible” (p. 31). While I could not go back to all of the individuals who were a part of this study, I did make the fictional work available to the public via http://femalestem.blogspot.com. This will serve as a continuing source of commentary. Comments made were welcomed after it was made public. Any changes suggested prior to the dissertation defense were considered and, if appropriate, were made.

A third goodness and trustworthiness strategy I used was the researcher’s reflexivity statement. Merriam notes this as “critical self-reflection by the researcher regarding assumptions, worldview, biases, theoretical orientation, and relationship to the study that may affect the investigation” (p. 31). In Chapter 5, I provided a statement that notes my own journey of self-authorship and social capital regarding STEM as a career choice.

Another strategy used in this study was adequate engagement in data collection. Merriam defines this strategy as “adequate time spent collecting data such that the data becomes ‘saturated’: this may involve seeking discrepant or negative cases of the phenomenon” (p. 31). The time spent gathering the data included the time of the actual experiences as a graduate research assistant, an instructor at secondary and post-secondary level, and a young woman who began and continues on a journey of self-authorship using
social capital, the time journaling on these experiences, and the time of reflecting and writing up the analysis.

Merriam’s audit trail, “a detailed account of the methods, procedures, and decision points in carrying out this study” is provided in the dissertation write up itself (p. 31). Again, due to the process of fiction writing as research, the detailed account varies from the traditional methods and is a creative rendering of remembered experiences.

Another strategy Merriam suggests is that of thick, rich descriptions allowing for a deep understanding of a particular circumstance or set of circumstances. Fiction writing as research necessitates this as part of the product created for the study’s results. This again is attending to the previously stated need for “showing, not telling” data in order to get at the affective understanding. Creswell (2009) suggests that not every strategy must be used to produce quality evidence. As a result, this study’s use of six goodness and trustworthy strategies should be sufficient.

**Role of the Researcher**

I am the primary instrument for data collection and data analysis. I was the primary investigator as I collected experiences in the social capital and self-authorship intersecting in young women considering engineering as a career choice in multiple instances, including participants in the NSF grant funded data set, post-secondary female students at a two- and four-year post-secondary institution where I taught, and as a young woman who struggled with this issue herself. My relationships were varied among the young women participants in the NSF grant funded research whose perspectives I knew through interview transcripts, the young women interested in STEM who developed a relationship with me as a students and an
advisee, and my own reflections upon myself as a young woman struggling with a STEM career choice. The young women whose experiences I had the honor of reading, listening to, and even the young woman I once was, are all an integral part of this study. It is through their voices that I became aware of truths that are part of the collage constructing the characters in this study and, it is my intention, the truths that will offer up alternative ways to understand young women’s social capital and self-authorship in their ultimate choice as a STEM or a non-STEM professional. I am grateful for this opportunity granted me.

**Positionality**

My own background as an English instructor who has worked with high school students, two-year students, and four-year students has led me to believe that truth is constructed by the individual. Reality is subjective and meaning is discovered by every individual as experiences inform ever developing interpretations (Crotty, 1998). I am a female, 38 years-old, Caucasian, whose experiences have been that of a rural, lower socio-economic woman who continues the journey of self-authorship while being aware of the privileges and limitations of my own personal social capital. My work with young female students is as an English instructor but I assume the responsibility of career counselor when it is asked of me. Working with a NSF grant funded data set in my graduate assistant experience has heavily informed this study.

**Ethical Issues**

While I am neither a STEM instructor nor career/academic counselor, I do serve as an informal counselor to students who seek out my thoughts on career choices. Certainly my own experiences as a child of STEM based parents have weighed heavily in those
discussions and my interpretations of stories that were a part of the fictional constructions here. While I can speak to the process of self-authorship and social capital intersecting to determine the career path of STEM, I also am influenced by my positive and negative experiences I have witnessed and/or experienced. To be transparent, the moments that make up the career selection process are at times laced with emotions that relate to self-authorship and social capital. However, the voices I attempt to give audience in this study are meant to incorporate and transcend the particularities of any one experience.

**Delimitations**

A delimitation of this research centered on young women who were encouraged to pursue STEM careers due to potential. In particular, this study looked at young women who were part of a NSF grant funded program introducing them to engineering in high school. I did not look at young men and I did not address students who were non-traditionally aged. I did not consider the perspectives of students who had never been identified as having potential in the STEM fields. The research was a compilation of experiences with young women located within the boundaries of one section of the continental United States of America. The research was also delimited by the participants’ availability to the researcher. Another delimitation of this study concerned my own experience as a researcher who was raised by STEM educated parents and struggled with a lower socioeconomic set of social capitals. Questions originating from my experience as a graduate student within a NSF grand funded project attempted to allow for the participants voice to emerge.
Limitations

Denzin’s discussion of the interpretive approach notes that this type of researcher intentionally participates in the “social world so as to understand and express its emergent properties and features more fully” (Denzin, 2001, p. 46). It is imperative that the researchers are “thoroughly immersed themselves in the phenomena they wish to interpret and understand” (Denzin, 2001, P.46). As such, this study is reflective of my own history, emotions, and personality. While many positivists find this to be a troubling limitation, just as the lack of duplicated results are troubling, Denzin (2001) celebrates the interpretive interactionist, as “knowledge cannot be assumed to be objective or valid in any objective sense. Rather, knowledge reflects interpretive structures, emotionality, and the power relations that permeate the situations being investigated. As a consequence, interpretive studies can reveal only the interpreted worlds of interacting individuals” (p. 51). The random samples of the positivist traditions were not a method used in this study. No generalization can be made to larger populations. The knowledge carried by this studied is not objectively valid. Instead, I have worked to use a different way of knowing via the tools that my trade as a writer and a literature scholar knows. And in so doing, it is my desire to participate in answering the questions of this study through a critically imaginative and democratic research process as Denzin (2001) claims all interpretive studies should do.
CHAPTER 4. THE WOMEN’S LIVES

“The most beautiful experience we can have is the mysterious--the fundamental emotion which stands at the cradle of true art and true science.”

*Albert Einstein*

**Introduction to the Participants**

Using the form of epistolary narrative, I have constructed four female characters, Jasmine, Marie, Chrysti, and Xi. Each has unique attributes that best described the situation of many young women who are capable, interested in, and deciding on a STEM field. Each is a collage of the multiple young women who were a part of the research leading up to this narrative. However, they have been stripped of any characteristics that would make them suspect of being any single student involved in that research. The narratives all take place during each of the young women’s third year after high school graduation. Each girl comes from different backgrounds but all participated in a high school program intended to introduce gifted young women to engineering. All continue to be part of the research following them throughout the four years after graduation, with the researcher interviewing them at the beginning and end of every term.

The institutions the young women attend, also fictional to protect identities, are a full research 1 university, Midwest State University (MSU) and a community college, Northwest Regional Community College (NRCC). The young women were all part of a large NSF grant driven project which was intended to introduce young women identified by their test scores, grades and teachers as talented in their high school science and math courses. Each young woman is further introduced prior to her narrative.

*Jasmine.* Jasmine is an exceptionally attractive young woman whose father is a talented African American mechanical engineer and is employed as the Senior Director of
Research Design at a large, profitable corporation. Her mother is a successful Physician’s Assistant at the public clinic in a large urban area. Both expect exceptional academic success from Jasmine in a STEM field. Jasmine has no siblings and is the primary focus of her well-educated, high upper-middle class parents. Her path has been relatively carved out for her and she has had little to do with students who do not come from privilege, except for her work as a volunteer homeless center worker once a month which was a service Jasmine’s parents suggested to strengthen her resume for graduate school.

**Jasmine**

*FB post: Tuesday, Sept 6, 11:04PM*

Hey all! Back at MSU!!!! Feels great. So nice to get out of the house and back with my homies. Even if it means class with male chauvinist engineers but I get to hang with Dr. Jane for two of the classes so that makes it worth it! Go Dorm 181ers!

*FB post: Thursday, Sept 8, 2:48 PM*

Intro to Molecular Biology went ok. Dr. Scott was his usual dull lecturer self. Ranked him on RateMyProfessor.com from last year as someone to avoid at ALL COSTS. But I have to take him because there are no other options. Sigh.

*FB post: Friday, Sept 9, 5:24 PM*

Friday at last! Got to Dr. Jane’s Organic Chem class and lab, her Biochem: Intro to structure, and Dr. Mark’s Bio Ethics. Ugh! But I love Dr. Jane. She is the only one that notices me. Well, onto studying I go.

*Text to Xi: Monday, Sept. 12, 1:32 AM*
Missed you at the party last night. I don’t know how you do it all. Am SOOO glad not to have to balance work. You are amazing! Give me a call if you are up. Need help with question 5.

Public Blog “Science Girl”: Tuesday, Sept 13, 10:46 PM

I can’t believe it’s only been a week back at MSU. It already feels like a million years. I don’t know how I am going to keep up the 4.0 with this year’s load. I will, I just don’t know how. Mom and Dad would kill me if I didn’t. They already asked if I need a grad assistant to tutor me. I told them not yet.

I am noticing more than ever this year how few girls there are in class. There weren’t many to begin with freshmen year. Sophomore year lost a lot in the full core work but now that we are completely doing the bio chemical engineer course sequence, there is only me, Xi, and three others. That is five out of the 53 core bio chemical class expecting to graduate next year. Dr. Jane told us that only 13% in this field are women. That is so CRAZY! I think girls are better at it because we actually notice things. The guys are way less observant about subtle things. But it’s probably people like Dr. Scott who keep girls out. He hasn’t called on me once, not that he calls on many people at all besides Dylan Shane, prince of the bio chemical department. Well, this year that will change! Nobody is better me at this stuff. So, guys better get used to being player number two to Jasmine Washington!

FB: Wednesday, Sept 14, 11:14 PM

Lab sucked today! There is nothing worse than being paired with Dylan Shane. Xi, why couldn’t we be together? All the girls are split up. What’s up with that? And aren’t we old enough to figure out our own groups? Dr. Scotts never disappoints with his perpetual
poor professorship. Blah! I can’t believe he was teaching when Dad went through MSU! How Dad likes him so much is crazy to me.

FB: Friday, Sept. 16, 10:23 PM

Dr. Jane was brilliant today! She compared metabolic pathways to social patterns. Except for a couple of guys like Dylan, the rest of them seemed totally bewildered with that analogy. Xi and I thought it was awesome. And it got me thinking about the social stuff that the Intro to Engineering program Xi, Chrysti, Marie, and I started our sophomore year. Going to have another program follow-up interview next week with Dr. Alice. I will run a few of the ideas I have past her.

Public Blog “Science Girl”: Tuesday, September 20, 11:45 PM

Saw Dr. Alice today for the interview. It’s kind of sad that I will only see her a few more times. She said the program will be over next year when I graduate and we only meet four times every school year.

She asked a lot of questions about how I felt about science. I know I am “Science Girl” but that question threw me off. I don’t really feel anything about science except that is a part of my life. I never considered anything else. Mom and Dad would have hated me in anything else. And I am really good at it. And I think I can make a difference with it. Plus, the starting salary is amazing. When I talk to some of my friends in education or English, they will barely make enough to make student loan payments when they graduate. It seems a little unfair. I won’t even have student loans between the scholarships for tuition and mom and dad paying for everything else as long as I keep my grades up and live on campus.

I guess science is my safe place. I know where everything is in science. I know there is a right answer and I know how to get it. I couldn’t handle those courses where everything
is up in the air. One of my friends is English major. I only see her at parties or by accident now because we are both so busy with school in our own departments but she talks about analysis in a way I don’t understand. She just makes stuff up from the stories she reads and calls it analysis. That would be laughed at if I just looked at a sample under the microscope and invented something about it. I have to do real analysis. I think that their field must have just stolen that concept from science. It’s fine but it shows why they get paid so much less. Why would anyone pay for somebody to make up stuff?

Dr. Alice asked about the support I have in school. I guess I am just really lucky because other than some, well most, of the professors in the department who hate me because I think they favor the guys, and a lot of the guys who are in the department and are incapable of talking to a girl like a real person, I have a ton of support. Dr. Jane is always around to listen and help. Mom and Dad are a little too “helicopter parenty” but they would do anything to make me successful. I know how to get around the college catalogue and get what I have to do to graduate on time and get into grad school. The way Dr. Alice asked the question, I know that isn’t always the case. Besides, when I think of Marie or Chrysti, they have a lot more challenges with support systems than I do. I wish I could help but really it’s just something you are born into I think. I won the genetic lottery in a way.

If you follow me on Facebook, I promised I would talk about Dr. Jane’s lecture on metabolic pathways and social patterns. And, since I know you aren’t all science girls like me, I am pretty much going to just talk about the social patterns. She said that everyone has power resources. It’s just a matter of whether society recognizes them as valuable or not. I told Dr. Alice about it and she said that is what our engineering program was meant to give in a way only she calls it social capital. I asked if I had social capital and she said I did but
that everyone does. So, we talked about how I think mine is more valued by professionals and schools and she agreed that it was but that it didn’t mean other kinds of social capital weren’t valuable. It just means that different systems value them differently. I need to think about that some more but I think it might be why so many girls aren’t in my bio chemical engineering courses. I think that gender is a big part of what gives you power in my field. Like, Dylan is a good looking guy who also is good at science. Xi thinks that he is given so much attention because he just looks put together and he is really attractive. But I put way more time into how I look and I am told all the time how pretty I am AND I am REALLY good at what I am studying but I get hardly any attention at all. I practically have to jump up and down to be called on. So, I think that girls feel like, “Why would I want to be a part of a profession that doesn’t value women?” I don’t because I want to prove them all wrong and I know that I will but not everyone wants to fight things like I do. Maybe not everyone CAN fight things the way I can.

Good night, all! Science Girl has to study now. I will be back soon with more about my science stuff.

**FB: Friday, Sept. 22, 10:23 PM**

I am furious! Dr. Marks who is supposed to be teaching ETHICS suggested today that there are serious ethical questions when talking about artificial insemination. What? That’s so ridiculous. It is so hypocritical for a man who isn’t married and doesn’t have kids to make statements like that! It’s a freedom! So clearly wrong. So clearly unethical to give any credence to stupid people’s disagreement with it as a practice. This is a black and white issue. It is crazy for him to make statements like that in biology. URGH!!!!!
FB: Friday, Sept. 29, 11:46 PM

So today is Rosh Hashanah. My mom asked if I was coming home for it but I told her no. I feel kind of bad. I did eat apples and honey at the school cafeteria so I hope she is okay with me not even considering finding a prayer service. It did make me happy to think of a new year, a new beginning. Last year still was so easy and this year is kicking my butt. Still, I can turn over a new leaf. I think I am going to take mom and dad up on the tutor offer. It would really cut down on me having to figure out so much on my own since all the other girls are so busy and none of the guys have ever, EVER invited any of us girls to their study sessions. They are all over in the same dorm or live in apartments with each other but still…..

FB: Friday, Oct. 10, 1:27 PM

I never write in the middle of the day but I had to voice a particularly disturbing practice on this campus. There is a Columbus Day celebration being held by RHA. Columbus Day? Really? We have a lot of Native American students on campus. How should they feel about that?

FB: Friday, Oct. 10, 11:46 PM

Still mad about the Columbus Day stuff. I got so upset that I ripped down every poster that I saw on campus for it. I didn’t go out of my way but I did look everywhere that I would go during Friday classes. MSU, stop being so white centered! How would it feel like if Germany celebrated Hitler’s birthday? Should my mom just let it happen? She never would. I feel almost as angry about the Native American students being so passive about it. I heard some mumbling but that was it! Stand up for yourselves! Make some change!
Hey All you Science Girl fans! I hope you had a fantastic Halloween. I shouldn’t have but I didn’t study at all tonight so that I could do dorm trick or treating. Dr. Jane brought by her two kids. Adorable! They are 3 and 5 years old. Both girls. They were dressed up as mini scientists which were a perfect contrast to all the Barbies, Disney Princesses and fairies that were wandering around. It makes me so angry that girl’s costumes are really just evidence that girls have to first earn some man’s love to have any power but even then it is only because they are connected to a man. All the little boys were dressed up in power costumes like super heroes and presidents and evil things that, while gross, clearly had far more power than some cutesy pixie. If I ever have a girl, I will never let her worry about getting love. I will only let her worry about loving herself enough.

It does make me wonder, though, how much this concept has invaded my own idea of who I am. This whole external culture that surrounds me seems obsessed with how girls look and I like it because I am told I look pretty but it makes me scared about not being attractive. It feels like the most powerful weapon I own sometimes. What will happen when it is gone? It makes me mad to care. I shouldn’t care. Dr. Mark and Dr. Scott don’t care how they look. They only care about who knows they have a Ph.D. and their research. Even Dr. Jane and Dr. Alice worry about how they look, at least a little. I can tell by how they dress and that they both color their hair. Dr. Scott would never think to color his hair. Because it doesn’t affect what his peers think of him. It DOES affect how Dr. Jane’s peers see her. Sometimes I hate being a girl.
Text to Xi: Monday, Nov. 7, 11:38 PM

Hey Girlie! Hard class today! I wish you didn’t have to work AGAIN tomorrow. We could go vote together and then find something to eat and do homework. Hope you get a chance to vote anyways! Let me know if you need help with the lab write up.

FB: Tuesday, Nov. 8, 5:57 PM

So I took a break from studying today to get my election-day sticker. Yay! It was great to feel like I was making a difference. I am still just getting used to voting. Its only my third time doing it. They make it really easy for students here though so that was helpful. I won’t say how I voted but I will say it was hard for me to bite my tongue when I heard some of the student political clubs saying things that I disagree with. Usually I would argue but it seemed only fair that today everyone gets a voice. Even if they are incredibly wrong, they have the right to be wrong….but I don’t have to like it 😊

FB: Monday, Nov. 14, 8:06 AM

Here we go. Midterm week.

FB: Tuesday, Nov. 15, 8:06 AM

Aced today’s midterms. Ready to pone again!

Text to Xi: Friday, Nov 18, 4:25

I just handed in the last midterm. I saw you still in there. Let’s go celebrate!

FB: Thursday, Nov. 24, 3:25 PM

OMG!!!! My parents are so insane! Guess who they had over for dinner? Dr. Scott!!!! They didn’t even tell me until like twenty minutes before he came. I couldn’t say anything and then when he walked through the door – with a sweet potato casserole – I was speechless for the entire dinner. So it was just the Washington three and then Dr. Scott. Awkward! But
Dad gushed on and on about how much Dr. Scott had helped him determine his career path and that Dr. Scott was so amazing blah, blah, blah.

FB: Friday, Nov. 25, 10:52 AM

OK. Still reeling from seeing Dr. Scott at the dinner table but Dad talked to me about it and its making a little more sense. He said even when he went to school, Dr. Scott had favorites and even though there weren’t ANY girls that he could remember in Dr. Scott’s classes, he could imagine that Dr. Scott might need to be encouraged to like me. He said that The Game is part of being successful and it is not wrong to know who the players are and what motivates them and then to act that out. So, I get it. It was a smart move by Dad. Let’s see what happens next week…..

Text to Xi: Nov. 27, 8:28 PM

I know you said you felt uncomfortable, but you should really consider sitting in on my tutor sessions. It’s not stealing like you seem to think it is. Mom and Dad are paying him a ton. He is super smart and it’s been really, really helpful. I would have probably gotten all the ideas before but it would have taken way longer. Think about it. It would be good to get in some boost before finals…..

FB: Monday, Nov. 28, 11:32 PM

I hate to say it but I think Dad’s ploy might have worked, at least a little. Dr. Scott called on me THREE TIMES today! That is more than he calls on me in a week, maybe a month, usually. He probably wants a Christmas invite too since he seemed to really like Dad’s vintage port but whatever. If playing The Game is this effective, I better start getting better at playing it.
Text to Xi: Wednesday, December 14, 12:01 AM

Honey, you are burning yourself out! You could barely keep your eyes open in the final today⊂ Please come study with me. I have the tutor on double time for Finals Week. Just tell your parents you can’t work this week. They have to understand.

FB: Friday, Dec 16,4:34 PM

So, finals are done. I just got back from my last final which was Organic Chem with Dr. Jane. I really want to make her proud of me. Its really important to me that she thinks I am the best student she has ever had. At least the best out of this class anyway.

Public Blog “Science Girl”: Monday, December 19, 11:45 PM

Hey Everybody! Hope you all did end of Finals Week dance by now⊂ I hated the thought of going back to campus after it but Dr. Alice had to do her end of term interview so I invited her to my house. She was super complimentary. She loved Mom’s art collection. She even knew some of the pieces. Mom gets a lot of local art and Dr. Alice knows some of the artists really well.

Anyway, today she asked a lot of questions about what I believe, like if I think that there is a reality outside of us. I know some people think that there isn’t but I don’t get that. Of course there is a reality. If not, why would we work so hard at trying to get to it? Besides, it’s just silly not to think there isn’t truth. We know we are who we are because of our DNA sequence. We know that cancer cells grow in a variety of ways that we can slow down and maybe stop. That is truth. There is right and there is wrong. Its wrong to kill people. Its right to save people.

I know that with enough work, anyone can do anything they want. My dad is a black man who was going to school during the Civil Rights days and he is uber successful and
professionally respected. Mom’s parents were almost killed in the Holocaust and she is not only safe and healthy, her patients love her and doctors ask for her opinion all the time. Anyone who doesn’t make their dreams come true just didn’t try hard enough.

Enough of that. I am going to try very hard not to think for three weeks. Mom and Dad said they have a really great early present for me that I earned. I can’t wait to see what it is.

*FB: Saturday, Dec. 24, 9:20 AM*

So the early Christmas present was a surprise trip to St. Thomas! I am leaving in an hour if the plane is on time. Excellent choice Mom and Dad!!!!!

*FB: Monday, Jan. 2, 8:39 PM*

It is possible for me to have too much sun and too much fun. The trip was amazing but I am so tired. We celebrated New Years on the beach in front of our resort. It was gorgeous and I had a little fling with this gorgeous guy from New York City. He was on vacation with his mom who was very single and wasn’t around at all because she was off looking for Mr. Number 2. Yumminess!

*FB: Monday, Jan. 2, 8:39 PM*

Some of you asked if I will see Yummy Boy again. No! I will never see him again and that’s ok. I don’t care if I ever see him again. He wasn’t very smart and he had no clue about what I was talking about if it was anything other than clothes or boats or water sports. He doesn’t have enough brains to be in a relationship with me.

*FB: Tuesday, Jan 17, 11:29 PM*

What I wouldn’t give to be back on the island with Yummy Boy. This term is even worse than last year. I have History of Technology with Dr. Barth, Transport Phenomena Lab
with Dr. Lewis, Momentum and Heat Transfer Operations with Dr. Shriver, Physical Chemistry with Dr. Dunn and my one fun class is Medicinal Narratives with Dr. Cecilia. I think I am drowning

FB: Sat, January 21, 3:31 PM

So I finished the first week. I am still alive but barely. I am keeping my tutor and I might pick up a math tutor too. I need to be better at some of my calculus or I will never make it through with a good GPA. Anybody know of one?

Public Blog “Science Girl” Monday, February 13, 9:42 PM

Science Girl Readers, rejoice! I am through the first month of hell term. My chemistry tutor who is now a graduate student at MSU was telling me that this was his hardest term of the whole program so that was good to hear.

I wanted to write about Dr. Alice’s beginning of term interview questions. It was mostly about how much I need others’ approval and being able to understand other’s points of views. I told her I didn’t need others’ approval at all because I really don’t care what my classmates think of me and my friends will be my friend no matter what I do. But she really pushed me to think about who I really do care about what they think. I guess my parents are important. I can’t imagine not living up to their expectations or going a different way than they have always talked about but I know I could, I just can’t imagine it. I care about what Dr. Jane thinks of me but that is because she is my mentor and I really am a role model for other women, especially minority women. Its my responsibility to succeed. I kind of care what the tutor thinks of me but that is only because I am like his student and I am always a good student. Maybe, and I am not sure, I care what Dylan thinks of me but that is only, only because he is so conceited and I want to show him I am better than him.
So after that, she asked me more about who I was, like how I would describe myself. I guess I would describe myself as a daughter of a Black man and a Jewish woman who are both successful and educated. I am a good student who is going to be an amazing woman biochemical engineer and I am a hard worker who is making her dreams happen. Dr. Alice asked if I wanted to add anything else and I couldn’t really think of much more. She asked if I wanted to describe myself in more abstract terms. I wasn’t sure what she meant. I mean I know what abstract means but I think she maybe doesn’t. But I tried to help her out. So, I said a representative for young women thinking about the sciences.

I am not sure how these questions about relationships and who I am have anything to do with the idea of social capital she was talking about before. There is never enough time to really ask her things and I know she says I can call her whenever, I don’t really want to focus on much else but studying right now. I can’t really afford to.

I will write again, Science Girl followers! I hope to have good news at midterm for you!

FB: Monday, February 14, 11:45 PM

Guess where I was? Perkins. No big deal right? Well, guess who I was with? Dylan!!! He asked me to study with him today and then we just kind of naturally grabbed something to eat. Weirdness since it was Valentine’s Day and all. No lovey stuff though he is really cute and is serious competition in class…..

Text to Xi: Sunday, February 19, 2:25 PM

Xi, I never see you. You can’t possibly work that much! Dylan and I are actually starting to study together regularly. Its just studying in case you were wondering. We are getting together in the Science library at 3:30 PM. Please come!
**FB: Tuesday, February 20, 7:37 PM**

No school today. President’s Day. Relief! I took time to go shopping for the first time in forever. Picked up some beautiful Michael Kors boots for a ridiculous $249 but I called Mom first and she said that if I see it as a longterm investment piece, she was fine with it. It just couldn’t be some fad thing. I can see wearing these forever!

**Text to Xi: Friday, February 24, 10:49 PM**

Seriously, you look half dead! What’s up? I know you have always been naturally tiny, lucky you, but you look like a skeleton. You need to take better care of yourself.

**FB: Friday, March 16, 12:05 AM**

I am just getting back from celebrating end of mid-terms with Dylan. I can’t believe I am saying this but I actually think that it might turn into something less friend-like. I think he almost kissed me tonight. And I was kind of disappointed when he didn’t!

**FB: Saturday, March 17, 6:39 PM**

Midterm grades are posted on MoodleCampus. Not good. My parents already called me. I can’t believe I gave them my password. Stupid! They told me I should stop my socializing with Dylan because they see a direct correlation between him and my grades. Hah! The direct correlation is super hard classes and my grades!

**FB: Saturday, March 29, 6:25 PM**

I spent my entire spring break locked in a room with the tutor. I have no idea how much he charged but it must have been a lot since he had to give up his spring break too. At this point, I will definitely get A’s in History of Tech, Medicinal Narratives and Physical Chemistry. I am still a little wobbly on the Transport Phenom lab and my Momentum and Heat Transfer Operations. Even a genius can’t get me to totally understand that stuff.
FB: Friday, April 8, 9:13 PM

One month of school left till summer! Reason enough to go celebrate with Dylan.

FB: Saturday, April 9, 10:35 PM

Had a fight with Dylan. Going to see what if he can fix it.

FB: Sunday, April 10, 7:36 PM

Dylan is a good-looking chauvinist bigot. He had me fooled all along. He told me that he really is better but I get by on my good looks. GOOD LOOKS!!! I work f*cking hard! THEN he said it doesn’t hurt that I am half black. I told him that if he only knew how much harder I had to work to get equal recognition he would slap himself for me. As it is, he doesn’t deserve that much attention. Good riddance.

Text to Xi: April 13, 8:35PM

FB

I heard you are maybe graduating early. How? You need to rest yourself. Dr. Scott has totally taken you over!

FB: Saturday, April 21, 5:46 PM

Dylan tried to talk to me today for the first time in a week. There just is really no coming back from saying what he said. He needs to understand how wrong he is. Right now he is just saying what he thinks I want him too. Whatever. Going to study.

FB: Sunday, April 22, 7:31 PM

OMG. One of the girls I was friends with in the Engineering program is pregnant! I am really happy for her. She loves babies. Always has. But, she was so smart. I am afraid she will never even get a BS now. Sad 😞
FB: Tuesday, May 1, 9:52 AM

Did the whole heavy duty tutor session most of the weekend despite Dylan’s drama. I am good to go for finals! Physical Chemistry today!

FB: Wednesday, May 2, 8:31 PM

Three down. Just History of Technology and Momentum and Heat Transfer Ops left. Not even going to study for the History one. It is an essay exam and I went to every class and listened. That’s good enough for an A. Wish Dr. Shriver’s class was the same way.

FB: Thursday, May 3, 3:45 PM

Fourth care package of the week arrived from Mom and Dad. They drive me nuts but they are so sweet. So far I have gotten organic nectarines that one of Mom’s clients got her hooked on. Dad knew I wasn’t leaving my study room Tuesday night because I was working with the tutor all night so he ordered my favorite Chinese food and had it delivered. Wednesday afternoon I got fuzzy slippers and a MSU hoodie. Today was pure comfort, French Silk Pie from Tres Bien Bakery. I will try not to eat it all at once but I make no guarantees.

FB: Friday, May 4, 5:47 PM

Done. Done. Done!

FB: Wednesday, May 8, 8:52 AM

Checked grades and I got a 3.8. It was Shriver’s Heat Transfer Op that I got a B on. Everything else was an A. I am pretty happy and even Mom and Dad are ok with it because they knew how hard I worked. Now, for a summer of relaxation. I have one last interview with Dr. Alice and then I will be interning with Dad’s company for 20 hours a week and hanging out at our pool the rest of the time with friends. Whew! I deserve it!
Hey all you Science Girl Readers! Sorry its been soooooo long. I am going to be way more regular now that I don’t have school shackling me down. I have some great ideas on what to write about this summer. Mostly because Dr. Alice started me thinking more about those three questions – how do I know, who am I, and what are my relationships? I am pretty sure I am going to have to start to change that “who am I” question to something about fighting status quo. That is really important to me - especially with women and a little about diversity too. And I think I need to talk to my parents about how involved they are in my life. It’s not that I don’t love them, I do but I don’t feel like I can even disagree with them. I need to start making decisions on my own. I have to decide more who I am. And that is more than what they see of me. It’s a bit daunting, I am not sure who I am yet, but I think I have to start trying to figure that out on my own - no advise on who to be allowed.

I also am wondering a little about how to know things. This year was really tough and I think it was mostly because the answers were less sure. I can give “right” answers. I just don’t know what to do when there isn’t one “right” answer. Maybe I can work on that thought. And as for relationships, I don’t think I have enough. I feel awful that I am not close with some of the girls in the program – we spent so much time together in high school because of Dr. Alice’s work. And now one of us is pregnant. Maybe I will help throw her a shower or something. It is so hard for me to be happy about it though the more I think about it. It would be the worst thing in the world for me to be a mother now. It would ruin everything. I have sworn off men. Dylan was distracting and then a total ass. He tried to make up for it but how do you make up for assiness? You don’t. So, clearly, I am not going to be having a baby anytime soon. Still, it’s weird to think about how grown up everyone is
getting. A lot of kids my age are working full time jobs and paying bills. Being independent like that, its scary but I think I need to try to be less dependent on Mom and Dad. I can’t be their little girl forever. And I want to be able to make more decisions on my own, without worrying so much about what they think I should do. But……maybe I will wait til after this summer of hanging out at the pool😊

I also am going to think and write more about this idea of social capital or “power” that Dr. Alice talks about. It is important that I was in this program but really it didn’t make that big of a difference. It did for some of the girls. I think that once they were being guided by the program they just kind of got lost. And they didn’t know what to do once they were lost. I don’t think they even felt like they have choices. When we left the program, Dr. Alice was around to help out. I never called her but some of the other girls did and she could help a little but I know a lot of bad advising happened and so those girls fell even further behind.

One thing I do know is that who I am has a lot to do with the power I have. It doesn’t mean that others can’t have power. It just means that I have a ton. And who I am will always be Science Girl. Well, maybe not all of me but a lot of me. So, there you have it. The end of junior year and I am ready for whatever happens next. Go Science Girl! 😊

Chrysti. Chyrsti’s life has little similarity to Jasmine’s. Like Jasmine, both of her parents were educated in STEM fields, her mother as a nurse and her father as a mechanical engineer. However, she was raised on a family farm where her parents moved to upon their own college graduation. Both expect Chrysti to complete her four year degree but do not support any graduate work as that was not part of their experience and in the rural community they live, a four year degree is considered extraordinarily well educated as most have no or just few terms of college work. Neither parent intends to offer any financial assistance to Chrysti
except for paying for the car she needs for travel from her apartment to her job as a waitress.

Chrysti is the oldest of six children by four years and knows that her parents don’t have the patience or time to offer much support when she is at school. Her path has been vaguely suggested but neither parent understands the post-secondary system and while encouraging of Chrysti’s higher education choices, they believe her to be an independent adult that can take care of her own situations. Chrysti has not been exposed too much diversity and though her family’s farm income always is very close to the poverty line, she does not have experience with urban poverty. Chrysti’s religion is very important to her and since MSU does not offer church services of her denomination, Mennonite, and she both attends and teaches Sunday school off campus close to her apartment.

**Chrysti**

*Diary Writing: Sunday, Sept 4*

School starts tomorrow again. I have mixed feelings about that. It is my first year at the university, not the community college. I am not really worried about it and I love school but this summer’s work load was intense. Counting the waitressing and the telemarketing work and the day-old bread store, I think I figured out that I worked over 50 hours a week most days. Bread store prep in the morning, telemarketing in the late morning and early afternoon and the waitressing whenever they could fit me in which was almost every night until close as well as long weekend shifts.

I am only keeping the bread store and the waitressing. I found the courses that I needed to take could fit in between those jobs. I am still trying to recover from the bad advising I got at NRCC. I am still glad I went there. It was fun to see Marie and there were
good teachers but it wasn’t as cheap as I thought it was because I still don’t have the first two years of classes that my program at MSU wants. I took some things that were totally unnecessary because that is what the advisor suggested. It was hard not to get frustrated by that when I came in and registered last May.

But, my classes are Introduction to Probability, Multivariate Calculus and Physics which is the course I should have taken last year plus the MSU writing class because they require a four credit writing course and NRCC only has a three credit writing course. Urgh! So frustrating!

FB post: Wednesday, Sept 7, 1:03 AM

I just got home from work. I have five hours before my next job starts and about five hours of homework. Help!!!

FB post: Friday, Sept 9, 12:25 AM

Back from work. Made a huge tip today. Somebody gave me two fifty dollar bills for a twenty-seven dollar meal. Awesome! If only I had time to spend it.

FB post: Saturday, Sept 10, 2:20 PM

No bread store today so I get to sleep in. I have to work tonight. Anybody want to join me for a study session at my place? I will bake cookies?

Text to Marie: Saturday, Sept 10, 3:48 PM

Whatcha doin? I am finishing up some studying. You are taking Physics at NRCC now right? Do you like it? It’s really hard here and I don’t have the time to work on it. I need to stop by counseling Monday.
FB: Sunday, Sept 11, 12:45 PM

Back from church and Sunday school. I got the 7 year olds this year. They are adorable! One little boy is so sweet and gave me a hug and it was our first class. Already my favorite!

Text to Marie: Monday, Sept 12, 4:25 PM

On my way to work. I barely had time to call advising today. I think to fit it in I will have to find a fill in for the bread store. Want to pick up some morning hours? Wednesday?

Text to Marie: Tuesday, Sept 13, 1:03 AM

Wow, just getting home again. Having all the college students are making us have to stay FOREVER. Thanks for filling in for me.

Text to Marie: Wednesday, Sept 13, 1:40 AM

Still up studying or working? Don’t forget the bread store at 6 this morning!!!

FB: Wednesday, Sept 13, 8:40 AM

Talked with the MSU counselor. Am going to drop Physics here and take it at NRCC. She said it would work plus it is about a third as much. It’s a week late but they will still let me in over there. I almost though about dropping Introduction to Probability but the advisor, Mr. Velazquez, said to wait until Friday just to be sure since it will set me back and he wants me to be sure first.

FB: Friday, Sept 15, 4:26 PM

Dropped Introduction to Probability. I totally bombed the quiz on Wednesday which was meant to study for the test today. I know I did horrible. No reason to stay and try to bring it up when I can start fresh.
Text to Marie: Saturday, Sept 16, 10:59 AM

Slept in way too late. I am so glad I dropped that class and transferred Physics. Love that I get to be in class with you again. Yay!

FB: Sunday, Sept 17, 1:40 PM

Today’s reading: Isaiah 41:10, “So do not fear, for I am with you; do not be dismayed, for I am your God. I will strengthen you and help you; I will uphold you with my righteous right hand.” Felt like it was for me since I am second guessing dropping that course. I will be even further behind now.

FB: Tuesday, Sept 19, 11:30 PM

Got back early from work. College kids all went home to study I guess, or party. Physics at NRCC uses the same book as MSU so I didn’t have to rebuy that. Still hard but they do so much group work in class that it’s really helpful.

FB: Friday, Sept 22, 2:49 AM

Still studying. Anybody out there?

Text to Marie: Friday, Sept 22, 3:36 AM

Did Dr. Alice set up an interview with you yet? I have one on Sunday afternoon. She won’t be happy about my class choices. I didn’t even call her to talk to her about it because I knew she would try to talk me out of it.

FB: Sunday, Sept 25, 12:46 PM

Psalm 55:22 “Cast your cares on the Lord and he will sustain you; he will never let the righteous fall.” I talked to the Sunday school kids about this verse being helpful to remember when they are worried about something. I better start doing it too. I am worried about never being able to finish this if I have to go so slowly.
Diary Writing: Sunday, Sept 25

I got to talk to Dr. Alice today. It was meant to be for the purpose of the interview but I asked her a lot of questions about my stuff. She is really the only one I trust after having that bad advice from the transfer counselor at NRCC before coming to MSU. I told her about my decision to drop a class and to switch to Physics at NRCC because of costs. She asked me about applying for different scholarships but, honestly, it feels like winning the lottery and I just don’t have time to apply for them. She wasn’t upset. When I told her how worried I am because of all these student loans and not finishing and then not being able to pay them back she was really encouraging. She told me that I had come a long way and she wouldn’t give up on me now. That I was always talented and teachers always believed in me. It just felt nice to hear that. Mom and Dad can’t tell me that. They are too busy with the kids and besides they don’t really understand what I am going through.

After talking about my stuff, Dr. Alice asked how I feel about science. I LOVE science! I love everything about it. I love seeing and touching and discovering out stuff that others already have, but on my own. I asked for a microscope when I was 9 instead of the Easy Bake oven although I did play with my friend’s Easy Bake oven and made giant rainbow crayons with the left over broken ones and I figured out that if you turn the pan upside down, heat it up and then color on top of the pan’s hot bottom it makes the color look like marker. I tried to use it like a kiln with my play dough and that is when her Mom wouldn’t let me play with it anymore.

So, I told her all that and how science is the best way to help people. That is why I want to someday be a doctor. But at this rate, I don’t know. She even gave me a hug because I looked so sad. When she asked me about the support I have in school, I don’t have much
but I am hopeful about my Multivariate Calculus professor, Dr. Forbes. He is really smart and really interested in the students. He knows everyone by name. Mine shouldn’t be too hard since I am one of three girls in that class. He has office hours that he requires us to attend at least twice a term for bonus points and I need to get all the points I can. My composition instructor seems really nice to. Dr. Bird’s papers are mostly about our lives and responding to ideas she presents with using our own life as evidence for our opinions. When I got back the first paper last week she actually asked about me instead of just the grade and some grammar things.

Dr. Alice’s last question was asking where I got my personal power from before I was in college and then now. I used to get power from being with my family. It is really lonely here and I found the cheapest apartment I could which is this loft with one roommate who is barely ever here. High school was so small so I was always the best in the class and that gave me power, like confidence, but it’s not hard when there is only thirty kids in a grade. I knew that then too but I believed I could do anything. Now, everything is so hard and I am so tired. I think I feel least powerful when I am told in every office that the answer to the question is online but I don’t know what I am asking in their words so if I see “transfer curriculum” in the course description at NRCC, I had no idea to ask if it was equal credits. That’s their job, and they seem too busy to do it. I was almost crying by the end. Dr. Alice gave me a hug and told me to call whenever.

FB: Friday, Sept 29, 11:54 PM

End of another week. Midterms are three weeks away. I have two papers due for composition by then. They are easy but they take time. Put in 47 hours of work this week. I am now going to pass out in bed.
FB: Saturday, Sept 30, 11:42 AM

Best thing in life? Sleeping in. Definitely sleeping in.

FB: Sunday, Oct 1, 1:32 PM

Hung out with that little boy from Sunday school today after church. He is gorgeous. His eyes just light up when he talks. His parents work in the factory. They are immigrants from Somalia. I can’t believe he can speak so well. He, Faysai, translates for his parents a lot. Crazy, a seven year old helping out so much like that.

Text to Marie: Sunday, Oct 1, 1:46 PM

Met a little boy who translates for his parents like you do. Only he is 7. You are such a slacker at 20😊

FB: Monday, Oct 10, 1:39 PM

Just got back from my office meeting with Dr. Forbes. A little weirded out…

FB: Monday, Oct 10, 11:39 PM

I got to squeeze in a little time today at the RHA Columbus Day celebration. Brings back good memories. In school we would make the Nina, the Pinta, and the Sant Maria. Once we made Columbus Day hats that I took home and floated in one of the pasture’s ponds. Maybe I will do that for my Sunday school kids this week.

FB: Sunday, Oct 16, 1:31 PM

Sunday school kids LOVED the paper hats. Yay me. While they made it, I talked about how much Columbus talked about God and doing God’s will. I used today’s bible verse, Jeremiah 29:11, “‘For I know the plans I have for you,’ declares the Lord, ‘plans to prosper you and not to harm you, plans to give you hope and a future.’” And I couldn’t help but look at Faysai and pray that his future is as wonderful as it should be. On a side note,
somebody apparently ripped down a bunch of Columbus Day posters on campus. So weird what people get upset at.

*Text to Marie: Sunday, Oct. 30, 11:58 PM*

Hey you want to join me at my church tomorrow? We are doing a saints party for the kids so they don’t feel left out of trick or treating. I am even taking off work for it.

*FB: Tuesday, Nov 1, 12:24 PM*

I cannot believe how much I don’t know. I knew this would be a problem when I took my high school calculus class. I am still paying for a bad education. I ran into this in Calc 1 and 2 but am still trying to relearn some concepts.

*FB: Wednesday, Nov 2, 12:49 PM*

Had Dr. Forbes last office visit today. Not good. Glad it was the last. Careful ladies.

*FB reply post to Marie: Wednesday, Nov 2, 4:09 PM*

I am not saying anything. There is nothing to say.

*FB: Saturday, Nov 5, 1:35 AM*

Late night and I am coming in tomorrow morning. Ugh. Saturday mornings are my only time off and midterms are coming up

*FB: Sunday, Nov 6, 1:46 PM*

I have got to get a different job. So many of the other engineers are working as lab techs or even office staff in one of the bio-tech firms. I have no idea how they got them.

*FB: Tuesday, Nov 8, 2:52 AM*

So tired. Found out where at least one of the students got a major related job. His dad is in IT at the firm and just asked his boss. I hate coming from nothing.
FB: Wednesday, Nov 9, 12:53 PM

Found out where another student got a major related job. He went to school in the city which had an engineer track and partnered with another firm. My school was lucky if they had books printed within the last 20 years which sucks if you are in science.

FB: Friday, Nov 11, 1:40 AM

Back from work. Tomorrow there is no class for Veteran’s Day. So, regular early morning for the bread store and then crash for a few hours before back to waitress. Wahoo!

Text to Marie: Sunday, Nov 13, 2:03 PM

Hey, thanks for helping out with homework yesterday. It was nice to have you come to my restaurant for once. Angel was as handsome as ever. Lucky girl!

Text to Marie: Sunday, Nov 13, 11:42 PM

I am freaking out about the midterms. You think Physics will be doable?

FB: Wednesday, November 23, 6:13 PM

Hitting the road. Five hours until home and Thanksgiving with my family. I miss them!

FB: Thursday, November 24, 5:32PM

Belly stuffed. Arms sore from hugs. Eyes burned from crying. I hate that I have to go back home but I have to work.

FB: Friday, November 25, 6:32PM

Went home early because of Black Friday’s heavy early crowd and light dinner crowd. Miss my family already. I am also missing my littlest brother’s first basketball tournament this weekend.

FB: Friday, November 25, 11:48 PM
It's going to snow. I can tell by how the air feels and the sky looked. If I was at home we would be bedding down the livestock to get them ready.

*FB reply post to Marie: Saturday, November 26, 4:42PM*

If it ever stops snowing, I am coming to take you up on your Physics tutoring and tacos. Maybe that could be your next big marketing plan 😊

*FB: Sunday, November 27, 1:05 PM*

I may hate being away from my family but Sunday school definitely helps. Faysai is a joy and he is also reminding me of how important family is. He is much further from home than I am and he told me today that he misses it but as long as he is with his family he is happy. I always thought I would be a doctor but I don’t know if I can be happy away from everyone as long as that would require.

*Text to Marie: Monday, November 28, 2:13PM*

I am working on dealing with my grades that are way lower than they should be. Right now I have a B in everything. It’s not bad I guess but I dropped a whole class so that I could get an A. How are your grades?

*Text to Marie: Thursday, December, 3:25PM*

Dr. Forbes talked about how important an internship is to graduate school applications. I don’t think I can afford to do an internship. I am not even sure what it is. Do I get paid? How do I get one? Do I have to pay FOR it? And I don’t want to get any friendlier with him to find out more. Urgh!
**FB: Friday, December 2, 11:57 PM**

Dr. Bird is so great. She really had read my work this semester and talked to me about how the financial aid office could work with me a little more. I had written about how tight things are. She was so positive and encouraging. Wish I had more writing courses to do.

**Text to Marie: Sunday, December 4, 11:36 PM**

Marie! Where are you? Finals are almost here. You spend too much time with Angel. Are you doing ok in school still?

**FB: Monday, December 5, 10:59 PM**

Talked to Dad about an internship. He didn’t think I would need it as long as I had a degree. Plus, he wanted me home this summer. I don’t think I can afford to tho….

**FB: Sunday, December 11, 3:31 PM**

Today at Sunday school, which I really should have stayed home and studied instead since I had to work a late shift tonight at the restaurant, I told the students that James 1: 2-4 writes “Consider it pure joy, my brothers, whenever you face trials of many kinds” Faysai said he wasn’t happy when he thinks about leaving home. And that he didn’t find it pure joy. I told him I was facing the finals week trials and I didn’t find it joyful either. But the first one is in ten short hours and before that I have to study, sleep and work. Ugh!

**FB: Friday, Dec 16, 3:58**

So tired. But finals week is over. I am working a shift tonight and then will be in bed for 48 hours. I think I have a cold coming on but it could just be this is what 2 hours of sleep a night and stress does to a person.
Diary: Tuesday, December 20

I woke up today and didn’t feel tired. It was amazing! I think it was partly because I talked to Dr. Alice yesterday. She always is so comforting. We met at the coffee shop and drank hot chocolate and just talked. It didn’t feel like an interview even though her phone was recording. She asked about the idea of truth today. She wanted to know how I get to know that truth if there is one. And if there isn’t, what am I searching for? I know what my parents would say. Truth is like God. God exists. Truth exists. We can choose to see it or we can choose to not see it but that doesn’t impact what is really there.

But I know that isn’t completely true. I ran into one of the girls I met in Dr. Alice’s program during high school. She was going on and on about how badly women are treated in the department. It might be happening. I don’t know. I don’t really think about it because it doesn’t matter either way. I still have to do what I have to do. It is very likely that it is just happening in her head or her and the professor’s head. It doesn’t mean it is real but it is real to her. So it is truth in that way.

Maybe that is the problem with how I am trying to look at my career. I used to think I was meant to be a biological engineer and go to med school and heal people but now, I don’t think that it what I was “meant” to do. It is just one of several options. If I were to go back to the farm after school like my parents did, that is an option that I have to. It is my job to find the best option. And that makes life much more confusing because it becomes less certain, less sure.

Dr. Alice agreed but said that is a positive step in my development. It is a sign that I see myself in more complex ways and she said, especially for me, that is a change. But then she talked about power again and I see science as power. I see science as a way to prove how
smart and good I am. I see science as my identity because I like it but also because I don’t feel like there is any certainty about who I am. Somehow, science gives me that certainty. And I need that. I need to know who I am, even if I don’t know exactly what reality is.

*FB: Saturday, December 2, 1:46 PM*

Made it back to the farm last night. It is beautiful. Everything is covered in beautiful snow. I helped out with chores this morning. It was like I was a kid again. So nice.

*FB: Monday, December 26, 10:31 AM*

Church was beautiful. I miss our church. Maybe I am just not cut out for the city.

*FB reply to Marie’s posting: Monday, December 26, 11:42 AM*

Just saw this. Congratulations!!!! You guys are going to have gorgeous babies!

*FB: Tuesday, December 27, 9:39 AM*

Ready to go back to the apartment. Waiting for Dad to get back from chores so I can say goodbye. He needs more help than he has. He is getting too old to do some of the things he does on his own.

*FB reply to Marie’s posting: Wednesday, December 28, 3:55 PM*

Wow! You guys are moving in together now? Since when did you become such a grown up? I still can’t find matching socks in the morning!

*FB: Wednesday, December 28, 11:59 PM*

I think the car is going to need a fix soon. Sounded weird coming back from the farm and then on the way home from the restaurant today it sounded even worse. Sigh. Money. None.
Campus is so quiet. Work is slow. I checked my grades. I got two A’s and a B. Multivariate Calculus was super hard to I am ok it’s just a B. Good professors last term but I will especially miss Dr. Bird’s class.

Text to Marie: Tuesday, January 17, 2:42 PM

Someone was saying you aren’t in any pre engineering courses at NRCC. What is going on? You ok?

FB: Wednesday, January 18, 1:37 AM

Finally got all my books. The financial aid was late but I have heard some wait through half the term so I can’t be too upset about halfway through the first week. I will be taking History of Technology with Dr. Barth and Medical Instrument Design with Dr. Wang. Both seem really knowledgeable. I am also taking one class at NWRC – Intro to Probability Statistics. I think it is the last one I can take there. And I am only doing three classes. I am working just as much this term as last. I will try to catch up in the summer maybe.

FB: Sat, January 21, 2:15 PM

I love seeing my Sunday school kids again. Faysai brought a toy his dad made. It was a carved paddle with the ball tied to it but it was beautiful. Reminds me of what my dad used to do for me, only this really was exquisite. If only people got paid for carving, Faysai’s family would be rich.

Text to Marie: Monday, January 22, 12:36 AM

You are so good with numbers. You want to help me with my Stats class tomorrow?
**FB: Saturday, January 28, 1:07 AM**

Car wouldn’t start so I missed work while I was spending money getting it towed. Mechanic dad knows here said that it would be $900 fix. There goes the cushion I had.

**FB: Saturday, January 28, 8:41 PM**

Missed another work shift but got it covered. Car done by Monday so bread store is a bike ride I guess. Wind from the North so its going to be awful getting there, ok coming back.

**FB: Monday, January 30, 11:49 PM**

Well, the car is back. Still not sure it is totally fixed but at least it seems to be getting me around and I will never bike at 5:30 in the morning in the winter for ten miles ever again. Nearly got myself killed on ice patches and snow chunks that I hit in the dark.

**FB: Friday, February 3, 3:41 AM**

Just got done studying for first big exam. Work in two hours. So tired. I can’t keep doing this. Do I really want a degree this bad? Is it worth it. Feel like crying.

**Text to Marie: Friday, February 3, 5:13 PM**

At work but I wanted to thank you for giving me a call. It was good to hear some encouragement. I needed it. Love you girl!

**Diary: Sunday, February 5**

After Sunday school, I met Dr. Alice for lunch at our coffee spot. She was going through the beginning of the term interview questions which were about needing other’s approval. I need some people’s approval, like my parents. But they are proud of me and they aren’t that focused on me. I call once a month to check in and they are always supportive. Maybe because they feel like I am successful and assume everything will be fine. I have always been responsible about everything. And part of that is because I feel a responsibility
to be a good role model for my siblings since I am the oldest and I want them to know they can do anything.

I care about my bosses thinking that I am a good worker and that my professors think I am good at my classes. But as for friends, I have a lot from work and school but they are supportive too. No matter what I do. I guess if I feel bad about anything its whether or not I am doing what is “right” or “good”. My faith is what is most important to me. In a way, it is a really tough critic though because in my field, I feel like I have to hide my faith, like its silly or weak to believe in. I was afraid Dr. Alice would say something or push me on it but she didn’t. It was nice to not have to explain.

She also asked me to describe myself. I am a scientist. That is just what came to mind. It really is who I am, part of why it’s hard to explain why I also am a spiritual person. Yes, I am a daughter and a sister and a friend and a student but that isn’t what I am. That is what I do. I am a scientist. I want to know more about everything. Even if I can’t finish this degree, that is who I am. I can’t stop wondering and questioning. Dr. Alice wondered what else being a scientist meant, especially with being spiritual and I think it makes sense to me because that is how I know God better. I go to church, but I find him in the amazing details of life. The beautiful systems that are so small that nobody even knows there are. The silent miracles that are all around us like the bacteria on our skin, the cells in our bodies, the neurons in our brains, that is what makes me a spiritual scientist.

It makes me angry sometimes to think how I am at such a disadvantage because I have to work so hard just to pay bills and I know a lot of other kids are just going to school. It is frustrating to have to slow down doing what will be a great career just so that I can pay rent and tuition and food. But, I am happy that I can still study what I love.
FB: Tuesday, February 15, 2:13 AM

Long night at the restaurant. Lots of Valentine dinners. Watching some of it makes me really happy I am not in a relationship. No time and also, so lame – candles and chocolates? If I ever am in a relationship, I hope that the guy has some sense of spontaneity and originality.

Text to Marie: Tuesday, February 15, 12:56 PM

You got a scooter? He made a scooter for you? Now that is an original V day gift!

Text to Marie: Sunday, February 19, 3:51 PM

No school tomorrow! Want to meet for lunch between my jobs like around 11? No Angel!

FB: Tuesday, February 20, 3:26 PM

President’s Day is the best holiday ever! Still had to work but it is so light I am actually able to do some studying at the restaurant. Amazing!

Text to Marie: Friday, February 24, 11:59 PM

You seemed so sad on Monday. I meant to ask earlier but was so busy getting ready for midterms and working. Let’s get together soon. Call me.

FB: Saturday, March 17, 2:13 AM

Just back from work. Too many students out celebrating end of midterms. If I would have been free tonight, I would have been celebrating by sleeping which is what I am about to do right now.
Spring break was great. I worked a ton and made a ton. For some reason, everybody needed time off so I filled in. Almost have that money cushion back. Now, if only my car holds it together….

Straight A’s so far. I can’t believe it. I haven’t studied nearly enough but I do love all my classes. I feel like a sponge in them. Makes a big difference.

Faysai’s family is getting ready to move. His dad found another job with a relative who owns a business, not sure what kind. But Faysai was really sad. I told him I would miss him. I really will. It’s got to be hard to be poor and to have to move around. I was poor but I always was stable. Faysai has to find a whole new set of friends in a whole new school. Poor kid.

I got your text. Let’s meet after work if you can. Should be out of here at midnight. I will meet you at my place.

Marie is pregnant. Now what?

Prayed for you today. You are so strong. Don’t give up on your dreams.

You are due in December, right? You could still do all next term. My mom worked on the farm through all of her pregnancies….
Text to Marie: Sunday, April 22, 4:36

Talked to Jasmine today since she is in my History of Tech course. I told her when she asked how you were doing. Hope that’s ok.

FB: Tuesday, May 1, 2:57 AM

Three hours of studying after work plus what I could get in during work. Finals suck!

FB: Thursday, May 3, 3:32 AM

Last final today. History of Tech. Its an essay exam. I have so much in my head. Hope it doesn’t leave before the test but I am so, so tired. Again. Sigh.

FB: Thursday, May 3, 1:35 PM

Done with everything. Now, just two more days of work until I can sleep for about twenty hours at once. Can’t wait.

FB: Wednesday, May 8, 3:53 PM

Grades are in. Got an A in everything except Stats which was an A- Thank you, Marie! Couldn’t have done that without you.

Text to Marie: Thursday, May 9, 4:31 PM

You looked amazing today. I can’t believe you are having a baby. You amaze me. You aren’t doing the things that anybody told us we should do and you seem fine. Wish I had that confidence.

FB: Friday, May 10, 4:36

Finished registering for next term. Want to take a full time load again, or at least try. It’s expensive but so is stringing this along. It’s already going to take me 5 ½ years to finish and that is if I go full time. I still want to go to grad school but its so much money and I miss home.
FB: Saturday, May 11, 5:31PM

I am trying to find a different job that could be steady day hours. I can’t keep not sleeping like I did last year. I wish I could take night classes but this program is set up for kids who do nothing but school. Grrr.

Diary Entry: Monday, May 13, 11:47 PM

Last interview with Dr. Alice for this term. It’s so nice to have her to bounce ideas off even though its meant to just be an interview. She has become more of a friend and mentor. And she knows the system so well. She was able to give me some suggestions about how to manage my time a little better and we talked about how I might be able to get this scholarship that is available nationally to women interested in bio-engineering. It sounds tough but she said with my grades and background I have a good chance. Without her, I would never have considered doing it but if she says I could, I believe it.

She also asked about the three questions that have been there all year like how do I know, who am I and what are my relationships. I feel like I know those things but they could change. Marie’s changed as soon as she found out she was going to have a baby. At least I think it did. I think if she would have been better connected with a group like we were in high school, she would have felt differently. But, she has to figure out what she wants too. The last time I saw Jasmine just before the History of Tech final she was saying that she might give her a shower because she feels so bad for Marie. I don’t know. I would have thought that before but there are so many ways to be a real scientist that it doesn’t need a degree and I think Marie is a real scientist. She thinks about things, really thinks about them. She doesn’t need a degree to do that. Actually, she is more of a scientist than Jasmine, even
with a degree, because Jasmine doesn’t seem to need science. It isn’t who she is. She just
does it. She would be fine without it. I couldn’t stop, with or without the degree.

Dr. Alice asked me if I thought that not finishing up the degree, if that were to happen
to me, would mean I had different kinds of social capital. I don’t know if I understand that
word but if I think about it like power, in a way, yes. I mean, I will have less ability to do
things, to be hired, to be respected and that means I can’t work on teams which is really what
you need to have as a scientist. But, I would still have my family. And I would still have
science. I don’t have it all figured out yet. I don’t even know for sure who I am but I am
starting to know more and the only way that is happening is because of the people I know
challenging the ways that I know, like Dr. Alice and Marie. Both of them make me see life is
complicated. It is not just facts. It is a collection of facts that are how we see life but it is just
facts. That is all. I see that now more than ever. My understanding of science is better now
because I am freed from only seeing one right answer. There are many. Just like there is not
one “right” me. There are many ways to be me and I get to be the engineer of me.1

Corinthians 13:12, “Now we see but a poor reflection as in a mirror, the we shall see face to
face. Now I know in part; then I shall know fully, even as I am fully known.”

Marie. As a first generation woman from Mexico, Marie has already overcome many
challenges that stand in the way of a four-year college degree. As a legal citizen, she doesn’t
fear many of the threats some of her friends who are not legal citizens do. However, she was
raised by parents who want her to do well but see her success obtained more through
marriage than through a career, though they do support some level of post-secondary degree.
She has attended NRCC for the past two years part time as she also does a lot of work at her
parent’s restaurant, including helping with the language barriers her parents face as well as
manage the book keeping. She was offered a full ride scholarship but it was for full-time course work and she had to give that up because she found she could not continue to play the role she always has for her family and keep up her studies. That pressure is felt due to her parent’s demands for her help as well as her own conscience that tells her it is her responsibility as the oldest child. While Marie is the oldest of three, the other two are both boys and are both encouraged by their parents to attend full-time and work at the restaurant only as waiters. Already, the middle brother, younger by two years, has passed Marie’s credit load. The youngest brother will start at MSU full-time next year. Marie has a natural gift with math and science and has considered going into bioengineering but is unsure. For Marie, the third year out of high school becomes a turning point.

Marie

*Private Blog: Saturday, Sept 3, 9:04 AM*

Twentieth birthday today! Angel got me a smart phone and I am paying for a data plan. Finally in the 21st century. It costs a ton but it is worth it. I can blog all the time now.

*FB: Saturday, Sept 3, 9:29 AM*

Hey everybody! Posting on my smartphone now. You are going to get sick of me now that I can post whenever.

*FB: Sunday, Sept 4, 12:07 PM*

Mom and Dad got me my annual bus pass. Boring but a nice thing I don’t have to pay for now. And a gift certificate to NRCC bookstore.
Private Blog: Sept 5, 12:07 PM

Just got out of Physics class. It is so easy. Don’t really think it will take up much time. I also am taking a child psychology class. Books are crazy expensive for both. I wonder if I can get by without buying them. Meeting with Dr. Alice for the second to last interview in two weeks. I will be glad to be done with this stuff. I don’t have much to say and I always feel like she is trying to push me back into being a full time student at MSU. It really isn’t her call and I am making choices I want to make. I don’t need to feel like they are wrong because they aren’t.

FB post reply to Chrysti: Saturday, Sept 10, 2:41 PM

I will be there to bake cookies. Obviously, I am not in any of your classes but I might be able to help. My classes this term are so easy for me I need a little challenge.

FB: Sept 10: Saturday, Sept 10, 8:41 PM

Had an awesome time with Chrysti baking cookies. Not much time studying though, sorry!

Text to Chrysti: Saturday, Sept 10, 3:49 PM

Hanging out with Angel at the restaurant. Slow here. I am taking Physics at NRCC. Super easy. Come take it with me!

FB: Sunday, Sept 11, 12:45 PM

Dad always does this big 9/11 remembrance thing at the restaurant. Thinks it is good for business. I have tried to talk him out of it. I see no proof when I compare profits over the last four years but he doesn’t like to listen to facts, just does what he wants with this business.
Text to Chrysti: Monday, Sept 12, 4:59 PM

I can pick up your shift if you want as long as they are ok. I haven’t worked there for a year now you know. Angel will drive me he said so I don’t have to take the bus so early.

Text to Chrysti: Tuesday, Sept 13

No problem. Wish our restaurant would get some of that business yours has. We are too far away. Need to work on a plan to get them over here.

Text to Chrysti: Wednesday, Sept 13, 1:41 AM

I am working on the books. Fell behind. Angel is here. Says hi. I won’t forget your shift.

FB: Thursday, Sept 14, 10:32 AM

My girl Marie is taking Physics with me. Awesome! A reason to go to class.

Text to Chrysti: Saturday, Sept 16, 11:28 AM

I loved seeing you in class too! I was starting to skip but you will help me keep going. Plus, I have to beat you in it😊

FB: Sunday, Sept 17, 1:40 PM

I have a brilliant idea. There is no young customer here. Dad has been relying on older people. People who eat out once a week. We need young people. People who are interested in finding a regular place that they are going to go to often. So…dollar marguerites for students and all you can eat nachos on Thursday and Sunday nights. It should get the crowds in here. Now, if only I can convince Dad.

FB: Sunday, Sept 17, 3:59 PM

Huge family fight. Juan and Mateo both supported Dad’s thought that it needs to be a more authentic experience and that would make it more of a party place. They are all wrong!
**Private Blog: Sunday, Sept 27, 8:59 PM**

At five tonight the restaurant was dead. Nobody was here. I had time to put together a simple spreadsheet so that my idiot brothers and father could see how bad we are doing. The boys are supposed to be so smart. They can’t count their own tips. They are so lazy, ungrateful, chauvinistic, blah! Maybe my parents just want them gone so that they don’t tank the restaurant. Anyways, even they saw we need to change something. They didn’t like it, but I am going to make up the flyers. I know some of the post office student workers at MSU and they will stuff mailboxes for me if I exchange a marguerite or two. I am going to FB an invite which should cover a lot of NRCC students and word of mouth will help. Might even publish it on the Northern net. A lot of students read that before going out since there are coupons on it a lot. I figured we should more than break even the first few weeks and then, if it picks up steam, those nights which are so dead now will become our biggest money makers.

**FB: Friday, Sept 22, 2:51 AM**

Not studying. Just up. Wondering about what I am doing with my life.

**Text to Chrysti: Friday, Sept 22, 10:42 AM**

Got your text this morning. You are staying up too late! You had work two and a half hours after you were up texting. Don’t make yourself sick. Yep. Dr. Alice interview set for Monday at the restaurant.

**Private Blog: Monday, Sept 26, 10:42 PM**

Saw Dr. Alice this morning. She is always so complimentary about the restaurant but I know she is thinking that I am being forced to stay here. I could leave if I wanted. I make my own decisions but I have other things besides me to think about it. Angel is doing really well at the shop and his dad is ready to give it to him he thinks. I like seeing if I can fix how
the restaurant, make it better, you know? Family is more important to me than anything else. I don’t think she gets it. Her encouragement feels like a put down to me. But Chrysti loves her. Maybe I am just missing something.

She asked me about science and how it related to who I am. I don’t see science as being anything to do with me. It’s a thing. I am good at it. It could be relevant I suppose but when I look around at things that need to be done, the restaurant needs direction, my parents need help keeping the books, they need help with English, they need me. I feel like science is this magical thing that everyone talks about but it is just a lot of jumping through hoops to be able to help people. I could help people right now. Today. My family. And I resent when she asked if I have enough support. My support is me. And Angel. And my parents, even Juan and Mateo, but they support me differently than she means so I just didn’t want to talk about it with her. School has been fine because I am good at it but I am sick of being treated like a second class citizen. When I went to the MSU science camp that I got the tuition paid for because my scores were so high, all the white kids, and they were almost all white kids, looked at me like I had it made because I speak Spanish and have dark skin and my parents have to work harder than theirs. I have had professors treat me like shit. When I won that scholarship, they knew that I have to do right by my family. And then they punish me by saying if I take care of my family and put school second I don’t get the scholarship. So screw it. I have no need to put up with that. Any of that. I know what I can do and who I am. I don’t need a degree. I just keep going because its fun and I am good at it. That’s it.

I kind of lost it then when she asked my about power. Didn’t I just say everything there was to say about that? I have no power at MSU. I have no power at NRCC. But I have power here, in my family. I can make things better. I can turn this business around. I can
show my dad what I can do. That is power. I know MSU kids in the bioengineering program that can’t read a bus schedule. I can. I know MSU kids who claim to be so smart because they have a 4.0 in Multivariate Calculus. I could not only get an A in it, I could teach that course. But I get looked down on because I speak Spanish when those fools can only speak bad English? Dr. Alice tried to calm me down but I was steamed. I told her that the program only showed me how the system is against me. It brought me to the doors and then dropped me when I wouldn’t change into the rich white kid they want, only in Mexican form. Well, fuck it. I have a life and a family and if they don’t like it, then they don’t get me either. I told her I felt like just something that they could show off how enlightened they were. I won’t do it. I won’t be part of that game.

Dr. Alice tried to agree but I knew she really wanted to argue with me but couldn’t. I know how this research works. They can’t try to change their “participants” minds by arguing. She can’t hide what she wants to do from me though. When she left I was shaking a little. I had to go wash dishes for a while to get my mind off the whole thing.

FB: Friday, Sept 29, 9:09 PM

Yesterday, the All You Can Eat Nacho night was a huge success. Tons of students came. We did great. Cheese and chips are really cheap and we make them pay per person as they come through the door so it was easy billing too. Juan and Mateo even had to agree it was good though Juan spent more time hanging out with the customers since so many were from MSU then he spent working. Anyway, come down. Sunday it happens all over again!

Text to Chrysti: Sunday, Oct 1, 2:39 PM

I translated at seven too, sweetheart. But that is cool you met a kid from Somalia. Its good for you to know people who are any other color but white;
FB: Monday, Oct 10, 10:42 AM

Yesterday was another hit. I think we have something here. If it grows, even by 2%, we could be making as much net those two nights as we do all the other nights put together. I am a marketing genius!

Text to Chrysti: Sunday, Oct. 30, 12:01 AM

I can’t go. We have to get ready for Dia de los Muertos. Dad wanted all the wait staff to dress up in skeletal costumes which I said no to but he still wants sugar skulls and I convinced the bakery to make some chocolate skulls as well. I am not sure how well they will do it so I am going over to check. Sorry!

FB reply post to Chrysti: Wednesday, Nov 2, 3:31 PM

Say something! You can’t just let it continue.

FB reply post to Marie: Wednesday, Nov 2, 5:31 PM

Whatever. Do what you want. I get what you are saying about just getting through without waves but you should know that I don’t agree with you. Wouldn’t choose that myself.

FB: Sunday, Nov 6, 2:53 PM

Sundays are so popular now I am wondering why I started it. Had to hire extra staff to help cover everything. Angel filled in for a while since the shop isn’t open on Sunday but I don’t want him to feel like he has to.

FB: Tuesday, Nov 8, 2:59 PM

Don’t say shit like that. You come from something. Just because the school doesn’t value it doesn’t mean it is valuable. That is why I hate schools. Nobody lives in the real world there. Bet none of those pretty boys with daddy’s in firms know how to grow enough food to feed a family. You do.
FB: Wednesday, Nov 9, 4:32 PM

Aced another Physics test. Wish it was a little harder. Too boring right now.

FB: Friday, Nov 11, 2:52 PM

Mateo was talking to some of his friends who are in the military and came in for our Veteran’s Day specials at the restaurant. I think he is considering it. Dad will hate it.

Text to Chrysti: Sunday, Nov 13, 2:52 PM

Angel is hot, huh? You are welcome about the homework. Anytime girlie.

Text to Chrysti: Sunday, Nov 13, 11:57 PM

Physics final will be a breeze. I am not even studying. I can help you with whatever.

FB: Wednesday, November 23, 11:43 PM

Angel’s family invited me over for Thanksgiving but I am staying at the restaurant. We serve turkey all day. No AYCE Nachos today, sorry. Amazing how many people want to eat at some Mexican restaurant instead of being with their families for a holiday.

FB: Friday, November 25, 3:42 PM

Good lunch crowd. We are so close to the mall we get a lot of Black Friday crowds. It will be slow the rest of the day though. Chrysti, if you are out there, you should stop by for some Physics tutoring and tacos®

FB: Sunday, November 27, 11:37 PM

Angel just came over to the restaurant to talk to Dad. Kind of weird. Wonder what he is up to.
Text to Chrysti: Monday, November 28 2:49 PM

A’s. But hey, you are working so hard and taking more classes than me for sure. Plus you know how easy math stuff has always been for me and physics is lots of math. Tutoring and tacos are always available to you….

FB: Friday, December 2, 10:36 PM

Angel helped clean up today. He is so sweet. Works all day with his own family’s business and then comes in to help my family out. Got myself a good one 😊

Text to Chrysti: Thursday, December 3, 5:31 PM

You don’t need Dr. Forbes’ help. You can figure it out on your own. Ask around. You like Dr. Alice so much. She would tell you that you keep giving other people all your power.

Text to Chrysti: Thursday, December 4, 11:46 PM

Don’t worry about me. My grades are fine. Not that it is any of your business, but Angel and I haven’t seen each other all day today so that should make you happy 😊

Reply to Chrysti FB post: Monday, December 12, 9:47 AM

You better stop posting all these bible verses or someone is going to think you are evangelizer crazy lady.

FB: Friday, Dec 16, 5:42 PM

Lots of people last night at the restaurant. Mostly college kids partying after their last final. Today is slow again. Have to talk to Dr. Alice tomorrow. Gag.

Personal Blog: Saturday, Dec 17, 3:52 PM

Finished the end of term interview with Dr. Alice. She seemed a little nervous. I guess she had a right to be. The last time we had talked I think I scared her with how mad I
got. It also may have been because her questions were really stupid this time. She asked how I got to truth. Well, that is a matter of what kind of truth there is. Is it the kind of fact truth that 2 and 2 add up to 4 or is it the truth of what the best thing for me to do with my life is. Those are different things. Facts and truths are different and she didn’t seem to be separating them at all. I know how to add two and two together but I also know how to get to 4 by dividing 8 into 32 and multiplying 1 by 4 or subtracting 5 from 9 or a million other ways. Some people can only imagine 2 plus 2 is four. They don’t think of it any other way. I do. Just like I think about what I should do according to what I want. That seems so hard for her to grasp. I don’t want to be what somebody else wants me to be. I am the only one who can claim that and own that and take the fall if it works out badly. There is no perfect path.

If somebody doesn’t want to listen to what I have to say just because I didn’t go to the right school or get the right degree, it doesn’t make me any less right even though he can’t hear it. I know I was meant to help my family out because I can and I should and I have a responsibility to it and I think it is right. There are a lot of ways to do that. Even being a professor of bioengineering might be one of those ways. But, I don’t know that I want to sacrifice the time and money to do that. That doesn’t make Dr. Alice wrong. Just makes it a different way of seeing the facts for both of us.

Dr. Alice seemed happy about that in some ways. She asked if I saw science as a source of any kind of power for me. Like, did I see it lifting me up? I guess it gives me more power among some people but it won’t make any difference to people who matter. Angel doesn’t care either way. He would support me if I went for it, I mean really went for it and didn’t just half ass it like I know I am doing. But I actually want a family someday. Maybe sooner than later. Doesn’t anybody talk about that. I know girls from high school who got
pregnant in high school and never graduated don’t have it right but I don’t know that Chrysti or the other girls from the program do either. What if they keep giving up today for some tomorrow they think is perfect. What happens if tomorrow never gets here? Or if it does and it isn’t perfect?

Even during Dr. Alice’s high school program, when they would bring us to college labs and classes and stuff, I always felt like the price I would have to pay to keep going was giving up little bits of me. Little bits of my family. Little bits of my culture. Little bits of my world. I just couldn’t see why I would do that. I don’t know if Dr. Alice understood that but she seemed to listen harder than she has before. That’s a good sign, right? We have two more interviews this year. I am going to make it my goal to try to get her to understand what I mean. I think THAT is something that should go in her research if anybody is going to read it.

FB: Sunday, December 25, 7:31 AM

Even I admitted we should close the restaurant for the holiday. Going to mass. Spending most of the day here and then doing dinner with Angel’s family.

FB: Sunday, December 25, 11:56 PM

Angel ASKED THE QUESTION! I am going to be Mrs. Santiago!

FB: Wednesday, December 28, 3:46 PM

Now that I am engaged, I am moving in with Angel. Mom and Dad are not happy. They brought out the big guns, Jesus, the Pope, the bible, the catechism. But I am an adult, they can’t stop me, and we are engaged. They will get over it.

FB: Tuesday, January 3, 10:37 PM

Finished moving all my stuff. Angel is right here. I am going to sleep now, a happy fiancé 😊
FB: Friday, January 6, 5:31 PM

Had our first post move-in fight. I am registering for classes. He thinks I shouldn’t now that I am going to get married. I won’t be bullied by someone, even if it’s Angel. I will take classes if I want.

FB: Saturday, January 7, 3:11 PM

Enjoyed buying my books and putting them on the table so Angel would see them when he got home. But I did give in a little. I am taking Child Development and Accounting. He will like Child Development because it will sound like something a mom should now and accounting is something that I use at the restaurant and will probably help the shop out with. Compromise #1. But I am ok with it.

Text to Marie: Tuesday, January 17, 3:25 PM

I am taking classes that make sense to me. I never had a plan. Am kind of making it up as I go along. Seemed like good choices for me.

FB reply posting to Chrysti: Saturday, January 21, 3:08 PM

People do get paid for carving. All the time.

Text to Chrysti: January 22, 1:46 AM

Can’t sleep. Angel is snoring. Who knew? I can help you out with Stats. Let’s see, Stats and Beans can be this term’s special for you.

FB reply to Chrysti: Saturday, January 28, 8:31 AM

You don’t need a car. Use the bus. I can show you how to read the schedule. You will never drive a car again.
FB: Monday, January 30, 11:01 AM

Angel actually wanted to hear about what I was learning in Child Development. He was really sweet about it. He will be a good dad.

FB reply posting to Chrysti: Friday, February 3, 8:14 AM

Just saw this. You can’t keep doing this. Take a break. I am calling you as soon as you are done at work this morning.

Text to Marie: Friday, February 3, 5:36 PM

Anytime girlie. I am here to help. Don’t want you letting down Dr. Alice like I have ;) And I am seeing her tonight for another interview. Remember you can do whatever you want to. Just make sure you want to do whatever IT is.

Private Blog: Sunday, February 5, 5:32 PM

Dr. Alice. She is so….Dr. Alice. I thought she was getting it last time we met but today’s questions were about what my relationships were like. If I needed approval from anyone. That kind of thing. I don’t know why it is so hard for her to see that approval and love are not the same thing in my family. I need their love. I don’t need their approval. Like moving in with Angel. Actually, that is another good example. I am taking classes even though Angel didn’t approve. But he still loves me. That’s all I need. I don’t give a shit what professors think of me. That’s why I doubt I could ever finish out a degree. You have to care a whole lot about what other people think. You have to be willing to jump through a hoop. I am not.

Then, she asked me to describe myself. The first thing I thought was “not a hoop jumper”. But that seemed really negative, even to me, so I said a person who is making the world better for the people she loves, and maybe even others she doesn’t even know. I am
independent and stubborn but I love and I show love and I give up and bend if I think I should do that. If I think that is what is right for me. I am not anything that fits into a box. I am bigger than the labels I think she was looking for. Besides, those things change and I don’t see myself as changing. What I do, who I know, what I want, those things will change. But me, I am here for good. Not much change to that. If I am me according to my terms, I am happy. And if I am happy, that is all that matters in the end.

Text to Chrysti: Tuesday, February 15, 2:37 AM

Busy at our place too. Lots of high school dates for our candle light meal we do every year but some college kids too. Then Angel surprised me when the restaurant closed with, get this, a scooter. I guess he had been working on it. Still too cold to ride, but so sweet. Love that man!

Text to Chrysti: Sunday, February 19, 3:54 PM

Yes to lunch. No, Angel won’t be there since he will be at the shop. Just us girls 😊

Text to Chrysti: Friday, February 25, 1:31 AM

Not sad for me. Mateo told Dad he was going into the military. Dad has been so depressed. He really wanted him to just go straight to school like Juan. Mom’s been crying ever since. She is sure Mateo’s going to die. Always was dramatic. I am proud of him for knowing what to do and doing it. Still hard to see the parents sad.

FB: Saturday, March 29, 11:58 AM

All spring break was discussing what Mateo should do. I finally said he needs to do what he wants. They need to support him. Just like if I decide to go back to school, they need to support that, even if it doesn’t fit with what they think I should do. Juan has it so easy. He is doing what they want and he seems to want it to. Nice when things work out like that.
FB: Sunday, April 10, 3:35 PM

Got sick this morning. Too little sleep. Angel leaves so early. I get home so late. Its tough to sleep for more than four hours without someone having to get up or go to bed.

FB: Monday, April 11, 2:15 PM

Still sick. Couldn’t keep anything down. The restaurant smell is not helping. Yuck!

FB: Tuesday, April 12, 11:35 AM

Went to both morning classes but felt nauseous during accounting and threw up during Child Psychology. I need to go in if I don’t get better. School clinic is cheap.

FB: Wednesday, April 13, 11:01 AM

Feel a little better this morning but still not great. And the restaurant smell makes me instantly nautious. I wonder…..

FB: Thursday, April 14, 3:31 PM

Went to the clinic today. She said I was fine….

Text to Chrysti: Friday, April 13, 4:01 PM

I need to talk to you. Can’t wait. Tonight?

FB: Saturday, April 14, 9:01 AM

Told Angel, the family, Chrysti. Time for FB friends to know…..I am having a baby! Due in December. Nervous, excited, happy!

Text to Chrysti: Monday, April 16, 3:45 PM

Thanks for the prayers but I hope they weren’t like pity prayers. This is a good thing. My dream is a lot of things. This is one of them. I might stay in school. Not sure. I will figure it out. Not worried.
Text to Chrysti: Sunday, April 22, 4:37

I don’t care who you tell. It’s on FB now so anyone could know. Stop worrying so much!

FB: Tuesday, May 1, 3:31 PM

Finished both Accounting and Child Development today. Strange to think it might be my last finals for a while. Not sure about next year.

FB: Wednesday, May 2, 10:32 AM

Saw Mateo off to boot camp. Mom cried but they both kind of seemed proud and Mateo seemed happy which is all they really want for us anyway.

FB reply to Chrysti’s posting: Wednesday, May 8, 4:31 PM

I am sure you could have gotten A’s without my help but thanks for saying it anyway. Hey, what about just coming over to Angel and my place Friday afternoon. Dad is making me take off every other afternoon so I am bored.

FB: Friday, May 10, 3:25 PM

I am registered for three classes this summer term and then two more this fall. I will have an AS in engineering fundamentals and a childcare certificate even after going part time for so long. I have taken all my generals since I tested out of so many and was full time the first year that the courses I have been taking have added up pretty quickly. The childcare certificate was only two more classes and it means I could do in home day care if I want. I just want it as an option. Don’t start calling me asking me to watch your kids yet! 😊

FB: Saturday, May 11, 4:31 PM

I was just working on the books for the school year to see how we did with the college students around. Great year! 39% increase in net income. Enough to replace some
things and do some more professional marketing. Who knows. Maybe I will open up my own place. I am pretty good at this.

*Private Blog: Monday, May 13, 3:38 PM*

Had my last interview with Dr. Alice for this term. I knew she was going to have that look on her face since she had found out I was expecting. I almost didn’t want to tell her I was finishing up a degree just because I wanted to see her try to maneuver around what is obviously her feelings on the matter. But, I am going to try to see her in the way that Chrysti does. And if I do that, she is just worried about me. And that makes her more likeable.

The three questions about who am I, how do I know and what are my relationships were pretty easily answered. I had spelled that out plainly before but the other question, what do I think about my power and do I think that not being in the sciences, at least for a while, will cause me to lose some of the power. That was tough. I talk big. I do believe everything I say about who I am and making myself happy without worrying about anyone else but on the other hand, I know that in the program, I had power. Just being touched by the magic wand of some program, some professor that made me “smart”, I suddenly became smart to a lot of people. People I didn’t know but could open doors in a different world. It felt good. It felt really good but….I know that isn’t enough for me. I don’t live for science like Chrysti does. I don’t need to know everything because somebody said so. I wonder about things. I think about things, but it doesn’t drive me. I won’t be driven. I just want to live. Chrysti sees that label of scientist as a nearly divine thing. I don’t. It just is another thing to do. I am not what I do. I am who I am. And power, the power I care about anyway, comes from not forgetting who I am
Having this baby seems like a disappointment to people like Dr. Alice, even Chrysti, but it isn’t. There is power to be found in families. There is power to be found in knowing there is something more outside of degrees or money or knowing how to get an internship or knowing the right people. I have all those things in different ways. I know how to make money, here, with my family. I know how to chart a course for the business, for my life, that doesn’t require such intense approval of someone. I know how to speak two languages, communicate with two cultures, understand whole ways of knowing because of what words each language has and how it is put together. That is power….at least to me.

Dr. Alice seemed really happy with that. So happy, in fact, she seemed to want to keep next year’s interviews. I think she will enjoy interviewing me with a baby around. She probably likes kids, even if she does want them all to be engineers, especially the girls. She did say if I never work in the field, it will be a great loss because I could bring such a different viewpoint and that I am so gifted but I told her there are many ways the world needs those gifts. I know I will use them, but on my terms. In my own way. And I will use them to find the greatest power, happiness.

Xi

While Marie’s parents immigrated to America prior to Marie’s birth, Xi’s parents were granted refugee status when Xi was three. Traveling from Thailand, Xi’s parents sought out a Hmong community where Xi was able to grow up. Xi’s parents came from a farming tradition but in America they built a prosperous dry cleaning business which has recently opened a second location near the college. They believe in hard work and, as Xi is an only child like Jasmine, focus fiercely on her ability to lift herself out of the poverty so many Hmong refugees find themselves caught up in. Unlike many of the Hmong traditional beliefs,
Xi’s parents embrace Western science and the education and professional success of a daughter. When Xi was 10, both parents chose to become Christian, hoping it would further assist Xi’s ability to assimilate more smoothly into the culture. Xi’s strong abilities in school, particularly the sciences, are due in large part to her study habits which included long hours in the back of her parent’s store, working alone. This intensive schedule and natural abilities allowed Xi a full ride scholarship at MSU which requires her to maintain a 3.5 GPA. While her parents would sacrifice nearly anything for Xi, they also expect Xi to work harder than any of her peers and have driven her relentlessly throughout her schooling, knowing little more than that Xi can and should be always the best in class. In their mind, she was chosen by an American professor as someone who should be and engineer and that is the choice they have made for Xi. Their understanding of her emotional needs is limited as their life was primarily about survival. The effect of this disconnect with Xi’s needs has been somewhat evident since her entrance to MSU as a full time student but it is her third year after being a part of Dr. Alice’s program that significant choices are made which will change Xi’s path.

Xi

FB post: Tuesday, Sept 6, 2:04 AM

Can’t sleep. Nervous about school tomorrow. I am taking overload this term and am so worried I won’t be able to do everything.

FB post: Thursday, Sept 8, 3:26 PM

Nice to see Jasmine in Dr. Scott’s Molecular Biology. He is a lecturer so I am happy to have that. Much easier to follow what he wants.
FB post: Friday, Sept 9, 4:52 PM

Got through Organic Chem, Biochem, Life Science and Lab, and Bio Ethics. Jasmine is in all of the classes except Life Science. That’s my overload.

FB post: Friday, Sept 9, 6:24 PM

Mom and Dad gave me the first few days of school off work but I am back at it tomorrow. I am at the MSU location. Lots of professors will come in I suppose.

Text to Jasmine: Monday, Sept. 12, 5:42 AM

I have to be in by five to the store so I can’t really stay up late. Sorry. I can help with question 5 before class if you still need help.

Private Blog: Tuesday, Sept 13, 2:35 AM

It is awful to be back in school with so much work. I wish I didn’t have to work so hard at work or school. I talked to an advisor today. She said I was taking a lot but it is the only way I will finish in four years and the scholarship is only for four years. No summer classes are paid for so I know Jasmine will be able to make up some, I just have to do it all during the school year. Mom and Dad don’t know anything about how it works. They only see it as what has to be done to be successful and if that is 18 credits, not that they know what a credit even is, than that is what I will do. The new store is making bills easier to pay but we really need to hire more employees and they just are too cheap to do it. I barely have time to sleep or eat.

Dr. Jane was great as usual. She is one of the only women who “get” it. She is also the only one who is brave enough to pronounce my name and has never asked me if I am Chinese. I hate that. I don’t even bother to talk to people about what Hmong is or means because they keep thinking there must be some Hmong Landia or something. Besides, I don’t
really come from that culture. Mom and Dad are so desperate to be American they don’t let me even ask about being Hmong. I get that they are grateful that we are safe and have opportunities here that they didn’t have at the camp or during the war but, it’s just so all or nothing with them. I am either the best or the worst. I am either All American or I am Hmong. No wonder they like me being in engineering. Lots of black and white answers there too.

Dr. Scott came into the store today with dry cleaning. It was weird to see him outside of class. He had on a t-shirt and jeans. I have never not seen him in khaki’s and a jacket. I am not sure he even recognized me. But he is hard to read. Jasmine hates him and thinks that he ignores her but I think that he just doesn’t know how to talk to people like her. She is so loud and, well, kind of rude. I am excited to hear some of the work he is doing. I would be so much better to get to the place where I can make a difference with my work. I feel like I am learning the alphabet when all I want to do is write a novel. I will be back at it tomorrow though. And the next day. And the next.

FB: Wednesday, Sept 14, 4:52 PM

Dr. Scott’s lab today was interesting. I was paired with a new student, John. He is really quiet and shy but I think he will do good work. And, I also think that he works with Dr. Scott’s research because I overheard them talking after class. It’s nice that he doesn’t show off about it.

FB: Friday, Sept 16, 4:13 PM

Slow day here. Nobody is coming in. Had Dr. Jane today. She talked about social patterns today and I felt like I had no pattern at all. I feel like my parents refuse to use the patterns they are supposed to take and forced whole new ones that don’t quite get them where they want to go. Like they have the road built, but they don’t have a car to drive on it now.
FB: Saturday, Sept 17, 11:49 PM

Closed the shop but had to help with the ironing and just got back home now. Need to get some studying done. Tired. Seeing Dr. Alice tomorrow after the employees take a lunch break.

Private Blog: Sunday, Sept 18, 10:52 PM

It was nice to see Dr. Alice again. We aren’t close like she is with some of the other girls but I feel like she cares about me. She was surprised at how many courses I was taking and that I was still working more than twenty hours a week. She thought that was going to be tough to keep up my grades for but then I reminded her how my parents are and she dropped it since I obviously didn’t want to talk about it.

She asked me about how I was feeling about science. I think she is the only one I have ever told that I don’t really like science but my parents think that is what I need to do, and it is what got me my scholarship, and it would make me somebody. It would be nice not to have to work in dry cleaning or at a restaurant or anywhere that you do little things that people could do on their own but just don’t want to. Science will give me that. Not a lot of people understand why or how things work. That matters. Washing people’s clothes doesn’t matter.

I told Dr. Alice how I am expected to be good in science. People think I am Chinese or Japanese because they don’t care enough to know more and they just assume I must be brilliant at science and math. When they hear that I am in bioengineering they aren’t impressed like they would be if I were blonde and white and in it. I feel really alone sometimes at MSU. I just don’t really fit in unless I fit into the stereotype people have for me.
I wish MSU would start a group for Hmong students, even students from refugee camps, anything. I see all these other clubs and just feel forgotten.

One of the things that Dr. Alice seemed worried about was when I told her I had no support in school. I mean, Dr. Alice is nice. Dr. Jane is great. But I don’t talk much and I think that makes it hard for me to have a relationship with anyone. She asked about advising and I told her I have just stuck to the generic plan the department has on their website. I don’t know what else to do. She said I should try to make a connection with a professor. That might help. I am really bad at that – connecting. Jasmine connects so easily. She is super pretty and confident. Even Dylan Thomas has a thing for her. I don’t have that. I just can’t act like that. She is always fighting for something. I don’t have that in me somehow even though a lot of things bother me, like how people think Asian = good at science and math. Instead of Xi = human. Dr. Alice said the high school engineering program was meant to help all of us out with that problem. We met with people. We saw lots of different career options. We had the chance to know that there were scholarships and how to apply for them. But she forgets how I still can’t make myself talk to people. I can’t make myself look in people’s eyes and have them see me. It’s easier in a way to rely on that stereotype which is why I can’t imagine leaving this field. It’s just what I am supposed to do.

FB: Friday, Sept. 22, 4:31 PM

Dr. Scott came in today. Had the same MSU t-shirt and jeans he did last time. Must have only the one pair. He definitely recognized me because we actually looked at each other for a second and he was startled, like he was surprised that I was there. Then he handed me his five jackets and almost ran away. As shy as I am, I still almost laughed he looked so funny.
FB: Saturday, Sept. 23, 3:41 PM

Dad came into the shop today. He seemed happy with how everything looked. He only checks in once a week. Mom comes more often to help with the labeling and sorting, sometimes ironing. She is getting older though. The heat seems to bother her a lot.

FB: Monday, Sept. 24, 5:42 PM

Remember my lab partner, John? He joked about how happy he is to be with someone who is genetically gifted at science and math. I felt so angry. I thought we were starting to have a relationship but no. He sees me as just a quiet Asian girl who is probably Chinese.

FB: Friday, Sept. 28, 5:15 PM

Dr. Scott came in as always with his five shirts and his jackets. Always the same except today he didn’t run away. Well, not quite as fast. He actually mumbled hello to me and maybe even said Xi. Then he hurried away. Somehow it makes me like him more that he is so shy.

FB: Friday, October 10, 5:36 PM

Dr. Scott has not only started to say Hi when he comes into the store. He looks at me and sometimes even smiles, sort of. I asked John if he was on Dr. Scott’s research project. He is. I think I might ask Dr. Scott about it. He is so shy that it makes me less so.

FB: Tuesday, November 1, 11:42 PM

I am thankful that as Americanized as my parents are, they never made me dress up and wear a costume. Every year after Halloween so many weird costumes are brought in to be cleaned. We had 8 gorilla suits this year, a few real pirate costumes with leather and velvet and feathers, and that isn’t even counting what the costume store brought in. It’s a great account but weird, weird things come through there.
FB: Wednesday, November 2, 11:36

John asked if I would be interested in working on the research team because one of the other students had dropped. He said I should ask Dr. Scott if I did want it. I get nervous just thinking about it.

FB: Friday, November 4, 4:39 PM

Dr. Scott’s laundry drop off was eventful today. I was so nervous that when I handed him his change it fell all over the floor. I apologized so much and he kept saying it was ok and then I blurted out that I wanted to work on his research project. He looked surprised and then said I could talk to him after the next class about it. Now, to tell Mom and Dad about how it will cut into my store hours.....

Text to Jasmine: Monday, Nov. 7, 11:57 PM

I had to stay to talk to Dr. Scott. Sorry. John is doing the lab write up for me since I did most of the lab work itself. Thanks for the invite.

FB: Tuesday, November 8, 11:42 PM

Late night again. All the workers were gone off and on for voting. I didn’t even have a chance to go. Sorry Jasmine!

FB: Saturday, November 12, 2:24 AM

Can’t sleep. I am going to meet the research team in the morning. I am not sure if I am good enough to do this. And mom came in today. She looked so tired. She should go to the doctor but they buy such horrible life insurance that they avoid the doctor no matter what.

FB: Saturday, November 12, 3:42 PM

The research team was great! John was really nice and Dr. Scott seemed so excited. Maybe he just doesn’t like teaching because I have never seem him so wired like today. He is
part of a national team that is developing a bionic hand. It is supposed to be ready in 2013 but they are having problems with the sensory signals. There is not a fast enough bidirectional flow of information between the nervous system and the prosthetic hand. I got pretty wired about it myself.

FB: Sunday, November 13, 4:29 PM

In between customers at the store I have been reading everything I can what exists for interfaces between artificial limbs and actual nerves. Most excited I have ever been about bioengineering. Finally, starting to do more than learn the alphabet!

FB: Monday, November 14, 5:46 PM

Mom still looks awful. I told her to run to the minute clinic. Those are pretty cheap. They should be able to find something to help her out. And midterms start tomorrow.

Stress!!!!

FB: Tuesday, November 15, 11:57 PM

Fell asleep at the store studying last night. But I think it was worth it. Two midterms today and I felt like I knew the right things. Now, three more to go.

FB: Wednesday, November 16, 3:26 PM

Mom stopped by the shop again after I had gotten back from class. She had gone but said they just took some blood and will get back to her. If she is told she has to go to an actual doctor after the labs get back I don’t know if she will go. Stubborn woman. So cheap.

FB: Friday, November 18, 2:07 AM

Still at the store. Still studying. Can’t remember when I last ate. Only two more finals tomorrow. Wish I could just work on the research project.
Text to Jasmine: Friday, November 18, 8:32 PM

Sorry I didn’t get your text. I stayed to talk with John and Dr. Scott. Working with them this weekend. Hope you had fun.

FB: Thursday, November 24, 4:31 PM

Store was closed today. Mom always tries to make a turkey for Thanksgiving. It weighs almost as much as she does. Usually makes her happy but this year, she just wanted to sleep afterwards. Kind of worried about her. I have no appetite because I am so stressed.

FB: Friday, November 25, 3:31 PM

Went to the clinic with mom. She needs help getting information. She is as shy as me but also is hard to understand for a lot of people so they often just smile and nod and try to end the conversation. They said that the lab work came back indicating Type 2 diabetes. Not the worst thing but she will have to manage it. She is not good at that. And she is not good at asking questions….or listening….or being understood.

FB: Saturday, November 26, 11:36 PM

Talked to Dr. Scott today about the diagnosis. He said the bionic hand project was funded in part by the American Diabetes Association and so he had some contacts there. Gave me some numbers to call if I don’t get answers next week at the hospital.

Text to Jasmine: Nov 27, 8:41

I would feel wrong using your tutor. Plus I am either at the store or at school or in bed. I just don’t have time to go anywhere. Now that Mom needs me for her doctor visits, its even worse.
FB: Monday, Nov. 28, 11:36 PM

Took Mom to the doctor. She is so nervous around them. I think she thinks she isn’t good enough to take their time. Anyway, good prognosis if she takes her medicine and eats better. I should take that advise too.

FB: Tuesday, Nov. 29, 5:25 PM

Got mom’s medicine. Helped her with her shot this morning. She doesn’t like it. I am not sure she will keep doing it. I have to study now. Finals…and work. No time to eat. Blah.

FB: Friday, December 2, 8:39 PM

Dr. Scott talks to me now when he comes in the store. He asked about Mom and when I told him I worried she wouldn’t keep up he suggested she take a class to learn more. He said the university hospital offer them for free. He also suggested a home care aide to check in a few times a week.

FB: Saturday, December 3, 11:42 PM

The research team was great today. I don’t get to do much but run for things that Dr. Scott and his grad students need and enter things into the computer but I still love it. Talked to Mom and Dad about the class and aide idea. They didn’t like it. I will try again.

FB: Sunday, December 4, 12:31 PM

Mom looked awful when she came in to work at the store. She won’t tell me but I am pretty sure that she isn’t taking her meds. I talked to Dad and told her how serious it was. He trusts me because he thinks all science is the same. I think he will convince her.

FB: Wednesday, December 7, 2:41 PM

Success! Got Mom registered for a group class at MSU’s diabetic center. Scheduled for Saturday.
FB: Saturday, December 10, 11:52

Bad day. Mom was really upset. She said no one could understand her and she didn’t understand anything. I am going to have to go with her. There goes my research team day 😞

Text to Jasmine: Wednesday, December 14, 6:31 AM

I have to work with Mom being so sick. There is less money because of how awful the insurance is being so we can’t hire help. I have barely studied with all the work and Mom’s stuff. I am on the bus now. See you in a few minutes at class.

FB: Friday, Dec 16, 4:25 PM

Last final. I think they all were bad. I didn’t study enough. I just hope I keep my scholarship after this. Still have to work tonight, and check in on Mom, and get her to her class tomorrow. I don’t think I ate at all today.

FB: Saturday, December 17, 10:32 PM

The class was awful. Mom was right. The man running looked bored that he was working with people and not in a lab. He ignored almost everyone but didn’t even look at Mom when she tried to talk to him. I doubt he can be bothered with patients at all, much less those with strong accents. I told him he needed to slow down and he did for maybe two sentences. Frustrating.

FB: Sunday, December 18, 10:58 PM

Called Dr. Scott to see if he had any thoughts. He said he would get me in touch with someone that would help.

FB: Monday, December 19, 1:35 PM

First thing this morning, Dr. Scott calls and gives me the name of the university diabetic center director. Said she would give my mom a private session and talk to the grad
student who had run Saturday’s session. Helps to know people, I guess. This must be how Jasmine feels all the time.

Private Blog: Tuesday, December 20, 11:42 PM

The store was quiet today which was good because Dr. Alice stopped by to do my end of term interview for her own research. I had to answer a couple questions during it because the girl at the desk is new but it was pretty uninterrupted otherwise. She didn’t know about Mom’s diabetes so we talked about that for a while. She asked if she could help but I told her about Dr. Scott and how helpful he was. She said that is what happens when you start to make connections outside of my regular, comfortable life. It’s so hard because I just don’t like to talk to people but I am getting better.

She also asked if I had ever thought about how I know things. I was confused but she explained it more to me and I understood that she was asking if there was realness that we came to or if that realness we experience every day is what we make up in our heads. I know that there is a reality outside of us that we don’t experience. We can’t experience it in the same way that others do so in a way it is both there and made up. We make it up according to our experience and they make it up according to theirs. I see Dr. Scott as a helpful man. Jasmine saw him as awful, especially to girls. There is only what we know. He is far more than either of those things but we will never know that because we won’t experience him in those ways. But he also is who we experience him to be. I don’t know. It’s complicated.

She seemed interested in what I was saying and then asked if I thought being in bioengineering would help me experience more. I said no but it would help me experience different things. Things that will make me able to help my family in a different way than running the store. Things that will get my mom private diabetes management instructions.
That is valuable, really valuable to me. I don’t think about being in a science like my parents do. They think it is a ticket to the American dream where everything will be paid for and I won’t have any problems. Obviously, not true. But it is a ticket to a world that can open up other whole worlds. I am starting to see it differently now. It’s starting to matter.

_Sunday, Dec. 25, 4:21 PM_

We had a big Christmas dinner with our neighbors. I cooked. I am not very good at it but I made garlic cauliflower and some lamb. She liked it and said I should cook more. It was good she and Dad both seemed so happy because then I broke the news to them that I got straight B’s in everything but I would be ok because it was averaged with what I had already done and next term. So, I should be ok. They were less happy. Definitely less happy.

_FB: Monday, January 2, 10:32 PM_

The college location is pretty slow. Dr. Scott hasn’t come in since classes ended but I have been able to get in to do some work on the research project with him. He had two professors come in from Stanford who are part of the national team. I got to sit in on the meeting. Amazing experience. Made me excited for what I could be in doing in ten years or so. They both gave me their cards and said I should consider grad school at Stanford. Scares me to death. Not sure how Mom and Dad would do. I don’t know. But so, so exciting!

_FB: Tuesday, Jan 17, 11:31 PM_

Mom’s levels have been good for three weeks now. I am proud of her but it helps that she takes the bus over to meet with the diabetes center director sometimes. Thank you Dr. Scott! Back to class. Only two credits overload this term.
FB: Wednesday, Jan 18, 3:52 PM

Have gotten to all my classes. History of Tech, Transport Phenomena Lab, Momentum and Heat Transfer Operations, Physical Chemistry and Hmong Cultures class for an elective I still need to fill. It probably would have been better if I had taken some science class for that but I really want to know more and Mom and Dad seem determined to down play it.

FB: Friday, January 20, 8:41 PM

Dr. Scott is back for his Friday drop offs. He is like a friend almost now. He doesn’t seem nervous at all and he always asks about my mom. He told me I made a good impression on his Stanford colleagues and that I really should consider it. We will see how this term goes. It is already just as hectic as the last one.

FB: Monday, January 22, 11:59 AM

Just got out of Hmong Cultures. I love that class. Back to work and checking up on Mom. Seeing Dr. Alice this Saturday. I can’t wait to talk about the class with her. It should fit in with her usual questions about who I am really nicely.

Private Blog: Sunday, January 29, 10:51 PM

Dr. Alice and I met at the store again. Mom talked to her a little. It was nice to see Dr. Alice take so much time with my mother. I felt like I was respected. I don’t feel that a lot. Dr. Alice, and I guess Dr. Scott, and some of the health care people I have met while Mom has been dealing with her diabetes are really good about that though. They look at me, really look at me and Mom, as people who are not just Asian dry cleaners. Some of them know more about Hmong people than me and they can tell we aren’t Chinese or Japanese or whatever else just by our name. It makes me feel like I matter.
It was funny then that she started off asking how much it mattered what other’s thought of me and if I can understand their points of view, even when they are different than mine. I do care that other people give me enough attention to have an opinion of me. I don’t like being lumped into one big Asian stereotype group, especially because of what I study. But I don’t need them to like me necessarily. I don’t talk to a lot of people anyway except for customers. Except for this year. Now with Dr. Scott’s research team and the university medical people that help my mom, I guess I have to talk to a lot of people. I guess I have changed a lot. Even last summer I would be so nervous when a customer would get upset and I would feel like it is my fault but now, I just wonder what they might have had happen that makes them so unhappy. Dr. Alice was interested in that change and asked if I could think how else I have been affected. Like, in how I thought about school and bioengineering in general.

I think the research team and Mom’s sickness has helped me see that what I am doing really can matter. It can change people’s lives. It can change my mom’s life. Older diabetic patients often have to amputate. In fact the doctor has already talked to Mom about that being real if she doesn’t get better at managing it. Maybe the project that I am helping Dr. Scott work on could be used by her. Even though I am not getting as high of grades as I was, at least last term, I am more excited about learning than ever. I actually am caring about my classes and trying to see if I can use what I am learning is some way on the team, or even with Mom. It has become something different than just studying. It has become important.

Then Dr. Alice asked how I would describe myself. I remember she had asked me that before, the first year of college actually. I was confused by that question because all I could think of was a daughter of Hmong immigrants who was going to MSU and got really
good grades in science and math. Now, I don’t think about that at all. I think about myself as someone who can run a store, who can be part of a real research team, who can navigate systems like health care and even the university. And my class is helping me think about my culture more than I have before. I am starting to understand why Mom and Dad are so grateful to be here and want so much for me. I have seen pictures of Hmong populations that are pushed around from one country to the next, one camp to the next. I think about my parents seeing that. Being young and wanting to start a family but dreading the thought of what kind of life their children might have. I see what they have done and I am proud of them.

It makes me also see how much I have that others, even people like Jasmine, don’t. My story matters. Who I am matters. I am not just another Asian in math and science, I am Xi. And for the first time, I think I am starting to understand who that is.

FB: Tuesday, February 15, 4:31 PM

Busy in the shop today. After Valentine’s Day there is always a whole lot of customers bringing things in. Wine stains, chocolate stains, the usual. Love is apparently messy.

Text to Jasmine: Sunday, February 19, 3:31 PM

I do work that much. I also study that much. I don’t sleep that much though. Can’t be there. Sorry. Have to finish up work at the store before Monday morning customers come in. Have fun with Dylan;)

FB: Tuesday, February 20, 3:31 PM

Its President’s Day so the front was busy in the morning and the back was busy in the afternoon. I was able to squeeze some studying in though and I think I might have solved a
problem that Dr. Scott has been working on. It’s so easy to forget about studying for midterms when I can study for something that has real world application.

FB: Thursday, February 23, 4:31 PM

Was reading my Hmong assignment. Hmong means free. I feel like I am become free. Not sure how. But something has changed.

Text to Jasmine: Friday, February 24, 11:59 PM

I am really tired and I am so excited about the project that I forget to eat. I solved a big problem though. Dr. Scott was thrilled. I know you don’t like him but even you have to admit the man is brilliant! I asked him to be my advisor. Don’t hate me!

FB: Friday, March 16, 5:41 PM

With midterms and the research stuff, I had slacked off taking care of Mom. She looks bad again. Need to bring her in.

FB: Saturday, March 17, 4:31 PM

At the hospital. Mom had a scare last night with chest pains and we know that strokes and heart attacks are common with diabetics. She seems alright now. Coming home tonight.

FB: Sunday, March 18, 6:42 PM

Midterms were ok. I can’t believe I am doing so well. I used to study so much but I guess I am getting the hang of what things really mean, not just going through the motions.

FB: Monday, March 19, 10:52 PM

The cost of Mom’s medicines and hospital visit is a lot. Dad is really worried. I feel awful. I wish that I could help them out.
**FB: Wednesday, March 21, 3:41 AM**

Couldn’t sleep so I was reading my Hmong text again. There is a pipe called the qeej that plays music that is a code. Each note is a word and only qeej players can hear it. I feel like I have always heard the music of who I am, and never known what it was saying. But now, maybe I am starting too.

**FB: Friday, March 23, 6:26 PM**

Dr. Scott came in as usual and asked about Mom as usual. I told him about the costs and he said he would think about what he could do.

**FB: Saturday, March 24, 5:46 PM**

We go to the free clinics every weekend now that the university diabetic center puts on for the community. Dr. Scott asked to talk to me tonight. Wonder what that is about. Maybe another great idea?

**FB: Saturday, March 24, 11:52 PM**

Dr. Scott met me with my transcripts and found a way to use the time that I have spent on the project as elective credits and he found out that I had taken more credits than I needed to have and so, according to him, I can graduate a whole semester early. So, December. Wow! I can’t believe it.

**FB: Saturday, March 29, 5:31 PM**

This whole spring break I have been thinking about what it would mean. I have met with Dr. Scott a few times. He suggested that I keep up the relationship with his Stanford colleagues and consider studying there for my graduate degree. I feel awful though. What will my parents do?
**FB: Sunday, March 30, 9:41 PM**

Mom and Dad were both over at the MSU shop with me getting ready for the Monday morning rush and I told them about the early graduation. They were so excited. Mom even jumped up and down. I told them I wasn’t sure what to do. I was worried about them. They wouldn’t even listen. I will give them some time to think.

**FB: Sunday, April 10, 10:58 PM**

Last week has been busy. Mom felt faint again. Told Dad he couldn’t handle both shops, Mom’s health and my being gone. He still won’t listen.

**Text to Jasmine: April 13, 11:42 PM**

It's crazy. Who told you? I know I am working really hard but for the first time, I see a purpose for this. And I understand how it could change what I can offer my parents.

**FB: Saturday, April 21, 9:37 PM**

Had a Skype meeting with the Stanford researchers. They love Dr. Scott’s plan and would take me on the research team as soon as I graduate. They said they could get my tuition paid and a small living allowance too. I can’t believe it. My parents’ dreams are coming true. And I think they might be mine too after all.

**FB: Monday, April 23, 9:36 PM**

Jasmine said that one of the girls from the engineering program is expecting. I remember her. She was so smart. Knew everything without even trying. Not like me. I always worked. Still do, I just like it now. I wonder what this means to her or her family.
Finals week. I worked hard studying. It all is starting to fit together too so it feels like I am studying one whole thing. Mom and Dad told me to take the week off. Dad said it would be a good try at what it would be like without me.

Finished every final and feel good about every one of them. One semester left. Which, if I did as well as I thought, the scholarship will be there for what is left. Thank goodness for Dr. Scott’s advising. Why don’t they pair up professors and students right away?

4.0!

Dr. Alice was thrilled to hear what I found out. She asked if I had remembered seeing Dr. Scott in the high school program on the MSU engineering department tour. I didn’t but she said he remembers me because I was in the back and so quiet. He was the same way so he always pays attention to that kind of thing. She asked me if I had thought anymore about who I am and who I have relationships with and how do I know things. A lot has changed this year for me. I feel like a different person. I took over a store for my parents and didn’t let them down. I got good grades and didn’t let them down. Usually that would be enough. But this year, so much more happened. I learned that I was really strong. Strong enough to manage a business mostly on my own. I was strong enough to make a relationship with a great professor. I was strong enough to get on a research team and prove myself valuable. I was strong enough to help my mom and even fight the system enough so that she was taken care of. I am tired and worn out but I grew so much for me. My life makes more sense now.
From the outside, it may not really look like it. I am still some Asian girl finishing up my degree but I am more than that for a lot of people now. Most especially me.

She asked about power too. The power I had coming into this year was there, I just didn’t know how to get at it. It’s not just having the power, its knowing I have it and knowing how to use it. I still don’t know everything but Dr. Scott will help me and I know that I am in here. It used to feel like I was buried under it all but now I know I am not. In fact, I am growing. Even flourishing. The qeej’s song is playing and at last I know what it is saying.
CHAPTER 5. ANALYSIS OF TEXT

Characters and Epistolary Reflections

When using fiction writing as research, participants are different than in traditional research methodologies. Characters are the participants. These characters are made up of a variety of characteristics that best allow the author to relay an affective understanding of the research. As a result, there are no detailed descriptors pertaining to specific research participants. This is why it is a study that does not require IRB approval. Please see the exemption letter for further information regarding this matter.

The genre used for the FWR was epistolary. It is a form that has been used throughout the Western cannon though some of the most well-known novels include *The Color Purple* by Alice Walker, *Frankenstein* by Mary Shelley, *The Screwtape Letters* by C. S. Lewis, and *Dracula* by Bram Stoker. It is little wonder that it is a popular genre as it is in letters that personal, intimate thoughts are written in the unique voice of the character. However, throughout several decades the epistolary form was less believable. Fewer and fewer people wrote letters to each other and it rapidly became a nearly forgotten form. However, with the advent of social media, epistolary writing again is relevant. Facebook postings have become a sort of shorthand journal entry or letter whose audience may be the entire set of “friends” but many postings reflect private thoughts. Similarly, blogs have become popular methods of making public statements while also assuming an audience of one when the author writes close thoughts.

The selection of the epistolary form satisfied the need for compact and immediate thoughts that only an epistle can provide. Singer (1963) reminds readers that letters are written “to the moment, while the heart is agitated by hopes and fears, on events undecided”
(p. 79). Being undecided, the character allows a reader the privilege of being able to hear the feelings and thoughts that conversation is less likely to do, at least with the same compactness Facebook postings require.

The characters’ postings, blogs and diary writings take advantage of the space needed to discover how she is really feeling at that point in time. Hogan (1991) discusses diaries in particular as “a potentially subversive form of writing because it tends to cross and blur the boundaries between things traditionally kept separate…. [I]t crosses the boundaries between self and other…between author and reader…between text and experience, art and life” (p. 100). Considering the study is looking at young women who are at pivotal moments in understanding self-authorship, social capital and a career in a male dominated field, epistles grant that moment of confusion, struggle to come to an understanding and then to clarify. As such, Hogan’s suggestion that letter writing is itself a process of “reflection and self-discovery” makes this form ideal for a study of this kind.

Finally, letter writing is a genre that is most often a female genre (Salsini, 2001). In past centuries, women’s voices were rarely allowed in public spaces, relegating them to comment in private forums. Martens (1985) explains that epistles are appealing to women because it “can be written in snatches and with little concentration; it is adaptable to the housewife’s interrupted day” (p. 182). While the characters in this study are not housewives, their lives are filled with obligations of daughters, friends, students, lovers, employers, employees, mentees and research participants themselves. These roles leave little time to reflect and so, much like the 18th century housewife, these young women must find fragments of time to reflect on unfolding experiences. Hogan goes on to say that the diary is:
Private, secret, locked—the paradoxical idea of a writing which will remain unread, a sort of “silent” text. If we see “feminine” as a cultural signifier, standing for the historically determined social construction of feminine behavior, psychological characteristics and the like, then the diary is a feminine form. (p. 99)

Instead of being passive, the epistle allows the young women to speak in a public arena. To actively assert their ideas and to deny the subservient tendencies that silent passivity demands.

All of the characters use Facebook and text each other, allowing for an inter- and intrapersonal conversation. However, the young women have slight variations in a third type of epistle they use. Jasmine’s bold personality is better suited to a public blog than a private one. Marie and Xi, for different reasons, use private blogs. Marie uses the private format to have a safe place to assert her rather outspoken thoughts on many of the authority figures that disagree with her life choices. Xi uses it to test ideas and quietly reflect and rejoice in the insights she finds. Chrysti uses a diary as she has for her entire life. It would be unlikely she would change, as she prefers the familiar and traditional in many ways.

**Themes and Analysis**

In reading the young women’s epistles, the reader may see three themes evolve. Each theme suggested in this study relates to the three research questions guiding the research. In fiction writing as research, the analysis of the narratives derived from the researcher’s experiences generate themes that are contextualized with scholarly literature:

- Balancing the scales: social capitals as help and hindrance
- Finding the center of self
- The STEM mystique
Balancing the scales: social capitals as help and hindrance

Social capital as defined by Yosso (2005) and Oliver and Shapiro (1995) include six elements: linguistic capital, resistant capital, navigational capital, social capital, familial capital and aspirational capital. Each of these capitals contributes to the ability or inability to succeed in a cultural setting. The cultural setting this study refers to is the intensely academic, traditional engineering department at a Research I university that has primarily male faculty members and male students. The four young women who make up the fictional narrative of this study are already at a disadvantage in this cultural setting because of their gender. From an early age, parents, teachers, counselors and peers unconsciously tell genders which careers are suitable (Adya & Kaiser, 2005). However, three of the women are further isolated as students of color. The isolation of minority women students in STEM settings has been proven to lower the persistence rates of this population (Foor and Walden, 2009; Grandy, 1998). The fourth woman is white but is also at a disadvantage due to her rural background and lower level of academic confidence. What follows is the literary analysis of the fictional narratives which are meant to convey a sense of how women in STEM understand and make sense of who they are, what powers they possess and how the choice of a STEM or a non-STEM career will affect their evolving self-authorship and social capitals.

Jasmine. Jasmine’s identity as a woman of color would align her with the research that has found women of color to be at a greater risk of STEM attrition (Fancsali, 2000; Foor & Walden, 2009; Grandy, 1998; Maton, et al., 2000). She has had negative course experiences before and continues to have these during her third year. In particular, she has found Dr. Scott to be a “dry” lecturer who neither encourages discussion nor makes an
attempt to call on females in class. The department feels unwelcoming to her as she notes in her Facebook post on September 6, that her major classes are filled with “male chauvinist engineers”. However, despite these multiple barriers, Jasmine is very successful and is almost certain to graduate on time with superior grades before continuing on to do graduate work. Why?

When examining her narrative, it becomes apparent that her background has given her the appropriate social capital for the engineering department’s culture. This allows her to be successful in not just persisting in the major, but in excelling. Of the six social capitals, Jasmine has a substantial amount in each.

Jasmine’s potential has been assumed to be endless by both her and her parents. Her aspirational capital is further boosted by her parents’ successes in STEM fields and her continued success. While the introduction to engineering program was intended to give aspirational capital, Jasmine saw it as unnecessary. In her blog entry on December 19, she notes, “I know that with enough work, anyone can do anything they want….Anyone who doesn’t make their dreams come true just didn’t try hard enough.” This cavalier attitude does shift throughout the year however. By May 9, she writes in her blog, “It is important that I was in this program but really it didn’t make that big of a difference. It did for some of the girls”: a definite recognition that her aspirational capital was sufficient without bolstering, but others were in greater need of it.

Jasmine’s navigational capital is seen in her father’s experiences studying in the same department as a student himself. Her advising by the institution was poor but her parents’ advice and her close relationship with Dr. Jane, the Organic Chemistry instructor, allowed her to be unaffected by what would have been for many other students the sole source of
navigational advice. On September 20, Jasmine states in her blog that “I know how to get around the college catalogue and get what I have to do to graduate on time and get into grad school….it’s just something you are born into, I think. I won the genetic lottery in a way.” In her mind, it outweighs the gender bias she feels in the department.

Yosso’s Social Capital focuses on the networks available to an individual, and Jasmine’s were well developed. Not only was Jasmine’s father an alumnae of the MSU engineering department, he also remained friends with Dr. Scott and used that relationship to massage the relationship that Jasmine perceived to be antagonistic, based on her gender. She knows the financial power of a STEM degree through first-hand experience and has connections via her father’s workplace to get an internship created specifically for her at the end of her junior year.

The familial capital gives Jasmine a story telling her she can survive as her mother’s family did in the Holocaust and her father as an African American engineering student during the Civil Rights movement. Her family’s story includes the dual professional STEM careers of her parents that unconsciously, and consciously, lead Jasmine to assume the same career. On September 20, Jasmine talks about her science career choice as one that was not even really seen as a choice, “I never considered anything else. Mom and Dad would have hated me in anything else.” The cultural knowledge she carries transfers multiple values of her family to her, including her ambitious STEM educational aspirations.

Linguistic capital is often thought of in terms of being bilingual. Yet, in Yosso’s framework, it also includes the ability to speak the language of a culture, an institution, even a field. Jasmine is well aware of terms used by her father as an engineer, her mother as a Physician’s assistant due to growing up in the family. Yet, she is given the additional
advantage of having her linguistic capital boosted by the introduction to an engineering program, as well as the academic tutor supplied by her parents as a result of family capital encompassing the family’s financial power.

Jasmine, perhaps more than any of the other students, is aware of the gender inequities in the department. She comments frequently on it and looks to Dr. Jane as an example of a woman who, though successful, still labors under gendered expectations. On October 31, Jasmine writes in her blog, “Even Dr. Jane and Dr. Alice worry about how they look, at least a little. I can tell by how they dress and that they both color their hair. Dr. Scott would never think to color his hair. Because it doesn’t affect what his peers think of him. It DOES affect how Dr. Jane’s peers see her. Sometimes I hate being a girl.” And while she is aware of this additional barrier, she has resistant capital that Yosso (2005) believes can be transformative to a community.

This same resistant capital also applies to Jasmine’s identity as a woman of color as she notes in her blog on February 13, “I really am a role model for other women, especially minority women. It’s my responsibility to succeed.” This responsibility can be fulfilled because she believes in resisting inequality. Jasmine’s recognition of the MSU Columbus Day celebration as an offensive choice, and her subsequent removal of the posters is yet another moment in which she believes it is the responsibility of all students to resist, though she does note on October 10, “I feel almost as angry about the Native American students being so passive about it. I heard some mumbling but that was it! Stand up for yourselves. Make some change!” Her own plentiful stores of resistant capital cause her to be frustrated by the lack of voice or action of the population she sees as being openly insulted. This social
capital will inform the evolution of her self-authorship, as will be discussed in the next section.

Chrysti. Like Jasmine, Chrysti comes from STEM educated parents who expect their children to graduate from college just as they did. She is also a woman in a STEM field. However, her social capital is less well suited to the community than Jasmine’s. Instead of seeing her role as one who resists inequities, she passively accepts the inequities and focuses her energy on just making it through barriers it might pose for her. On December 6 she writes in her diary that, “I ran into one of the girls I met in Dr. Alice’s program during high school. She was going on and on about how badly women are treated in the department. It might be happening. I don’t know. I don’t really think about it because it doesn’t matter either way. I still have to do what I have to do.” Though she seems to not be aware of any barriers her gender may present, she is conscious of Dr. Forbes apparent sexual harassment and yet feels no obligation to oppose it in any way other than a passive and vague warning to friends in her November 2 Facebook post, “Had Dr. Forbes last office visit today. Not good. Glad it was the last. Careful ladies.”

Another clear example of her passive acceptance is when she writes in her February 5 diary entry, “It makes me angry sometimes to think how I am at such a disadvantage because I have to work so hard just to pay bills and I know a lot of other kids are just going to school. It is frustrating to have to slow down doing what will be a great career just so that I can pay rent and tuition and fool. But, I am happy that I can still study what I love.” Despite her frustration, she is grateful for what she does have. This attitude is certainly a noble one but it does not allow her to rectify any of what she rightly perceives as injustices.
At times, her resistant capital reserves are so low that she can’t recognize inequities. The Columbus Day celebration that so upset Jasmine, only cause Chrysti to remember childhood celebrations of the same. She sees it as a historical fact, not one culture’s victory cross-sectioned with another culture’s tragic loss. Yet, she is not insensitive to the needs of individuals she meets. Her young Sunday school student, Faysai, captures her attention and gives her inspiration because his very human experiences, like being homesick, are hers as well. This is also seen in her sensitive relationship with Marie.

One of Chrysti’s greatest deficits is her navigational capital. Her ability to know what direction the wind is from or what the weather is likely to do as a result of her rural farming background does not allow her to navigate MSU’s curriculum system. On September 4, Chrysti writes in her diary, “I took some things that were totally unnecessary because that is what the advisor suggested.” While Chrysti was led to believe she could get the same education she needed for her first two years at the community college, her advising was inadequate and caused her to retake her writing course, an easily transferrable course, because she took a three credit course when MSU required a four credit course. She is hesitant to apply for a scholarship because she doesn’t know where to start. It is only after Dr. Alice intervenes at the end of the junior year that Chrysti is shown what path to take in order to get a scholarship successfully.

Her inability to navigate MSU as well as Jasmine is also hindered by her linguistic capital. She doesn’t really understand what an internship is, for example. While Jasmine’s linguistic capital informed her as to what an internship is and her navigational and social capital allowed her to procure one, Chrysti still struggles with understanding what it looks like and, due to her poor navigational and social capital, doesn’t understand how to get that
information. Regarding her poor advising, in her conversation with Dr. Alice, Chrysti tears up when admitting, “I think I feel least powerful when I am told in every office that the answer to the question is online but I don’t know what I am asking in their words so if I see ‘transfer curriculum’ in the course description at NRCC, I had no idea to ask if it was equal credits.”

Chrysti’s family capital is strong. Her memories of growing up are mostly positive. She talks often of traditions that imply “a sense of community history, memory and cultural intuition” (Yosso, 2005, p. 79). Her parents unconsciously led her to assume higher education was expected and STEM was a likely path. Yet, it is limiting to her as well. She sees that her family and community were also limited as she posts on Facebook on November 1, “I cannot believe how much I don’t know. I knew this would be a problem when I took my high school calculus class. I am still paying for a bad education,” and again on November 8, “Found out where at least one of the students got a major related job. His dad is in IT at the firm and just asked his boss. I hate coming from nothing.” Both instances are clear frustrations that her family capital is not the right kind to be adequately effective in the university engineering department environment.

Chrysti’s social capital is seen in contrast to Jasmine’s vast connection to people and community resources. Jasmine’s father is an old friend of Jasmine’s professor. Chrysti’s father is a friend of a local mechanic in town who can offer her a good deal on car repair. Jasmine’s father is connected enough to his corporation that he can create an internship. Chrysti’s father is unsure of the value of an internship and would far prefer that Chrysti come home and help out on the family farm. The social contacts Chrysti comes from are necessary
to be successful in her rural farming community, but again, they are not appropriate for the
highly competitive MSU engineering community.

Finally, Chrysti’s aspirational capital is a neutral quality for her. Though she
definitely can imagine the possibility of completing the STEM degree despite the longer path
she has to take due to very limited finances, she also struggles with imagining a graduate
degree. On May 10 she posts, “I still want to go to grad school but its so much money and I
miss home.” The burden of having to work multiple jobs dampens the aspirational capital as
well since the hours often conflict. She admits on Facebook on May 11, “I am trying to find a
different job that could be steady day hours. I can’t keep not sleeping like I did last year. I
wish I could take night classes but this program is set up for kids who do nothing but school.
Grrr.” This comment, in addition to frequently mentioning her constant exhaustion,
exemplifies how her aspirational capital is negatively impacted by other factors.

*Marie.* Chrysti’s close relationship with Marie is possible in large part because of
their common social capitals. Like Chrysti, Marie is closely tied to her family that, unlike
Jasmine’s, needs her. Chrysti’s responsibilities to her family are limited by physical distance,
but Marie’s family lives close to MSU. Marie’s family is rich in its history and, as a first
generation woman from Mexico, Marie acts as a kind of hinge between the history of her
family’s Mexican culture and the new culture they are immersed in. The restaurant honors
both 9-11 and Day of the Dead. Marie’s parents support her in school to some degree and
they see her as a strong woman, a community value that Marie unconsciously assumes as she
takes control of the family restaurant’s success. However, Marie’s family also sees women as
being well suited to family life and she is comfortable with that role. She tells Dr. Alice, “But
I actually want a family someday. Maybe sooner than later.” Marie resists the notion that a
career is the “right” choice for her according to the engineering culture and says in her private blog on December 17, “I know girls from high school who got pregnant in high school and never graduated don’t have it right but I don’t know that Chrysti or the other girls from the program do either. What if they keep giving up today for some tomorrow they think is perfect? What happens if tomorrow never gets here? Or if it does and it isn’t perfect?” She questions the denial of beginning a family and reproducing a family capital that she values.

By the end of her junior year, she blogs on May 13 that, “Having this baby seems like a disappointment to people like Dr. Alice, even Chrysti, but it isn’t. There is power to be found in families.” Marie resists the limited definition of success by the engineering culture and defines it around family capital sufficient on its own, without its inadequacy to empower her at MSU. She resists it so far that it causes her to question why a degree would be valuable when she blogs on December 17, “I always felt like the price I would have to pay to keep going was giving up little bits of me. Little bits of my family. Little bits of my culture. Little bits of my world. I just couldn’t see why I would do that.” Her family capital is more valuable than the capital she might gain by sacrificing it.

Marie’s resistant capital is apparent in both the external community of MSU and her immediate family. When Angel complains about her registering for courses after they are engaged, she defies him by saying on her January 6 Facebook post, “He thinks I shouldn’t now that I am going to get married. I won’t be bullied by someone, even if it’s Angel. I will take classes if I want.” She convinces her father and brothers to change marketing practices for the family restaurant, and with great success. But she also resists the criticism, spoken and silent, of her choice to have a family. She also recognizes and resists the positive and negative bias that comes from being a first generation woman of color who is talented in
STEM. She blogs on September 26 about the classmates who assume she has the benefit of qualifying for scholarships and programs because of her gender and culture, the professors who treat her poorly because of her gender and culture, and the administrators who offer scholarships because of her gender and culture, yet deny her the ability to fulfill the obligations of her gender and culture. This all suggest a powerful inequality that pressures her so far that she chooses to opt out, “So screw it. I have no need to put up with that. Any of that.”

Like Marie’s frustration with the university culture’s inability to recognize her need to preserve her family culture, she is equally annoyed by the lack of respect for the navigational and linguistic capital she does possess. Her September 26 blog challenges the university’s value of these capitals, “I know MSU kids in the bioengineering program that can’t read a bus schedule. I can. I know MSU kids who claim to be so smart because they have a 4.0 in Multivariate Calculus. I could not only get an A in it, I could teach that course. But I get looked down on because I speak Spanish when those fools can only speak bad English?” She continues to value social capitals even as the university culture denies that it is worthy of value.

Though Marie does not choose to continue on in a STEM field, she does show a strong sense of aspirational capital. While Dr. Alice and the introduction to engineering program attempted to carve a path for her that would have been difficult but expected, Marie can imagine success in multiple ways and blogs on May 13 that her aspiration is not limited to one vision, “I know how to make money, here, with my family. I know how to chart a course for the business, for my life, that doesn’t require such intense approval of someone. I know how to speak two languages, communicate with two cultures, understand whole ways
of knowing.” By the end of her narrative, Marie’s success is certain in her own mind. While Dr. Alice and the reader may be uncomfortable with her aspirations or the methods in which she is pursuing success, Marie has little patience for anyone forcing their values onto her.

Xi. Another woman of color, Xi also is a first generation student. Her parents, Hmong refugees, have shown resistant capital themselves as they have tried to immerse themselves in the new American culture and distance themselves from the old country. Xi, however, has very little resistant capital. Her parents have forced her to excel with strict studying enforced under their watchful eye. They have corralled her into the STEM fields despite her lack of passion, or at least as far as she knows, ability. Yet, Xi does not resist this parental pressure and finds herself in the third year of a bioengineering major and struggling. This is not unusual to Asian students but little research has been done specifically on the Hmong student. Yet, in a study by Pao Lor (2008), it was suggested that a supportive family environment for academic excellence was a common factor in Hmong families.

When others label her as “Chinese” or “Japanese” it bothers her, but she does not correct them. Her introverted nature causes her to recede in nearly every environment. Jasmine’s rally for Xi to vote is averted and it would seem that Xi denies herself even the small voice that is heard in a vote. Xi blogs about Jasmine’s ability to take a stand on Sept 18, “She is always fighting for something. I don’t have that in me somehow even though a lot of things bother me.” Despite this lack of resistant capital, Xi slowly begins to find her voice upon her mother’s diabetes diagnosis. Her love for her mother gives her a reason to claim the resistant capital necessary to seek appropriate support for her mother’s condition. Interestingly, the method she uses to find this resistant capital is drawing on social capital she was not even aware of. Using Dr. Scott’s contacts, she arranges for her mother to participate
in group classes focusing on diabetes management. When that proved to be unhelpful, Xi looks to Dr. Scott again who connects Xi to a university diabetic center director who not only promises to correct the problems Xi saw in the group class but to work with Xi’s mother individually.

Xi’s social capital also increases as she participates in Dr. Scott’s research team. She is able to claim science in a way that has never been a true connection before and, with her engaged learning, she garners the attention of not only Dr. Scott but also his colleagues and project co-investigators at Stanford. Xi has begun to meet the people who will continue to connect her to increasingly larger social networks and additional resources to utilize those connections. Xi’s increase in social capital influences her navigational capital. While Xi had been able to successfully maneuver through applying to the university, the college of engineering, and the scholarship that paid for her tuition, it was primarily a result of Dr. Alice and the support of the introduction to engineering program. By year three, she had not yet established greater navigational ability. Her only source of advising was the pre-set curriculum guide until she asked Dr. Scott to be her advisor. In a matter of days Dr. Scott was able to traverse the university and departmental requirements to shave an entire semester off of Xi’s assumed four-year plan. Xi posts on March 24, “Dr. Scott met me with my transcripts and found a way to use the time that I have spent on the project as elective credits and he found out that I had taken more credits than I needed to have and so, according to him, I can graduate a whole semester early.” This would have been impossible for Xi to manage on her own without the increased social and navigational capital Dr. Scott brought to her.

Xi’s familial capital was unusual in their choosing to turn from the culture of origin, intentionally denying Xi the knowledge, history and memories of the Hmong people, in order
to better prepare her to be successful in the competitive STEM field. Xi notes that loss and, with her new resistant capital, chooses a Hmong cultures course over a science course. It allows her to see her parents in a new light as she blogs on January 29:

And my class is helping me think about my culture more than I have before. I am starting to understand why Mom and Dad are so grateful to be here and want so much for me. I have seen pictures of Hmong populations that are pushed around from one country to the next, one camp to the next. I think about my parents seeing that. Being young and wanting to start a family but dreading the thought of what kind of life their children might have.

The family capital her parents intended to give her was a manufactured Western capital. Xi’s blog suggests that though she had resented it in the past, she values this choice, which she now recognizes as an ultimate act of love.

Xi’s resistant capital can be increased due to Xi’s linguistic capital. Her ability to speak her parents Hmong Dao dialect as well as fluent English shows her a power she had not previously valued. It is also evident she can transition between the Western hybrid world her parents have attempted to construct and the university world, and upon her mother’s diagnosis the Western medical world. Her acceptance into, and success with Dr. Scott’s research team results in Xi’s realization she has not just math and science skills, she also has the ability to use those skills in real-life problems, as when she suggested a solution to a research team’s problem. Another linguistic capital example is Xi’s ability to maneuver between family and academic responsibilities. Xi’s recognition and gain of greater capitals has also influenced her aspirational capital.
Previously, Xi had been vocal in her dislike of science to Dr. Alice, believing she was not gifted in it. Yet, upon gaining access to the research project, she became excited as she posted on November 13, “In between customers at the store, I have been reading everything I can for what currently exists as an interface between artificial limbs and actual nerves. Most excited I have ever been about bioengineering. Finally, starting to do more than learn the alphabet!” With this infusion of joy, Xi allows herself to imagine possibilities for her future. She is able to picture herself happy in bioengineering and getting a graduate degree out of passion, not obligation to her parent’s dream. She is able to imagine leaving her family and the family dry cleaning business to work at Stanford. She has achieved enough aspirational capital to create a history “that would break the links between parents’ current occupational status and their children’s future academic attainment” (Gandara, 1985, p. 55).

Overview. Each of the four women’s narratives has revealed social capitals brought into college from both the introduction to engineering program as well as their own personal situations. The epistles throughout their third year also reveal an evolution of that social capital in different ways. The complexity of factors involved in the young women’s life reflect the inability of researchers to have certain and direct causal relationships between any one variable and a result. Though Jasmine would appear to be the most likely to excel in the field, Xi’s discovery of passion for bioengineering may outweigh the social capitals inherent to Jasmine’s place in society. Marie’s choice to not follow through with a STEM career would be noted as a student who was failed by the system, and yet Marie consciously and intentionally resists a STEM career in a positive way.

These narratives allow the reader to have an affective experience with the women in a way that transcends the dichotomous nature of traditional research. It becomes evident that
each of the young women are far more than a persisting student or a non-persisting student, a
student completing a STEM degree or a student choosing a different major. Social capital, as
discussed here, plays a role in how the women are able to choose. Understanding the origin
and evolution of the four young women’s social capital is a necessary step to understanding
how self-authorship evolved during the same time period.

In the following table 5.1, the young women’s basic self-authorship and social capital
as measured in the beginning of the junior year is simplified to better prepare the reader for
the proceeding analysis. Strong self-authorship will be seen as ideally consisting of: (1) an
epistemological dimension which allows the character to view knowledge as contextual and
capable of developing an internal belief system via constructing, evaluation, and interpreting
judgments in light of available frames of reference; (2) an interpersonal dimension which is
the capacity to engage in authentic, interdependent relationships with diverse others, and in
which the self is not overshadowed by the need for others’ approval; and (3) an intrapersonal
dimension which allows the individual to choose her own values and identity in crafting an
internally generated sense of self that regulates interpretation of experience and choices.
Each dimension will be given a rating of: (1) strongly oriented toward self-authorship
(Strong), (2) neutrally oriented toward self-authorship (Neutral), and (3) weakly oriented
toward self-authorship (Weak).

Strong social capital will consist of seven kinds of wealth including cultural wealth,
aspirational wealth, familial capital, social capital, navigational capital, resistant capital, and
linguistic capital. Each capital will be noted as strong in the majority community culture
value (MV) or strong in the young woman’s diverse community cultural value (DV). The
only exception is in the case of Xi, whose capital is absent from both a majority and a diverse community cultural value.

Table 5.1: Women’s Initial SA and SC Ratings

<table>
<thead>
<tr>
<th></th>
<th>Self-Authorship</th>
<th>Community Social Capitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jasmine</td>
<td><strong>Epistemology:</strong> Weak</td>
<td>Resistant: MV</td>
</tr>
<tr>
<td></td>
<td><strong>Interpersonal:</strong> Neutral</td>
<td>Navigational: MV</td>
</tr>
<tr>
<td></td>
<td><strong>Intrapersonal:</strong> Weak</td>
<td>Social: MV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Family: MV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Linguistic: MV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aspirational: MV</td>
</tr>
<tr>
<td>Marie</td>
<td><strong>Epistemology:</strong> Strong</td>
<td>Resistant: MV</td>
</tr>
<tr>
<td></td>
<td><strong>Interpersonal:</strong> Strong</td>
<td>Navigational: DV</td>
</tr>
<tr>
<td></td>
<td><strong>Intrapersonal:</strong> Strong</td>
<td>Social: DV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Family: DV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Linguistic: DV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aspirational: DV</td>
</tr>
<tr>
<td>Chrysti</td>
<td><strong>Epistemology:</strong> Weak</td>
<td>Resistant: DV</td>
</tr>
<tr>
<td></td>
<td><strong>Interpersonal:</strong> Neutral</td>
<td>Navigational: DV</td>
</tr>
<tr>
<td></td>
<td><strong>Intrapersonal:</strong> Neutral</td>
<td>Social: DV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Family: DV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Linguistic: MV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aspirational: MV</td>
</tr>
<tr>
<td>Xi</td>
<td><strong>Epistemology:</strong> Weak</td>
<td>Resistant: -</td>
</tr>
<tr>
<td></td>
<td><strong>Interpersonal:</strong> Weak</td>
<td>Navigational: DV</td>
</tr>
<tr>
<td></td>
<td><strong>Intrapersonal:</strong> Weak</td>
<td>Social: DV</td>
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<td></td>
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<td>Family: DV</td>
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<tr>
<td></td>
<td></td>
<td>Linguistic: MV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aspirational: -</td>
</tr>
</tbody>
</table>

**Finding the center of self**

Social capital provides the context from which self-authorship arrives. It gives individuals greater or lesser freedom to move through the three-phase journey Baxter Magolda (2001) delineated: questioning (the crossroads), clarifying (becoming the author of
their own lives), and acting in ways that integrate the interpersonal and cognitive in interpersonal arenas (internal foundation). This three-phase journey is not to be confused with the three dimensions of social capital Baxter Magolda (2001) and Kegan (1994) identify as the interpersonal, intrapersonal and epistemological dimensions of self.

Self-authorship can be seen externally if both the reasoning and action appear to be self-authored. In Pizzolato’s study (2007) students assessed self-authorship based on decisions, because it showed “the ability to reason in ways that foster engaging in multiple perspectives in a way that simultaneously honors one’s own internally defined goals, belief, and values” as well as “action congruent with such reasoning” (p. 36). The analysis of self-authorship developed by Pizzolato’s (2007, p. 40), visualized in table 5.2 below and used in this study, must be underscored. In this matrix, Pizzaloto would see self-authored reasoning as a decision made by the individual after coming to believe it is what she wants, reflecting on the implications of the decision, and then going through the process necessitated by the decision. Self-authored action is often “displayed through actions that separate students from the majority, important others, or community principles”, although it is possible that actions are self-authored when “consistent with community standards and expectations of authority figures” (Pizzolato, 2007, p. 40).

On any level, Expression 4 is not self-authored. However, Expressions 1, 2, and 3 have the potential to be self-authoring. Expression 1 is most clearly identified as self-authoring since reasoning and actions reflect a self-authored orientation. Expression 2 has self-authored reasoning but the action itself is non-self-authored. Individuals who identified as Expression 3 are acting with self-authorship, but this action is caused not by self-authored reasoning but by gut instinct, rebellious desires, and desire for satisfaction.
Table 5.2: Self-Authorship Expression Matrix

<table>
<thead>
<tr>
<th>Self-Authored Reasoning</th>
<th>Self-Authored Action</th>
<th>Non-Self-Authored Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expression 1: Action consistent with reasoning; both action and reasoning evidencing self-authorship</td>
<td>Expression 2: Action inconsistent with reasoning; action appears non-self-authored, but reasoning shows signs of self-authorship</td>
</tr>
<tr>
<td>Non-Self-Authored Reasoning</td>
<td>Expression 3: Action inconsistent with reasoning; action suggestive of self-authorship, but underlying reasoning ability not present</td>
<td>Expression 4: Action consistent with reasoning; neither action nor reasoning indicative of self-authorship</td>
</tr>
</tbody>
</table>

(Pizzolato, 2007, p. 35)

Fiction writing as research (FWR) allows the researcher and audience a unique vantage point to hear the internal, and often un-vocalized reasoning processes characters use to come to a decision. Without hearing the internal voice, researchers and audiences cannot fully know if the action itself is self-authored, particularly if it is in keeping with the community and authority figures’ expectations. The young women’s personal voices are heard in the modern public private space that Facebook and blogs allow. Apart from Jasmine, the young women’s voices were also heard in a private space as the diary of Chrysti or the private blogs of Xi and Marie. The included texts allow the researcher and reader to be privy to a private dialogue. This is especially insightful in the case of Marie and Chrysti’s texts due to their close friendship.

Jasmine. As previously discussed, Jasmine’s social capital is well aligned with the engineering field community, as are her actions. Jasmine has taken a path where decisions have been pre-made for her by her parents and her engineering department. While she often complains about details peripheral to the larger choice, Jasmine still follows the larger choice because it is part of the path. An early example is her September 8 post, “Intro to Molecular
Biology went ok. Dr. Scott was his usual dull lecturer self. Ranked him on RateMyProfessor.com from last year as someone to avoid at ALL COSTS. But I have to take him because there are no other options. Sigh.” Though this could be self-authored action if the choice to be in her field were her own, Jasmine repeatedly suggests that science is not her passion. “I don’t really feel anything about science except that it is a part of my life. I never considered anything else. Mom and Dad would have hated me in anything else….Plus the starting salary is amazing” (Public Blog, p. 76). In many ways, Jasmine’s self-authorship suffers from her enviable situation. It is difficult for her to leave what she sees to be the most pleasurable path of least resistance. She hasn’t taken the time to reflect on her career choice. She has not made many of the choices herself and she has seemingly accepted that the situation did not permit self-authorship.

However, this is contrary to the self-authorship she shows in her resisting the “white centered” Columbus Day celebration, Dr. Marks’ questioning the ethics of artificial insemination and her perception that Dylan is chauvinistic. Her self-authored actions following her self-authored thought were to tear down the posters advertising the celebration, to argue with Dr. Mark, and to break off the relationship with Dylan. Because of the inconsistency between these small seemingly self-authored thoughts and actions and the larger non-self-authored thoughts and action regarding her career choice, it is apparent that Jasmine’s self-authorship is developing.

To reconcile these conflicting situations, Kegan’s (1994) fifth order of consciousness points out that choices are made in complex situations and identities and as a result, self-authorship appears to be absent, but may not be. Though Jasmine shows a lack of meaningful reflection on her career choice, she does recognize that “I am really good at it. And I think I
can make a difference with it” (Public Blog, p. 76). This shows a limited but growing sense of self and ability to consider her assumed career in light of that knowledge of self.

Jasmine’s epistemology remains in a relatively undeveloped state. She blogs that “I know some people think that there isn’t (a reality) but I don’t get that. Of course there is a reality outside of us. If not, why would we work so hard at trying to get to it? Besides, it’s just silly not to think there isn’t truth….There is right and there is wrong” (p. 83). Such a statement implies a positivistic epistemology. Multiple researchers agree that views on how knowledge is obtained progress from a certain right and wrong, black and white position to greater relativism with some grey, and then to believe that knowledge is grounded in context and therefore fluid within those contexts (Hofer, 2004; Hofer & Pintrich, 1997; Pintrich, 2002). Jasmine is at a lesser-developed point of her epistemology in December of her junior year. However, and perhaps due in large part to Dr. Alice’s interview questions, Jasmine comes to a different developmental point by May’s blogging, “This year was really tough and I think it was mostly because the answers were less sure. I can give ‘right’ answers. I just don’t know what to do when there isn’t one ‘right’ answer. Maybe I can work on that thought” (p. 90). Jasmine’s recognition that there is dissonance between how she believed knowledge worked, getting the right answer meant success, and how her advanced STEM education suggested multiple ways to answer a problem, implies a new phase. As shown in table 5.3 below from Baxter Magolda (2001), Jasmine moved from a phase during which she followed external formulas to a phase labeled “the crossroads”.

Jasmine’s final blog of her junior year also acknowledges she needs more relationships and has become isolated from her peer group, particularly the young women in
her introduction to engineering program. In accordance with Baxter Magolda’s theory that self-authorship involves development of the epistemology, interpersonal and intrapersonal

Table 5.3: Characteristics of the Phases in the Development of Self-Authorship

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description and Characteristics</th>
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</thead>
<tbody>
<tr>
<td>Following External Formulas</td>
<td>• Accept beliefs and plans from authority figures</td>
</tr>
<tr>
<td></td>
<td>• Define self through external roles and relationships with others</td>
</tr>
<tr>
<td>The Crossroads</td>
<td>• Act to acquire approval from others</td>
</tr>
<tr>
<td></td>
<td>• Question accepted beliefs; see need for own vision</td>
</tr>
<tr>
<td></td>
<td>• Sense dissonance between external roles and internal identity</td>
</tr>
<tr>
<td></td>
<td>• Realize need for more balance in relationships</td>
</tr>
<tr>
<td>Becoming the Author of One’s Life</td>
<td>• Grow trust in own belief system and internal voice</td>
</tr>
<tr>
<td></td>
<td>• Begin formulating coherent personal identity</td>
</tr>
<tr>
<td></td>
<td>• Reframe relationships with others to achieve mutuality</td>
</tr>
<tr>
<td>Internal Foundations</td>
<td>• Rely on internal belief system and chosen values</td>
</tr>
<tr>
<td></td>
<td>• Achieve personally defines, stable and congruent identity and sense of self</td>
</tr>
<tr>
<td></td>
<td>• Construct interdependent relationships with others</td>
</tr>
</tbody>
</table>

(Baxter Magolda, 2001)

relationships, Jasmine’s self-authorship development will require her to examine those relationships and become less defined by her external relationships. Jasmine is struggling with relinquishing “the wish to maintain community in family or hometown values and ways of thinking…and most importantly the wish to maintain a self one has felt oneself to be” (Perry, 1970, p. 52). In February, a little over halfway through her junior year, Jasmine describes herself in terms that are external: “I would describe myself as a daughter of a Black man and a Jewish woman who are both successful and educated. I am a good student who is going to be an amazing woman biochemical engineer and I am a hard worker who is making
her dreams happen” (p. 86). At this point, Jasmine’s self-descriptions reflect that her sense of self is embedded in external definitions. By the end of the term, she implies that she is starting to extract herself from that external need. “I think I need to talk to my parents about how involved they are in my life. It’s not that I don’t love them, I do but I don’t feel like I can even disagree with them. I need to start making decisions on my own. I have to decide more who I am. And that is more than what they see of me.” In seeing she has a self, more than the self her parents observe, (and quite possibly she has been aware of up to this point), there is a risk that her parents will disapprove of her developing identity, yet she is ready to take that step.

**Chrysti.** While Jasmine stands firmly at the crossroads, Chrysti is attempting to develop a sense of self, with a very strong sense of self arising from not just her family and small rural community, but also with a religious understanding of how she should make choices in her life. Her social capital is less compatible with the engineering culture than Jasmine’s. Unlike Jasmine, Chrysti’s parents have no time to coddle, or even guide her choices. She regrets the lack of attention and support her parents give and relies on Dr. Alice for some of that attention. “She told me that I had come a long way and she wouldn’t give up on me now. That I was always talented and teachers always believed in me. It just felt nice to hear that. Mom and Dad can’t tell me that. They are too busy with the kids and besides, they don’t really understand what I am going through” (p. 95). The external self-identity that Jasmine’s parents give is not as evident in Chrysti’s parents’ interactions with their daughter. Science plays a significant part in Chrysti’s identity in a more entrenched manner than Jasmine’s. While Jasmine assumed she would become an engineer of some sort due to her parent’s own professions and influence, Chrysti sees science as a defining part of who she is.
“Dr. Alice asked how I feel about science. I LOVE science! I love everything about it. I love seeing and touching and discovering out stuff that others already have, but on my own” (p. 95). Later, in February she writes in her diary that if she were to describe herself, she wouldn’t do it in the visual manner that Jasmine does but with a more internal sense of self. “I am a scientist….It really is who I am, part of why it’s hard to explain why I also am a spiritual person. Yes, I am a daughter and a sister and a friend and a student but that isn’t what I am. That is what I do. I am a scientist” (p. 106). Science is intertwined with her religion as she sees science to be a way to “know God better. I go to church, but I find him in the amazing details of life. The beautiful systems that are so small that nobody even knows they are there. The silent miracles that are all around us” (p. 106). She sees science as a way to help people, an important element to her as evidenced by her religious understandings and her work with Faysai and other Sunday school children.

This intense alignment of self with the scientific way of knowing is something that Chrysti recognizes in others. She says, “Marie is a real scientist. She thinks about things, really thinks about them. She doesn’t need a degree to do that” while Jasmine is seen by Chrysti to have a different relationship with science. “Jasmine doesn’t seem to need science. It isn’t who she is. She just does it. She would be fine without it. I couldn’t stop, with or without the degree” (p. 110). The coherence that Chrysti has found in her personal identity suggests she is at the stage of “Becoming the Author of One’s Life” in Baxter Magolda’s matrix.

Chrysti’s epistemology aligns with this stage as well. Unlike Jasmine’s positivistic view of making knowledge, Chrysti has experienced science as a tool to question, seek, and experiment with in a creative, curious manner. Yet, Chrysti’s religion poses a problem with a
constructivist mindset. Chrysti sees the tension after Dr. Alice asked her if there is a truth. “I know what my parents would say. Truth is like God. God exists. Truth exists. We can choose to see it or we can choose to not see it but that doesn’t impact what is really there. But I know that isn’t completely true” (p. 102.) She references running into Jasmine who commented on what she perceived as sexism that Chrysti had not noticed in her experiences. Such a polarization of two women’s experience in the same department causes Chrysti to consider, “it is very likely that it is just happening in her head or her and the professor’s head. It doesn’t mean it is real but it is real to her. So it is truth in that way” (p. 102). So while her parents see religion as evidence of a truth apart from a personal construct of it, Chrysti understands truth to be, at least to a certain degree, an experience that causes the individual to make meaning, thus truth, out of it. She values Dr. Alice and Marie for their ability to make her see that “life is complicated. It is not just facts. It is a collection of facts that are how we see life but it is just facts. That is all….My understanding of science is better now because I am freed from only seeing one right answer. There are many. Just like there is not one “right” me. There are many ways to be me and I get to be the engineer of me” (p. 111). Perry’s (1970) description of epistemological growth as taking responsibility for personal decision by accepting the finiteness, uncertainties and dissolution of beliefs aligns with Chrysti’s self-authored thinking.

Finally, Chrysti’s relationships with others do influence her. She relies on Dr. Alice for support and wants her parents to be proud of her as well, to be a good role model for her siblings. She has friends whom she believes will support her regardless of what she does or doesn’t do. For the most part, her relationships do not define her. Again, her religion complicates matters. Even while she is beginning to move from a positivistic sensibility, her
spirituality does cause her to question her actions, “I guess if I feel bad about anything its whether or not I am doing what is “right” or “good.” My faith is what is most important to me. In a way it is a really tough critic though because in my field, I feel like I have to hide my faith, like it’s silly or weak to believe in” (p. 106). Her thoughts are self-authored and her actions tend to be as well, but the dissonance the external world sees between science and religion clearly troubles her.

Chrysti’s stage is in Baxter Magolda’s (2001) “Becoming the Author of One’s Life.” She trusts her own opinions and visions. Her identity is consistent even though at times she recognizes that others do not see the linkage between her science and religious beliefs. Her relationships do not define her but act as comfort and support when needed. She provides the same to others.

Marie. Chrysti’s good friend, Marie, is a character who is limited in many ways that could slow her self-authorship development, if judged from appearances. Her social capital is not highly valued by the majority culture. Her culture and family of origin have particular roles and relationships outlined for her as a woman. Still, Marie’s three developmental areas, epistemological, intrapersonal, and interpersonal, have surpassed her classmates.

Marie avoids all external labels when asked by Dr. Alice to describe herself. She does not use relationships for her self-definition as Jasmine does, nor does she use her chosen vocation as Chrysti does, she uses an entirely internal method. Marie blogs in December, halfway through her third year out of high school, “I don’t want to be what somebody else wants me to be. I am the only one who can claim that and own that and take the fall if it works out badly” (p. 120). This reflects a stable sense of internally defined self she previously distinguished in September’s blog, “I know what I can do and who I am. I don’t
need a degree. I just keep going because it’s fun and I am good at it. That’s it” (p. 116). More than any of the other young women, Marie sees a conflict between herself and the reconstructed self she believes finishing an engineering degree would require. In December she blogs, “Even during Dr. Alice’s high school program, when they would bring us to college labs and classes and stuff, I always felt like the price I would have to pay to keep going was giving up little bits of me. Little bits of my family. Little bits of my culture. Little bits of my world. I just couldn’t see why I would do that” (p. 121). Jasmine is only beginning to see the conflict and is hesitant, while Marie is focused firmly on keeping her self-authored thoughts consistent with her actions. While her choice to begin a family is disapproved of by Dr. Alice and even her close friend Chrysti, her reliance on internal values allows her to say, “What I do, who I know, what I want, those thing will change. But me, I am here for good. Not much change to that. If I am me according to my terms, I am happy. And if I am happy, that is all that matters in the end” (Private blog, February 5, p. 124). Clearly, Marie’s answer to “Who am I,” a question Dr. Alice posed to all of the young women, is self-authored. But what is her epistemological stance? Is it as self-authored as her inter- and intrapersonal development is?

As Dr. Alice has asked the other young women, she asks Jasmine how she knows and if there is truth. Marie’s ability to see the question abstractly reflects her constructivist epistemology, as does her answer: “Well, that is a matter of what kind of truth there is. Is it the kind of fact truth that 2+4 add up to 4 or is it the truth of what the best thing for me to do with my life is? Those are two different things. Facts and truths are different and she didn’t seem to be separating them at all. I know how to add two and two together but I also know how to get to 4 by dividing 8 into 32 and multiplying 1 by 4 or subtracting 5 from 9 or a
million other ways. Some people can only imagine 2 plus 2 is four. They don’t think of it any other way. I do. Just like I think about what I should do according to what I want” (Private blog, December 17, p. 120).

In her answer, Marie sees knowledge as contextual. She trusts her own internal belief system as she constructs, evaluates and interprets facts on her own. Just as Marie perceives Dr. Alice, to see any career choice other than engineering would be “wrong”, she also recognizes it as one way to see the facts according to an interpretation and frame of reference for what the ultimate goal is. Similarly, her parents strongly disagree with her choice to move in with Angel, her fiancée, yet she does it despite this conflict of values. Her thought and her actions are self-authored.

Marie’s last blog acknowledges that in her unwillingness to change her self-authorship in order to meet the demands of any one person or community, she is also giving up power that comes from being part of a majority culture’s educated elite. Yet, her framework that comes from a constructivist epistemology, a self-authored personal identity and relationships that do not control or define her but are symbiotic, causes Marie to justify the cost, “There is power to be found in families. There is power to be found in knowing there is something more outside of degrees or money or knowing how to get an internships or knowing the right people” (p. 128). Her commitment to use the gifts that Dr. Alice indicates are best used in a STEM profession further emphasizes the self-authored thought guiding her self-authored action, “I know I will use (my gifts), but on my own terms. In my own way. And I will use them to find the greatest power, happiness” (p. 128). Incorporating her own frame of reference, that happiness is the ultimate goal, she can envision multiple potential
futures, but all of them must be pointed toward her chosen goal, not the ends that others believe best.

Xi. Each of the young women has parents who love their daughter. Xi’s parents are no different, but in their struggle to survive a refuge camp, immigrate to America, and give Xi financial and cultural stability, their epistemology becomes positivistic. Xi mourns their black and white thinking in her first blog of her junior year commenting on her difficult load dictated in large part by her parents, saying, “they only see it as what has to be done to be successful and if that is 18 credits, not that they know what a credit even is, than that is what I will do” (p. 130). This dichotomous view extends to how they define their daughter, “I am either the best or the worst. I am either All American or I am Hmong. No wonder they like me being in engineering. Lots of black and white answers there too” (p. 131). Xi’s fellow classmates and professors use stereotypes to do essentially the same dichotomous defining of Xi. Because she appears Asian, Xi is assumed to be good at math, “people think Asian = good at science and math. Instead of Xi = human” (p. 133). Xi feels trapped by this due to her introverted nature. While she doesn’t particularly enjoy science she admits, “I can’t make myself look in people’s eyes and have them see me. It’s easier in a way to rely on that stereotype, which is why I can’t imagine leaving this field. It’s just what I am supposed to do” (p. 133). At this point, Xi remains in Baxter Magolda’s Stage 1, accepting beliefs and plans from authority figures and defining her self through external roles and relationships.

By the middle of her junior year, Xi is developing a less positivist epistemology. As Jasmine found Dr. Scott to be sexist, Xi finds him to be helpful and kind. She understands this by allowing her epistemology to see truths as an interpretation of experiences, “I know that there is a reality outside of us that we don’t experience. We can’t experience it in the
same way that others do, so in a way it is both there and made up. We make it up according to our experience and they make it up according to theirs” (p. 140). Dr. Alice’s third interview session asked how Xi saw others’ view of her to impact her own self-definition. She rejects that it impacts her much by saying, “I don’t need them to like me necessarily” and continues to describe her self in what she is capable of, but also as a part of a larger historical story that she is able to interpret and make meaning out of her parents and herself. “I think about myself as someone who can run a store, who can be part of a real research team, who can navigate systems like health care and even the university….My story matters. Who I am matters. I am not just another Asian in math and science. I am Xi. And for the first time, I think I am starting to understand who that is” (p 144). This movement indicates Xi has moved from Stage 1 to Stage 3 as she begins to formulate her coherent personal identity.

By May, the end of her junior year, Xi finds herself in a very different place from the shy young woman who was defined by her parents, her generic “Asianness”, and her math and science career. “A lot has changed this year for me. I feel like a different person….I learned that I was really strong….My life makes more sense now. From the outside, it may not really look like it. I am still some Asian girl finishing up my degree but I am more than that for a lot of people now. Most especially me” (p. 148). Her comments suggest she has developed an internal belief system and internal voice as her mother’s needs forced her to develop an external voice she found to be a realization of the internal voice that has been developing. Her ability to have a stable, consistent sense of self is evidenced by her choice to step outside the generic curriculum, the MSU track for her graduate work and her assumed family responsibilities. Dr. Scott’s support is not overbearing but has allowed their relationships to achieve interdependence as she finishes her degree early, attends Stanford’s
graduate biological engineering program, and becomes a colleague working on the research team. These self-authored choices and actions prove that she is shifting from Stage Three to Stage Four.

**STEM’s mystique**

In all four of the young women’s family, a STEM education and profession had an identity of its own. Jasmine’s family saw it as part of their family identity as Jasmine’s mother and father, and now Jasmine herself are educated in a STEM field. Marie’s family saw it as unnecessary for a woman to invest the time and money necessary for a STEM career. Chrysti’s family saw her STEM choice as suitable to her world-view as well as a continuation of their history despite the systemic changes that had occurred since they had graduated with a STEM degree. Xi’s family saw it most clearly as a form as social capital that was an accepted currency in the majority culture, “They think it is a ticket to the American dream where everything will be paid for and won’t have problems. Obviously, not true. But it is a ticket to a world that can open up other whole worlds” (p. 141).

According to the narratives’ social capital analysis, power is present in social capital as it is a cultural categorization and system of power. Likewise, the narrative’s self-authorship analysis asserts that power plays into self-authorship, as the individual must have personal power in order to choose self-authored thinking and actions. In all four young women’s lives, STEM is also seen to give power in some way either directly, as Xi’s parents believe, or indirectly. Jasmine, who is conscious of her own well supplied social capital reserves, sees it as primarily a way to accumulate further financial stability which then allows for a continuance of her social class status, “the starting salary is amazing. When I talk to some of my friends in education or English, they will barely make enough to make student
loan payments when they graduate” (p. 76). When asked directly by Dr. Alice if she were to not finish the degree, would she have less power, Chrysti responds, “I would have less ability to do things, to be hired, to be respected and that means I can’t work on teams which is really what you need to have as a scientist. But I would still have my family. And I would still have science” (p. 110). Chrysti’s view of science is not tied to socio-economic status. It is an integrated identity that forms her foundation. Instead of it being a means to an end, as in Jasmine’s comment, Chrysti sees it as the end itself. Regardless of a degree or department proclaiming her to be a scientist officially, she believes it is fully who she is.

Marie sees STEM as being a field that is bigoted, for the privileged, and passed on to the privileged or to those outsiders willing to give up their true selves for the power of STEM, “I feel like science is this magical thing that everyone talks about but it is just a lot of jumping through hoops to be able to help people….When I won that scholarship, they knew that I have to do right by my family. And then they punish me by saying if I take care of my family and put school second I don’t get the scholarship” (p. 116). Marie despises that STEM demands a sacrifice of her family social capital to use her aspirational capital. When asked by Dr. Alice if she could see science as a source of power she admits, “I guess it gives more power among some people but it won’t make any difference to people who matter” (p. 121), but despite her self-authored identity, she recognizes science to have power she will now be denied as she leaves for a new life direction:

I know that in the program, I had power. Just being touched by the magic wand of some engineering program, some professor that made me “smart”, I suddenly became smart to a lot of people. People I don’t know but could open doors to a different world. If felt good. It felt really good but I know that isn’t enough for me….Chrysti
sees that label of scientist as a nearly divine thing. I don’t. It just is another thing to do. I am not what I do. I am who I am. And power, the power I care about anyway, comes from not forgetting who I am (p. 128).

Her self-authorship is so developed that her perception of STEM’s power in the majority culture is not as strong as her self-authorship power, leading her down a path that may or may not eventually bring her to a STEM career.

For all four women, STEM has a mystique. It is sufficient to claim it as a career to define the self, even if it is in the indirect effect of economic capital as Jasmine discusses. Xi is beginning to recognize other social capitals that STEM can offer: the connections she makes within the STEM community affords her special treatment for her mother’s diabetic needs, ability to participate in projects that can change people’s lives, and her forward motion as she is shown by Dr. Scot a way to avoid an unnecessary term and attend a prestigious graduate program at Stanford.

The women’s experiences reflect the current emphasis on STEM as a national focus. The President’s Council of Advisors on Science and Technology stated that the education system in the U.S. must prepare students to have a strong foundation in STEM (President’s Council of Advisors on Science and Technology, 2010). In 2006, the National Academy of Science released a report spawned by a congressional request and found what they believed to be an insufficient number of STEM graduations. Further pressure has been felt by education organizations as the trend in national reports calls for more teachers who can effectively teach in the STEM fields (NAE, 2009; NAS, 2006). STEM is continuing to expand into elementary schools as federal legislation allocates money specifically for STEM as a nationally valued set of disciplines, recently adding engineering to the previous math,
science, and technology grouping (Kuenzi et al., 2006; Minnesota Academic standards: Science K-12, 2009; National Academic of Science, 2006; National Governors Association, 2007). Many researchers make the argument that for the United States to remain globally competitive, STEM fields must be well supported as a matter of national benefit (Bottoms & Uhn, 2007; Freeman, 2005; Jeffers et al., 2004). As the nation invests in STEM education, students’ recognize the programs themselves as privileged fields. Additionally, as students become aware of the higher wages offered in STEM fields, it further solidifies the ability for STEM careers to provide entrée to a bank of social capital valued by the majority culture (Hossain & Robinson, 2012).

**Additional Findings**

Self-authorship’s intersection with social capital varies dependent upon the situation. As this FWR study shows, having social capital privileged by the majority culture can cause the self to be defined by those external roles and relationships, because to do otherwise would mean possibly giving up some of the social capital gained from fulfilling those roles. In Jasmine’s case, her parents’ financial support may be withdrawn if they disagree with her choices. This hardship would be difficult for Jasmine who is doted on and given international trips as well as private tutors, even though she has no work responsibilities. The path, though easy and well laid out for her, can be interpreted as coming at the cost of sacrificing the freedom to define the self. As Jasmine’s junior year unfolds, Jasmine’s social capital remains static and her self-authorship moves from the basic Stage One, as defined by Baxter Magolda (2001), to Stage Two. The shift, though small, allows for questioning that must occur to begin to trust internal systems over external systems. However, her aspirational capital, though significant, must rely on the growth of her resistant capital in order to survive the
opposition her parents and the engineering community may pose if her self-authored identity does not align.

Marie, whose social capital is not privileged by the majority culture, has developed the furthest of all of the young women characters. Her resistant social capital allows her the strength to “maintain and pass on the multiple dimensions of community cultural wealth” (Yosso, 2005, p. 80). However, while she refuses to submit to the sterilization of who she is, as she believes the STEM career requires of its students, her current refusal to participate in the engineering department’s perpetuation of a traditional culture will ultimately strip her of her power to oppose the system’s continuation of inequitable policies (Delgado Bernal, 2001). Marie’s plan to finish a two-year engineering degree has allowed her to keep the door open to other opportunities, but she will need to participate in the system to change it internally. For her to do this, she will need to discover a way to remain self-authored in thought and action even as she acts within the hegemonic STEM field.

It is evident from the young women’s narratives that social capitals are not equally possessed by any one individual. Also, social capital is not absent if it is not accepted as currency by the majority culture. An individual may have rich social capital but it is not recognized as valuable by the majority culture or a particular community. Through these narratives, Yosso’s shift away from seeing a deficit of social capital in any one community to understanding that social capital is valuable can be observed. Though Jasmine’s abilities will be welcomed in the STEM fields, Marie’s significant gifts in STEM and her tremendous sense of loyalty and responsibility would be equally welcome to a company. Xi’s passion for practical applications of STEM knowledge is valued by STEM companies, as is the discipline she has gained over the years of working under her parents’ watchful gaze.
Chrysti’s dedication to science as a way of being, not just a knowledge set that may be applied to a problem, would be a force of innovation desirable to STEM fields as well. However, the willingness of the academy to provide social capital and to support the self-authorship development of students is key to adding the diversity of women and women of color to the STEM field. Of course, as the narratives also show, no student lives in a sterile environment where any institution, no matter how well intentioned and consistent in supportive policies, can dictate every influence on students, nor can any institutional practice control outcomes. The complex condition of humanity denies such certainty. Still, the narratives do reveal that the women’s choices are also influenced by situations within the university that consequently will suggest practical ways to attend to the needs of a diverse student body.
CHAPTER 6. SUMMARY, FINDINGS, AND RECOMMENDATIONS

[T]here shall be love between the poet and the man of demonstrable science. In the beauty of poems are the tuft and final applause of science.

Walt Whitman

Summary

The purpose of this study was to use Fiction Writing as Research (FWR) to investigate the social capital young women brought to college after participating in an introduction to engineering program during their last three years of high school. Using the social capital brought into college as a reference point, the young women’s self-authorship and social capital evolution was also considered, as was the effect of social capital on the young women’s self-authorship as a STEM or non-STEM student.

Four young women characters were created from the researcher’s experiences as a post-secondary instructor, a daughter of STEM parents, and a graduate assistant on a research project studying the effects of an introduction to engineering program. Each of the four women came from different socio-economic backgrounds, different cultures, and different life situations in order to suggest the affective experience of a variety of women gifted in STEM and considering STEM as an academic and career choice.

Jasmine, as a woman of color, comes from an educated and upper class family. The narrative suggests that her socio-economic status alleviates the majority of barriers that her fellow STEM female students face. Chrysti, a Caucasian woman from an educated but less financially wealthy family, struggles with her ability to successfully navigate a system that is primarily a majority culture that does not recognize many of the capitals she brings as a rural student. Likewise, Marie, a young woman of color from a lower socio-economic family, has a well-developed self-authored self. While she is capable of being successful in the majority
community of the university engineering department, her self-authored belief system gives her different guidance as she recognizes her diverse community capitals are devalued within the majority culture and, as a result, she has little interest in continuing to invest in the system. Finally, Xi, a woman from a less recognized community culture has too little self-authorship to use her Social Capitals well. However, Xi’s narrative has the greatest growth curve as her self-authorship is drawn out by both family challenges and professional opportunities.

**Findings**

As a postmodernist, I delighted in my ability to utilize an experimental methodology that could better provide a level of engagement and deep connection with art and understanding of the human experience. This practice is a recent development in narrative experimentation in research across disciplines including novels, short fiction, poetry and many other genres of arts-informed research (Banks & Banks, 1999; Ellis & Bochner, 1996; Neilsen, Cole & Knowles, 2001; Norum, 1997). Dissertations have also used narrative experimentation (Crooks, 2001; Dunlop, 1999; Geelan, 1998; Sellito, 1991).

The narrative of formation is well established and is perhaps most familiar to readers as Rousseau’s *Emile or On Education* written in 1762, Charles Dickens’ *Great Expectations* and his *David Copperfield*, and the more experimental James Joyce’s *Portrait of the Artist as a Young Man*. Fiction itself has been seen as a source of moral and social instruction. Victorian writer’s like Charlotte and Emily Bronte wrote novels that had women characters searching for self-authorship. Margaret Atwood’s (1982) comments see fiction as a source of knowledge construction and appropriate to use in education research: “If writing novels--and reading them–have any redeeming social value, it’s probably because they force
you to imagine what it’s like to be someone else. Which, increasingly, is something we all need to know” (p. 119). The stories in this research are stories that enabled me, and hopefully my reader, to see things in new ways. The product here is a cultural product. It is an interpretation of experiences just as every researcher’s end product is a selective interpretation of findings. This narrative is not meant to be a closed system but one that requires the reader to actively create meaning from the text, interpreting it and allowing open response and understandings. It is meant to be exploratory, explanatory, hopeful and generative in its epistemology. Fiction, as used in this study, allows an awareness of complexities, diversities, multiplicities, and ultimately the infinite richness of coming to know the experience of being human.

*Jasmine.* The character of Jasmine represents the complex identities of a mixed race woman who also comes from a privileged set of social capitals. As a residential traditional student, Jasmine has no obligations outside of her success in school, and further assisted by her parents in the form of tutors, verbal support, the use of social connections, and the ability to navigate the academic system, using the appropriate terms and conceptual understanding of the process. Jasmine recognizes inequities, at first in the disparity of women in her STEM courses and later, at Dr. Alice’s promptings, the disparity of advantages many of the young women she met in the introduction to engineering program have when compared to her. This sense of injustice motivates her to be successful and act as a role model for other women of color to succeed in STEM. It also causes her to question her position of privilege and, as a direct result, the role she plays as a result of external expectations accompanying those privileges.
As Jasmine’s self-authorship develops, her awareness of her privileged social capital increases as well. However, her substantial original social capital does not evolve within her narrative. It is undeniable that Jasmine’s social capital affects her career choice in her inability to imagine any other career but a STEM career and the easy path carved for her by her parents. As she begins to move from Stage Two to Stage Three in her self-authorship development, it is possible she may lose some of her privileged social capital if her parents were to withdraw support. However, it is likely that this would force Jasmine to acquire social capital of her own that is not directly connected to her parents.

**Chrysti.** Chrysti’s perception that she is disadvantaged as a result of her rural culture and the inadequate preparation her original social capitals offer limits her ability to evolve her social capital. In her focus on day-to-day survival and her continued frustration at having no navigational or linguistic capitals that allow her to efficiently traverse the institutional system, she has limited evolution of her self-authorship as well. Yet she is fortunate because her moments of despair are moments when the social capital offered by the introduction to engineering program and Dr. Alice can offer Chrysti the strength to continue on. Dr. Alice acts as a sort of mentor to Chrysti and encourages her to persevere. Her ability to successfully advise Chrysti overcomes the poor advising available to Chrysti through the traditional system.

Many of Chrysti’s rural affectations allow sentimentality to overcome her ability to see situations as complex power structures. For example, while Jasmine is incensed by the insensitivity of the Columbus Day celebration, Chrysti revels in childhood memories of the day. Chrysti’s unique connection to a distinct Judeo-Christian spirituality causes her epistemology to develop more slowly toward a constructivist perspective, yet she creates a
unique construct that marries science and religion in a way that differs from many of her peers and may serve her well as the two passions bolster each other.

Chrysti’s lack of social capital appropriate to MSU causes her to lose aspirational capital yet by the end of her narrative, Dr. Alice, a source of social capital, provides the ability to believe she is capable of attaining a scholarship. For Chrysti, due to her reliance on Dr. Alice’s continued relationship, the introduction to engineering program grants her an evolving social capital and, perhaps ultimately, her ability to have faith in the possibility of obtaining her goal of becoming a bio-engineer.

Marie. While writing Marie’s narrative, I felt a formidable sense of personal self-authorship that none of the other characters had been able to find. Though she is angry at the privileged system for denying her the cultural and family identities that offers her a more valuable social capital than that of a STEM degree, she remains firm in her self-authorship and chooses against the preferences of the authority figures represented by Dr. Alice and her professors and, to a great extent, even her friend Chrysti who does not initially understand how Marie is not disappointed to cut short her education. The social capital she brings from her family and culture informs her self-authorship development but it does not evolve further during her junior year. Likewise, her social capital affects her STEM choice only as she chooses not to participate in a system she finds to be prejudiced against her values and identity.

Yet Marie, more than any of the other characters, has great potential to have a stable sense of self. Just as she defies the authority figures of the institution, she also defies her parents and her fiancée when she finds their opinions contradict the actions her internal belief system would guide her toward. This independence does not cause her to sever relationships
but allows her to construct interdependent relationships in which she is an equal. Her self-authorship reaches the fourth stage of development, the highest of all the characters. As the writer/researcher, I found her to be inspirational in her centered self-authorship that does not rely on external pressures and definitions, but instead seeks her internal compass in thoughts and actions.

**Xi.** A child of Hmong refugees, Xi’s story is often not told. Her disciplined focus on completing a goal her parents set for her at birth is remarkable yet she acts out of obligation and external requirements. It isn’t until Dr. Scott inspires her to see rote learning as a key to unlock solutions to problems that Xi begins to find a reason to accept the pre-determined role as STEM graduate as part of her personal identity. While this indicates a development of self-authorship, the great leap in Xi’s self-authorship development occurred due to adversity. Because of her mother’s needs, Xi finds the strength to reach beyond the limitations she has allowed external forces to place on her. Xi, at this point, sees the connection between theory and practice, social capital and helping her family, STEM and new worlds of opportunity, in her ability to navigate the medical system with her connections to Dr. Scott. Due to the congruous values, her self-authorship can develop quickly in her embrace of STEM, her newfound understanding of the Hmong culture and her trust in the voice she recognizes as her own.

The social capital Xi brought was not compatible with the currency of the academy but because of her aspirational capital, Xi was able to persevere long enough to acquire the more compatible social capital through Dr. Scott’s assistance. As she gained social capital, she developed in self-authorship incorporating a STEM identity. Like Chrysti, Xi needed a single person to access the social capital valued by the Academy. Xi’s chance relationship
with Dr. Scott and Chrysti’s relationship with Dr. Alice as a result of her participation in the introduction to engineering program act as reminders to institutions that students need points of access to be successful. These points of access can be mentors, advisors, faculty members, or senior peers, but without them Chrysti and Xi would be lost to the STEM fields. Their diverse voices are needed and warrant additional institutional resources to assure they are heard.

**Implications**

As a result of the FWR analysis, it was clear that the characters had a complex set of variables that are influential in this study’s three key foci: self-authorship, social capital and STEM career selection. This study was conducted by utilizing a constructivist epistemology, postmodern theoretical perspective, Fiction Writing as Research methodology, and the experiences of the researcher as a post-secondary faculty member, a graduate student assisting on the analysis of the effects of an introduction to engineering program, and a daughter of STEM parents. The characters’ internal thoughts and reflections were exposed using an epistolary narrative written via the means of social media. Each character recounted their unique story through private and public blogs, Facebook postings and personal texts to peers voicing reflections on Dr. Alice’s interview questions, life situations and relationships. The literature addressed self-authorship, social capital and the disparity of women and women of color in STEM fields of study and practice. The characters’ narratives provided an additional level of affective understanding absent from traditional scholarly thought. The characters communicated their frustrations with the institution, faculty members, peer choices, and their challenges and opportunities as a result of their six social capitals: resistant, navigational, social, family, linguistic, and aspirational. With an intimacy allowed by the
characters’ personal epistles, the researcher and reader is given an affective knowledge of what it means to be a woman STEM student in a variety of personal situations, with a variety of social capitals, at a variety of self-authorship development levels and around a variety of understandings of STEM as an identity and source of power.

**Recommendations for Practice**

Thorough consideration regarding the social capital requirements of the institution and the necessary self-authorship development of students can facilitate the possibility for change that is meaningful and purposeful. Attention to such detail will enable institutions to be more responsive to diverse student’s needs. The coherence of diverse cultures within STEM culture can be achieved if faculty and the study body as a whole understand how each person brings social capital to the field, valuable in ways not traditionally recognized. In this regard an “us” versus “them” mentality is circumvented, and a unity of focus, purpose, and vision can be achieved by the STEM department and study cohort. Harmony will be furthered, dissonance reduced, and communities of academic support can be formed for the betterment of all. Seven recommendations for practice are offered based on the findings of this study to ensure institutions are able to reach this mutual respect among diverse perspectives.

1. **Provide Professional Opportunities.** Though Jasmine had ample opportunities to have professional opportunities, the other three young women only experienced these opportunities during the introduction to engineering program as high school students. Dr. Scott assisted Xi in having the experience of participating on a research team but the STEM field would be well advised to consistently provide these for all students.*Provide and/or*
Modify Existing Advising Programs. Poor advising happened to all of the young women. Jasmine was able to avoid the consequences due to her privileged navigational capital. Marie did not pursue advising; had an advisor not actively sought her out, she would have likely not been as resentful to the institution’s perceived rejection of her belief system. Chrysti was most affected by poor advising as she duplicated courses that drained her financial and time resources more than necessary. Though Xi followed the prescribed curriculum, she was able to circumvent unnecessary courses due to Dr. Scott’s assistance. In all cases, the institution’s advising failed the student.

3. Provide Faculty Interaction Opportunities. Chrysti suffered the most from a lack of faculty interactions. Dr. Alice acted as an access point to institutionally valued social capital but she was not a faculty member Chrysti saw on a regular basis. Xi and Jasmine established relationships with key faculty, Dr. Jane and Dr. Scott respectively, who acted as a source of inspiration and encouragement. Jasmine’s connection to faculty through her parent’s connections allowed her insight into the system that the other women had only after establishing their own student-faculty relationships.

4. Partnerships with engineering businesses. Chrysti knows she needs to be working in her field and yet does not have the navigational, social or linguistic capital to do so. Institutions can create equitability by partnering with businesses and offering students who are not connected personally to have the same opportunities students like Jasmine have.

5. Relieve financial pressures. All three women but Jasmine were affected by financial pressures. Xi overloaded her schedule to ensure she finished before her scholarship ran out. Chrysti was forced to go part time, a significant factor in student attrition, in order to manage the financial realities of her situation. Additionally, she received her financial aid late, which
caused her to be without textbooks for the first week of classes. Marie used finances as a key variable in her cost benefit analysis of a STEM education. If institutions can relieve financial pressures, students will have greater freedom to engage more fully and not be distracted by jobs and bills.

6. *Educate and support family members.* Jasmine’s parents were system literate and understood the institutional requirements Jasmine would have to meet. However, Chrysti, Marie, and Xi had parents who were not educated in the requirements of STEM, nor on the outcomes of acquiring a STEM education. By educating and supporting family members, institutions relieve pressure placed on students by misinformed parents. Chrysti’s parents may have understood the value of their daughter’s continuing on to a graduate degree. Marie’s parents may have begun to see Marie’s responsibility to the family as being fulfilled in her future as a STEM worker. Even Xi’s parents who believed STEM career choices to be the golden ticket to the American dream would have been able to have realistic conversations with Xi regarding her future.

7. *Require practitioner-based themes within coursework.* Both Xi and Chrysti were excited by the application of STEM concepts. However, the young women experienced their coursework as a lecture-based set of theories. Only when Xi participates in Dr. Scott’s research team does she find the passion of acting as a practitioner and not a book-based scholar. Her awareness that the product she is developing with Dr. Scott could help her mother ignites excitement for the work that supersedes her previous discipline to achieve a grade. Chrysti’s passion for science is because of her own experimentation fueled by personal curiosity. Should STEM departments wish to develop STEM graduates who
integrate STEM with their self-authorship, it must become evident to the student that the course work, and therefore the work of a STEM, is meaningful to them.

**Future Research**

Future research should take into consideration the complexities of social capital regarding genders. Since all four of the characters were women and were part of the introduction to engineering program as women, it would be of interest to conduct research that centers on men who were equally gifted in STEM fields but were not selected by a program due to their gender.

Another suggestion for future research is to more closely investigate the social lives of the young women. While Jasmine’s social life hinted at some regularity, none of the other young women mentioned friends other than each other in the study. In other words, what impact does it have for women of color’s self-authorship to primarily form peer groups within their STEM cohort as opposed to when women of color primarily form peer groups among those whose social capital is similar to theirs.

A third suggestion would involve a case study of a group of STEM women who use the new institutional space of social media. Research would be set-up utilizing a critical theoretical perspective with which to explore if self-authorship can be developed. Since the participants in the study used social media only for personal and social use, it would be important to establish how institutions themselves can foster self-authored thinking and actions through social media tools.

A fourth consideration for future research concerns how STEM departments attempt to assist in the development of, and support of self-authorship for all students with an
emphasis on the importance of diversity of vision and insights. It would be of importance to investigate how diverse vision and insights are responded to by faculty and by peer sets.

A final suggestion regards a continuation of experimental studies done within research fields that prefer traditional quantitative research. STEM as a subject of research is most commonly studied with a STEM form as well. However, FWR as well as new postmodern methodologies can offer a new way to understand problem that can evade traditional methodologies and investigations.

**Policy Implications**

In meeting these characters I have created, I better understand how a variety of social capitals, including STEM which can be understood to carry with it a great deal of favored social capital, can influence both the development of young college women’s self-authorship and their freedom in choosing a career pathway. Many of the difficulties encountered by these young women could have been avoided by better institutional policies that focus on the Institution itself as a “gifter” of social capital. As a result, new programmatic procedures were put in place. I found great satisfaction in my ability to have been able to enact change (Taylor, 1997). Tierney (1997a) agreed with Taylor and encouraged professionals to change their perspective on socialization. This is especially important in The Academy that is full of traditions and in many senses, remains a community that prefers the old to the new, the familiar to the unfamiliar, and the traditional to the experimental.

Suggestions for possible implementation of best practices would involve the following areas. Additionally this information could be used as a checklist to guide an institution in its efforts to support developing self-authorship and equitable social capital among its students:
• Provide opportunities for faculty to learn what self-authorship is and how supporting self-authorship development benefits their students.

• Celebrate the importance of diverse vision and perspective and its impact upon the potential STEM holds for the future.

• Provide safe spaces and situations for students to share a diverse set of social capital among their STEM peers.

• Have department program reviews include a focus on the support of student self-authorship and equitable social capital significance.

• Provide assignments where students can use a variety of social capitals consciously to look at solutions to problems.

• Reserve time for students to meet with advisors who insure equitable navigational and linguistic capital within the institution’s system.

• Establish professional activities for STEM students in diverse communities where a diversity of social capitals is needed.

• Reserve time for faculty to meet with advisors who can assist with ensuring self-authorship development is supported and applauded by STEM coursework.

• Survey students in order to identify their social capital strengths and perceived needs. Consider administering this survey within a growth model so continued efforts can be appropriately measured.

• Establish viable, meaningful, and purposeful mentoring programs to further the equitable access to social capital valued by the institution for students. Peer partners would consist of upper level STEM students and faculty. Possibly allow students to
gain credit and faculty be given course release time for their time, effort and valuable contribution to the future STEM workers.

- Set up departmental peer meetings for all STEM students that occur on a weekly basis. Establish a schedule where STEM students can meet exclusively with alumni who can speak to the benefit of self-authored thought and action as well as the value of all cultural social capitals.
- Provide opportunities for students to develop an understanding of their social capital they have brought to their programs and how that social capital can be valuable.
- Provide opportunities to develop an understanding of their developmental stage within the Baxter Magolda self-authorship developmental theory.

**Reflexivity**

Beginning this journey was easy. Continuing this journey was not. In the midst of the research work, a major personal crisis drastically affected me and who I was. I realized that my own initial social capital had greatly affected my personal self-authorship and I found that I was not nearly as evolved as I had once thought I was. The process of working through this research allowed me time to consider and reconsider who I am in profoundly different ways than how I would have described myself in the beginning. Like Jasmine, I was a child of STEM educated parents who could only imagine the world in a positivist light. Ever the artist, I was constantly denied a different view of the world. I never realized that I wasn’t able to see the world in the way most natural to me--through a constructionist lens. Like Chrysti, I was the child of rural parents who were educated but were not system literate, nor did they have many of the social capitals afforded someone like Jasmine. Like Marie, I
struggled with questions of gender roles. I wondered if women should be primary caregivers to their children or were they still “good” moms if they had a full-time job outside the home. Like Xi, I too struggled with parents who expected perfection and many of the following tendencies, including an eating disorder. Just as there are shards of the many young women I have worked with throughout my teaching career making up the glass mosaic of these characters; there are shards of me that create these female characters as well. These shards mold together as the characters take on a new identity and try to find their way in a world that is often not kind, welcoming or forgiving of mistakes.

The time spent on this study was often time stepping in a direction that ultimately was not one I would take. I had initially planned to do a more traditional qualitative study on the young women but due to external complications related to grant data, that option became an impossible one. With the assistance of my advisor, Dr. Ebbers, I was able to determine an equally valid qualitative design and, as life often does, it was perhaps the best thing that could have happened to me. This design fits how I write, how I see the world in stories, and was a significant part in healing through a very difficult time.

Upon determining this design would be the route I would take, I realized the very experimental stage it is currently in. I was not anticipating so little literature on this form of research design and yet I saw the opportunity to explore a new academic path that became a fantastic adventure. The young female characters in this study illuminate so many of the concepts in ways that are understandable to so many people, which is why I determined that I would make it a blog, and invite other STEM women to chime in.

When reflecting back on the work I did on the large grant funded program as a graduate research assistant, I thoroughly enjoyed coding the interviews. I appreciated being
part of a team of bright, well educated, thoughtful professionals who brought a diversity of perspectives to the table. Yet, in the end, some of the most insightful moments I had were in crafting these young character’s lives. They became flesh and blood to me and I could imagine exactly how they acted, what they experienced and how the male dominant STEM field would be a different kind of road-block to each of them. I saw how social capital was present in every one of the girls’ lives, yet The Academy in many ways denied accepting much of the capital those diverse students were offering.

After reading the interview transcripts, coding those transcripts for thematic information, then determining that data would not be a direct part of my work, I turned to old journals, old emails, and old connections to complete a larger understanding of young women in STEM from a variety of backgrounds. In the words of these young women, the themes were obvious to the prepared reader though they were just beginning to understand the larger implications such concepts would have on the rest of their lives. Taking them through their junior year was thrilling and sad at the same time as I saw what, though only fictional in this account, is very much the reality many of our young women face. Data saturation was fairly evident when the women’s words came back over and over again as dancing around, and sometimes stepping directly on, the primary questions that this study attempted to answer.

For me, writing is a joyful experience. Writing in this multiple voiced genre drew on skills that had lain patiently in wait for me. I became so interested in my topics, so interested in the young women and their experiences that I would often write until I was falling asleep at 3 and 4 o’clock in the morning, knowing at 6:00 was awaiting me, and my own students deserved quality teaching. Yet, stopping in the midst of passionate creativity was impossible.
So here I am, writing this last section of my dissertation and I see that this amazing, painful, powerful, and enlightening experience of my Ph.D. program is almost over. It has been a goal from the time I was a very little girl and I am not sure how I am going to live a life that doesn’t seem to be always looking toward this larger goal. Though much of the pain I have experienced would have likely not occurred had I not begun and continued on this path of my forever dream, I do not regret it. I am a better, stronger, more self-aware person than I could have ever been without the emotional trials and intense internal work that so well dovetailed with this study. The effects of this learning experience, the friends I have made, the knowledge I have gained, and the strength I have acquired will be with me for the rest of my life. As I look to my own four children, there is a part of me that would spare them so much of the difficulties I have faced and yet, I wish them the outcomes that I have been so fortunate to obtain. May they find safe passage, but more importantly and even if it means taking a dangerous way, may they find what they must, despite the despair I will feel when their feet find stones that cut and bruise just as mine did. For it is only as I end this leg of my journey, that I embrace, as woman and as a mother, Whitman’s words on the human experience of finding a way in the world:

“Not I, nor anyone else can travel that road for you.
You must travel it by yourself.
It is not far. It is within reach.
Perhaps you have been on it since you were born, and did not know.
Perhaps it is everywhere - on water and land.”

Walt Whitman, *Leaves of Grass*
Date: November 15, 2013

To: Wanda Systelian

CC: Larry Ebbes, Faculty Supervisor

From: Kerry Agnitsch, Interim Director, Office for Responsible Research

RE: IRB Determination for “Science of Self: Self-authorship, social capital and women exploring careers in engineering”

Per your request, I am writing to provide a determination regarding whether IRB review was required for your project “Science of Self: Self-authorship, social capital and women exploring careers in engineering”.

I have read through the dissertation chapters that you sent to me via email on November 7, 2013 and November 12, 2013. The dissertation describes your methodology as “Fiction Writing as Research” (FWR). Instead of basing your analysis on research data, analysis is based on a fictional account you developed of the experiences of four young women and the interactions they had while attending college and taking part in an NSF-funded research project. This fictional account is based on the following:

1. Your memories and recollections about what you learned from the research data to which you had access during your time as a graduate student on the NSF-funded project;
2. Your experiences and reflections about teaching young women in a college setting;
3. Your own personal journals about your life experiences.

Based on these memories, recollections, and journals, you have created four fictional women who are a “collage” of persons you encountered during your experiences.

You have confirmed, via email and phone conversations with me, that ALL of the information presented in your dissertation referencing any individuals (e.g., the four characters or anyone mentioned by those characters) is completely fictional. That is, NONE of the information regarding their background, demographic characteristics, experiences, etc. is about or was provided by either (1) the subjects in the NSF-grant-funded research project for which you were a graduate student or (2) any other living individuals. Further, you completely made up all of the language/words/experiences shared in the Facebook/blog postings/etc. presented in your dissertation—this information was not taken from the Facebook/blog postings that research subjects provided for the NSF-grant-funded (or any other) research project.

Based on my understanding of your methodology, as outlined above, I have determined that your project did not require IRB approval because it does not involve human subjects, as they are federally defined. That is, you did not interact or intervene with living individuals to collect any of the information that is presented in your dissertation; nor did you collect private and identifiable information about any living individuals.
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I am most appreciative for the time I spent with you all. It has been an honor to become classmates and friends.
In 2009, when I started this process, I was a very different person than I am today. The doctoral program was part of the journey that I had to make to understand who I am and what I am capable of. My self-authorship will continue to evolve as I intentionally seek out the fifth order of Baxter Magolda’s theory. This academic piece has become a part of who I am and will actively assert ideas that are certain to shape how I will grow and learn more about who I am, how I know, and what relationships I want. Though scholars should constantly be aware of how little they know as the world continues to enlarge even as they know more of it, I doubt there was a scholar who realized how little self-knowledge she had as I did upon delving into my own dimensions. The humility I have gained while researching and writing is one of the greatest gifts of this process as is the belief that humans are complex, brilliant creatures who cannot be understood in simple binary systems.