Major Decisions: Religious Women and Their Perceptions of Women in STEM Majors

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ABSTRACT

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Women still lack representation in many Science, Technology, Engineering, and Math (STEM) fields, particularly those with high earning potential. Past studies on women who study STEM have failed to acknowledge the impact of religious values on choice of major among women. Using data collected at a religiously-affiliated university in 2013, this study explores how 24 religious women made decisions about majoring in STEM fields. The results from this sample closely follow the literature review, while also adding many new layers to understanding how religious women make decisions about STEM. Themes identified using this approach are useful for designing future studies on traditional women who study STEM.

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The first person that I want to extend my thanks to is Dr. Carol Ward. My paper differentiates the roles of an adviser versus a mentor; an adviser "believes in" a student in some sort of abstract way, but a mentor guides the student down a path that she would experience great difficulty traversing otherwise. I am certain that I would not have been able to finish this thesis without Carol's consistent, kind, and patient mentoring. I seem to lead quite the tumultuous life, but Carol has always been understanding of my fluctuating circumstances. She gave countless hours of her time walking me through my varying stages of excitement and self-doubt, reminding me that my project was important and that I was doing well during those times that I felt the complete opposite. For that, I am forever grateful to her. I am furthermore humbled to have been able to work with her on an ethnographic project, as she is well known in the field for her ethnographic work. I am glad to have been able to learn so much from her expertise.

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Whether … science is a worthwhile 'vocation' for somebody, and whether science itself has an objectively valuable 'vocation' are again value judgments about which nothing can be said in the lecture-room. To affirm the value of science is a presupposition for teaching there. I personally by my very work answer in the affirmative, and I also do so from precisely the standpoint that hates intellectualism as the worst devil … the devil is old; grow old to understand him.

Max Weber, *Science as a Vocation*

Strictly speaking, there is no such thing as science "without any presuppositions"; this thought does not bear thinking through, it is paralogical: a philosophy, a "faith," must always be there first of all, so that science can acquire from it a direction, a meaning, a limit, a method, a *right* to exist.

Friedrich Nietzsche, *On the Genealogy of Morals II*

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Women in STEM Majors

      Women in Science is a topic that has been given more attention recently by the academic community as the numbers of women going into Science, Technology, Engineering, and Math (STEM) fields plateaued in the 1990s and continues to plateau. Although there have been many excellent studies showing explanations as to why this may be, there is a lack of scholarship about women who have traditional religious values. Since STEM fields are often thought to be very career-focused (US Labor Bureau 2017 shows that all the topmost lucrative jobs in the US are in STEM) and religious values in the United States are strongly related to traditional values (Bryant 2003), careers in STEM appear to have a focus that contradicts the traditional American family structure for women. Consider that women in the US tend to be less religious the more money they make (Schnabel 2016). There are many religious women who study STEM on campuses across the nation; in fact, in the US women as a whole are more religious than men are (Norris and Inglehart 2008; Sigalow, Shain and Bergey 2012). While there are numerous colleges and universities in the United States that have some sort of religious affiliation, there are only nine that are classified by the Carnegie Classifications of Institutions of Higher Education as either Research I or Research II institutions; this group of universities presents an opportunity to consider the retention of women in STEM because they have religiously-minded people (including women) who are producing high-quality scholarship in these fields.

      The purpose of this study is to address a question emerging from recent scholarship concerning the retention of women in STEM fields: how do young women studying STEM on a religious campus make decisions about their futures in STEM? Although studies have examined the experiences of under-represented groups in STEM, no studies have addressed how religious women make complex decisions about their education and career choices during their time at

university. Additionally, the current literature on the retention of women in STEM suggests nothing about how religious values impact a young woman's decision to study STEM. This project is an exploratory study that attempts to discover what is important to young religious women as they make decisions about STEM majors. The venue chosen for this study is a private religious university (one of the nine mentioned above). To inform the research question, twenty-four interviews with women who studied STEM at this campus are analyzed using the Grounded Theory Approach. Themes that are identified using this approach may be useful for designing future studies on other traditional religious women who study in the STEM fields. Such studies could contribute to the literature on conditions that may either keep women in STEM or make choosing STEM more difficult. While the study of this population provides insight specifically for young American Christians, it also may be relevant to women in other religious groups that encourage traditional gender roles. This study provides insight not only into this substantial religious population, but to countless women worldwide who subscribe to conservative religions while also pursuing an interest in science. In the next section, a literature review discusses the existing scholarship regarding women in science and provides an overview of the theoretical framework that will inform the analysis of the interviews.

LITERATURE REVIEW

Women in Science has been a major subject of scholarship in the past few decades. This literature review will first discuss the relevant sociological theory on gender ideology, then give a brief review of the scholarship on female students who study STEM. A discussion of the religious environment in the United States will emphasize the importance of focusing on religious women in particular. The scholarship in these topics provides the foundation for the study question and methods.

Gender Framing and Ideology

  The socialization of women in our society is a nuanced and multi-layered process, the extent of which cannot be fully fathomed in a literature review. The purpose of the present overview is to share some important aspects of feminine socialization that should be considered for both the research question and the research sample.

  To begin, being feminine is defined as a "subordinated element in the gender dualism masculinity/femininity [that carries a] meaning derived from often associated essentialized female traits, such as passivity, irrationality, and desire to nurture even at the expense of self" (Borgerson 2007:484). Because historically in American society, upper-class white women (the "ideal" woman) were not encouraged or even allowed to be in many public spaces and were expected to stay at home, these norms were adopted by other groups that aspired to higher social class lifestyles (Lopata 1994). Thus, cultural norms have persisted that revolve around roles in the home: women in the kitchen, women as the hostesses, women as nurturing mothers (see Berk 1985). The belief about the gendered separation of societal roles such as these is what the term "gender ideology" refers to (Davis and Greenstein 2009). It is important to note that these separate societal roles between the binary sexes are largely thought to provide concrete biological reasons for the subordination of women (Chatillon, Charles, and Bradley 2018). This section will examine many of the ways that these views impact the socialization of women.

  There have been many attempts to measure ideas about gender spheres and roles, especially since the 1960s; Davis and Greenstein (2009) give an excellent review of such measurements, showing the ways that attitudes have changed over multiple generations. The authors point out that although the variables used in measurement have been valid, they are often concerned with the relationship between men and women and not on the social psychology of

women themselves. However, there are many levels of gender ideology that social researchers attempt to capture in these studies, such as the acceptance of male privilege, motherhood and the feminine self, the role of the breadwinner in the household and the division of labor in the home, just to name a few. The authors illustrate that despite more women being involved in the workplace now than ever before, women as homemakers remains the ideal because it is seen as a privilege to be able to stay home, particularly by the working class. This is emphasized by the social idea that associates a working mother with the fear of child neglect, whereas there does not tend to be the same attitudes about working fathers (in fact, men tend to be rewarded by being involved in child rearing in any capacity and not penalized if they are not involved in child rearing). Bryant (2003) shows that these traditional ideas tend to be mitigated after a student attends four years of college; however, measurement of the religiosity of the campuses was not included in the analyses. Thus, it remains unclear as to how much traditional gender role ideals change for students who attend a campus that is shown to have a highly religious environment.

Gender Framing (Goffman 1967; Ridgeway 2011) suggests the subtle ways in which men and women are distinguished in daily life, informing individuals of how to treat others. What does this look like? An illustrative example comes from language (Schur 1984). Women may experience difficulty connecting with their male colleagues and peers due to their ability to converse with their male peers. Schiebinger (1999) shows how men and women converse about different topics among one another than they do with each other, and there is reason for this. Ridgeway (2009) points out that "common knowledge is cultural knowledge that we all assume we all know" (147). The common knowledge shared between men is probably different than that between women. As an example, because men tend to be socialized to be competitive, they may tend to watch and care about sports and use this aspect of popular culture to relate to each other.

"They may believe (often correctly) that women do not understand or care about sports" and thus may choose to talk to women about something more "feminine," such as how their kids are doing (Schiebinger 1999:88). What does this mean in the way that men see women, and more importantly, how women see themselves? It means that women are kept in a space where they are "not the competitive equals of men but the delicate and pure 'better halves' of their robust and assertive companions" (Schiebinger 1999:87). Because of these stereotypes, men and women continue to support the existing social system.

Women in STEM

One of the biggest issues in the gendered separation of societal roles is when gender stereotypes seep into the majors in higher education institutions. This means that majors in universities may have feminine or masculine stereotypes embedded in the socialization into the fields (Chatillon, et al. 2018). However, there is an interesting phenomenon when it comes to the idea of science fields. While the cultural perception of science often includes that it is sterile and neutral and untouched by those cultural folkways, it is actually masking a strong masculine bias:

> The pretense that science is objective, apolitical and value-neutral is profoundly political because it obscures the political role that science and technology play in underwriting the existing distribution of power in society. Science and technology always operate in somebody's interest and serve someone or some group of people. To the extent that scientists are 'neutral' that merely means that they support the existing distribution of interests and power (Hubbard 2001:159).

This alone suggests that science and math fields do not exclude women, because science assumes that it is unaffected by the gendering of fields of study. However, numerous accounts document not only how STEM fields are masculine but also how gender dynamics affect females that study in STEM. This section will discuss many of those aspects.

The distribution of women employed in STEM fields varies among the eleven STEM categories as defined by the National Science Foundation. Additionally, the distribution of

women varies across the subcategories of these fields. While women represent more than half of the college educated workforce overall, they make up only about 28% of the science and engineering workforce (NSF 2015). What barriers exist in the scientific communities that are making it challenging for women in particular to excel in the STEM fields? There are a great many proposed and well-researched explanations as to why women are underrepresented in STEM. Blickenstaff's (2005) overview of why women persistently "leak" out of the "pipeline" of a STEM career path includes such reasons as the absence of role models, the "chilly climate" for girls in science classes, an inherent masculine worldview in science fields, and the pressures of traditional gender roles. A few illustrations of these explanations include the following.

The culture of the scientific community represents the white male competitive stereotype, and women are less likely to be socialized in ways conducive to those competitive norms (Rosser 2004). For example, one study showed that boys have "a propensity for competition fifty times greater than that of girls" (Baron-Cohen 2009:15; see also Bederman 1996). One way that competition is maintained between students is grading on a curve, making it less likely that students will work together to help each other succeed. Moreover, there is a "weeding out" process that is cultivated over a student's time at university where if a student is not performing highly enough, then they are marginalized out of their education (Tran, Herrera, and Gasiewski 2011:4). "Women may fall victim to weeding-out practices more than men because competition intensifies their culturally induced sense of self-doubt" (Schiebinger 1999:87). Other explanations, discussed next, provide more insights into how gendered roles remain strong motivators in social behavior.

These views of gender start from the premise that women and men relate to each other in different ways. Describing the process of Gender Framing, Ridgeway explains that, "we automatically and nearly instantly sex categorize any specific person to whom we attempt to

relate" (2009:148). This means that we instantly fall into folkways about relating to the opposite

sex, which often times involve stereotypes about gender that are prevalent in popular culture.

This suggests that the way we talk and think about gender actually changes the way we interact

with each other. Specifically, because "we think 'most people' hold these beliefs, we expect

others to judge us according to them" (Ridgeway 2009:149). Consequently, if women are

stereotyped as the "weaker sex," they are treated, and often expect to be treated, that way. Even

when people want to change the manner in which women are approached and treated, they may

find it difficult to redefine things that have become commonplace; individuals do not have to be

fully convinced by the status quo in order for it to retain its social power (Ridgeway 2011).

While we perhaps attempt to develop new ways of discussing or thinking about issues involving

gender, it can be easier to fall back on stereotypes because they are familiar and generally

acceptable. While performing strategies of face preservation (Goffman 1959), in which people

act in certain ways because they think that people around them expect certain behaviors, people

may fall back on comfortable stereotypes simply by using popular language. The way we frame

gender in society happens in countless, subtle ways every single day. These behaviors are not

just socially accepted ways to interact with each other; they are the expected way to interact.

Men and women treat each other in specific ways in all facets of life, including in the STEM

fields.

Another important note is how women treat themselves and each other in these fields. For

example, we know that women still earn less than men do at every level of education attainment,

and that women in STEM earn about 86% of what men do at the same level among all racial

groups (Mickelson 2015). This, however, is not totally due to being suppressed by their male

peers. Mickelson showed that women may attempt to attain higher levels of education not

because they will increase their own earning potential, but because they tend to believe that being educated will increase their value on the marriage market; that is to say, women tend to believe that men who earn more money due to their own education and training level will look for a partner that has been educated as well. This is obviously impacted by the fact that women with the same educational goals as men tend to choose lower-paying jobs in the field because they are looking for the positions in their field that are characterized by communal values (in the medical field, for example, more women will choose to become a pediatrician than a specialized surgeon, and there are obvious income differences in those two jobs). Females in particular tend to rate communal values as very important when choosing a vocation and, thus, stereotypical impressions of science have been shown to dissuade women from STEM because they do not seem to represent cultural values associated with femininity (Brown, et al. 2015; Diekman and Eagly 2008; Stout, Grunberg and Ito 2016). Ridgeway (2011) points out that there is such gendered segregation in job fields that more than 40% of all working women would have to change professions in order to make the ratios more balanced. Mickelson (2015) gives an excellent in-depth explanation of the educational levels and earning potential of women versus men in the United States.

Several studies conducted by Cheryan, Davies, Plaut and Steele (2009) attempt to further illuminate this phenomenon by examining "ambient identity." In order to explain why there are so few women in computer science, these researchers conducted studies in which they compared women's interest in the field when they worked in a computer lab that was decorated in a stereotypically-male way versus a lab that had a neutral décor. They found that women were more likely to be interested in computer science when the lab was neutrally-decorated. The way that a lab is decorated may seem insignificant but, in reality, this is a prime example of how we

frame gender and construct social expectations based on gender—it happens in subtle ways that truly impact people's behavior. The ambiance of the physical space where women work and study cues them on a social-identity level whether or not they belong in that space or in that perceived group.

A study by Carol Dweck (2007) helps to illustrate some of the difficulties that women experience as a part of their socialization. Dweck points out that up to the fifth grade in the U.S., girls generally do better in all school subjects than boys do, but by the eighth grade, boys tend to surpass girls in mathematics. Dweck's 1999 study was designed to understand more about this process. She begins with the idea that in our society some people believe that intelligence is purely a genetic matter while others believe that with hard work a person can increase intellectual ability. For her study she implemented an eight-week course for students at one middle school in which there was a control group and an experimental group. The control group's course involved general life-achievement and success encouragement. The experimental group's course included the idea that there is no scientific basis for inherited intelligence, and that, neurologically speaking, when a student puts in lots of hard work into her studies, she can make herself more intelligent. There was a remarkable outcome to the study. For the control group, the norm that boys did better than girls in math continued. However, for the experimental group, girls did just as well as boys in eighth grade math.

What does this tell us about the performance of females? First of all, about when girls hit puberty is evidently a time when self-doubt may become a significant problem for them. During that transition into adulthood, females may start to act out many of the internalized ways that women are socialized. However, intervention during this critical stage made a significant difference in how females performed in math, suggesting not only that encouragement, not

marginalizing competition, may foster more success in females, but also that given the support and opportunity, many females *want* to be as successful as males in math. Clearly their internal self-efficacy and their desire to perform are at odds at this stage, because Mickelson (2015) shows that females tend to do better in school overall. This is partially due to the verbal praise that they get from their parents and teachers, for which they are more likely than boys to be impacted by. Ridgeway (2011) explains that future success in STEM depends greatly on earlier performances in math specifically, and that "the way gender frames the path to math is part of the problem" in women's underrepresentation in these fields (107). To make this analysis even more nuanced, Goldin (2015) explored how women internalize grades differently than men do and how these internal processes indicate whether women will remain in a STEM major or whether they will change to an easier major. Correll (2001) also showed in a longitudinal study that girls who performed as well as boys on math tests tended to self-rate their own mathematical abilities lower than the boys rated themselves. It is well-known that men are not naturally better at math or science than women are, and that the way women are socialized contributes to their persistently lower numbers in these fields (Holland and Eisenhart 1990).

Explaining Retention Rates in STEM

At each stage of schooling and into a career, more and more women drop out of STEM. This means that the higher one goes in her education the fewer female peers a woman has. There are a number of subtle reasons why women drop out of STEM (many which have already been discussed). One reason that needs to be given special consideration for religious women in particular is that female students are at an age where many begin to think about the desire to bear children. Rosser and Taylor (2008) shows that while more women than men enter into and earn bachelor degrees, these figures drop significantly in graduate school (46% of PhDs are earned by

women in biological sciences, 28% in mathematics and statistics, 26% in physical science, 21% in computer science, and 18% in engineering). The primary reason cited for this significant drop was the struggle to balance work and family. Still, while their family goals may be a major factor in how women make decisions about their future, it may not be the only factor. Morgan, Gelbgiser, and Weeden (2013) have shown that perceived attitudes towards work and family do not totally account for women's underrepresentation in the STEM fields.

A study by Rosser (2004) addresses unique issues for women as they prepare for and enter the workplace. In 2001, Rosser surveyed 105 recipients of the POWRE (Professional Opportunities for Women in Research and Education) award over the years of 1997-2000. One of her questions was, "What are the most significant issues/challenges/opportunities facing women scientists today as they plan their careers?" An "overwhelming" number of respondents cited balancing work with family as a significant barrier (35). We know that the difficulty in combining career and family is a key barrier for both men and women, but it is particularly true for women since the act of bearing children is uniquely a female experience (Xie and Shauman 2003). Because the tenure clock and the biological clock coincide for academic careers, the expectations of productivity to achieve tenure versus the guilt associated with not devoting self to family life creates an essential struggle to women being able to progress in their careers (Rosser 2004). The effect of this unique struggle can be seen in data from 2015: women only made up 34% of tenured faculty overall (National Center for Education Statistics 2016). Furthermore, even if a woman wants to devote herself to her career, a woman of child-bearing age is seen as potentially pregnant, even if she is not actively trying to become pregnant (Hubbard 2001). Therefore, her capacity to become pregnant makes it less likely to be given as many opportunities within her career because of doubts that such investments may not pay off.

Rosser's 2004 study also showed that women had difficulties finding mentors, building credibility among peers, and experiencing isolation in their careers. This study specifically addresses the processes by which this occurs among women: the competitive nature of the programs and how females may find it more difficult to succeed, the barriers of harassment and discrimination faced by women, and "backlash" from peers because of a perceived benefit from affirmative action. In relation to moving forward in academic careers, Valian (2006) cites additional evidence showing that "more women than men move into part-time positions; women advance more slowly than men; women earn less money than men except at entry level; women are particularly underrepresented at top-tier institutions; and women receive fewer national awards and prizes" in all fields (320-321).

While the experiences mentioned may not be the same for all female students studying STEM, they certainly remain an important factor for the retention of women in their fields. Women go from being students in a male-dominated major to being in a male-dominated workplace, and this imbalance alone increases the likelihood that women will not be maintained in their STEM careers (Ridgeway 2011). Moreover, while women are more likely to hold egalitarian views concerning gender ideology, men are less likely to hold such views because they do not tend to believe that they will benefit from them (Davis and Greenstein 2009). Since many of the STEM fields are male dominated, this suggests that the evolution concerning gender equality in a STEM workplace may be slow. Finally, Rosser and Taylor (2008) point out that the economic costs of women dropping away from STEM is astronomical when considering the thousands of expensive hours spent training them. They estimate that 30,000 women in the US leak out of STEM each year and place an economic cost of $15 billion dollars on this figure.

The Importance of Mentors

One of the most important roles that faculty members and academic advisers take on is that of a mentor. Mentor/mentee relationships are incredibly important to all students, including females, and this section will delineate why that is. Dua (2008) differentiates between a mentor and an adviser, pointing out that an adviser helps a student on a purely academic path, whereas a mentor helps a student navigate the unwritten rules of their field, while also advocating for them and empowering them. There are several ways that mentors teach students how to advocate for themselves in their field. Rosser and Taylor (2008) point out that being mentored and learning how to network go hand in hand, and that women need extra help learning how to sell their skills in an entrepreneurial fashion due to the ways they are socialized. The mentoring experiences students experience can substantially affect how women will interact with the industry they enter, whether academic or commercial. Confidence and experience are built through a mentor's dedication to advocate for their students to take on such roles as lab management team members and in other leadership positions, and to teach students how to write grants and talk about their skills. Most importantly, a student's first opportunities to get published and otherwise interact with academic journals is most often associated with their adviser's work. Finally, being guided by an enthusiastic faculty member often helps to mitigate imposter syndrome (Brems 1994), which is another indicator of whether a woman feels like she belongs in her field and thus chooses to remain in it.

Recent research on underrepresented groups in STEM fields suggests that mentors of students often have a useful perspective on how students are performing as well as how they are forming their future plans. More importantly, mentors have a uniquely powerful influence on their students. A study by Bettinger and Long (2005 suggested that female students' choice of

major and the number of credit hours taken in a certain subject is affected by whether or not they have a female mentor, which indicates how mentors have a unique influence over important decisions that students make for their career paths. Some studies show that female students with female advisers spend less time in graduate school and are even more successful in publishing (Bostwick and Weinberg 2018). Ridgeway (2011) points out that if a woman has a male supervisor, she is more likely to hesitate and ask for his opinion before making a choice, which suggests that female faculty members may be more successful at instilling self-efficacy in female students. Still, the influence of mentors on women needs to be explored in greater depth (Chemers et al. 2011).

STEM fields represent positions of power and influence, considering that they point to greater access to material resources. Figures from the US Labor Bureau in 2017 show that the top-most lucrative majors are all in STEM, not to mention increased prestige in society. STEM fields were founded by white males and have been dominated by white males ever since. When females are in positions of authority, they may be seen as not performing their prescribed gender role and thus labeled "illegitimate and rudely dominate" (Ridgeway 2011:81). Female students, then, are uniquely relying on their mentors to guide them through the process of making themselves legitimate in their field. Because women have had to socially fight their way into these fields, desirable career paths may not be so obvious for women. This partially explains why having a mentor may be so important to the success of females in these fields. Due to age and experience, mentors are trusted by students. During a time in a student's young life where they are trying to decide where to take their career, the encouragement of a mentor is instrumental in instilling the confidence that it takes to continue in the path of STEM.

How Does Religion Shape STEM Experiences?

      Traditional religious values persist in the United States, making it so that even if a person is not religious, she is affected by the religious atmosphere in this country. According to the Pew Research Center (2015), 70.6% of Americans (and 66% of college graduates) identify as some form of Christian. A more recent finding by Pew researchers (2018a) reveals that only 10% of adults in the US do not believe in any form of a higher power at all. About 80% of adults in the US reported that they have never doubted the existence of God (Pew Research Center 2012). Religion is much less important in other developed nations than it is in the US: in comparison to 15 countries in Western Europe, many more people in the US report that religion is very important in their lives, attend religious services at least monthly, pray daily, and believe in God with absolute certainty (Pew Research Center 2018b). In fact, more than a third (36%) of Americans report weekly church attendance. Even more interesting, since the early 1990s social researchers have been investigating a phenomenon in which Americans may report in a survey that they attend church services, but figures vary as to how many people that report weekly church attendance actually go to church that often (Brenner 2012). This indicates that there is a unique social pressure in the United States to act religiously, as evidenced by respondents feeling the need to lie on a survey about church attendance. This fact is important to consider for this research project, because it is known that belief in a religion affects major decisions in a person's life, and that women display more religious tendencies than men do (Sigalow et al. 2012). At the same time, religious affiliation is correlated with greater traditional values and lesser egalitarianism (Bryant 2003).

      Overall, there is much variation in how people think God works in their lives (from speaking to them and protecting them, to punishing them and rewarding them), the majority of

Americans believe that a deity holds some measure of sway in their lives. Furthermore, Christian teachings are very specific about the roles of women in society (see Genesis 2:18; Genesis 3:16; Proverbs 31:10-31; Ephesians 5:22-23; 1 Timothy 2:9-15; Titus 2:5). Why is the religious environment so strong in its sway over women? Social Identity Theory (Tajfel and Turner 1986) provides additional insight into this group behavior. Specifically, people benefit from participation in social groups and often favor members of their groups. For example, in the context of religious women, many members of a religious congregation share a group identity and a sense of belonging that leads to participating in shared ideals about gender and race and other stratification factors. Rejection of these ideals, however, may lead to being ostracized from the group and thus a loss of group identity. Thus, the religious atmosphere in the United States makes a difference in the lives of young women choosing a STEM major and career, but it is unclear as to what extent. The present study attempts to illuminate more in that regard.

Summary and Expectations

Research has shown that socialization processes, such as gender ideology, result in a reinforcement of existing social institutions which promote cognitive biases about the aptitudes of self and others (see Chafetz 2006). As such, gender ideology strongly influences the gender gap in many collegiate fields of study, occupational choices, and income. The gender gap in STEM field, for example, has been shown to be particularly susceptible to gender ideology and, consequently, shape women's pursuits in important ways such as recruitment, retention, and advancement. Furthermore, gender ideological prospects are influenced within the STEM fields by mentors, who are social actors that affect women involved in STEM. For better or for worse, mentors alter expectations for women as they guide students through their possible future paths and are shown to have a great effect on a student's self-efficacy in her field. Although this body

of literature continues to grow, there is still a dearth of research examining how religious environments and backgrounds alter how women act in STEM fields. This shortcoming is particularly noteworthy in the United States, where traditional religious values remain strong. To better understand that influence, this project examines how religious women in the US make decisions about STEM.

METHODS

This exploratory study attempts to discover how religious women studying STEM on a religious campus make decisions about their futures in STEM. To inform this research question, 24 interviews with women who studied STEM at a religious university were analyzed using the Grounded Theory Approach. Themes identified using this approach may be useful for designing future studies on traditional religious women who study in the STEM fields.

Rationale

Although there is a fairly extensive literature on women in STEM in general, there is a dearth of research on religious women in particular. Since the vast majority of people in the United States identify with some belief in religion (in varying degrees), women who are especially religious should be examined to infer their unique experience in choosing a major in STEM. University students are a key demographic for this study because they are at an age where they are seriously considering their future family goals (non-university students of the same age are also considering these things, but university students have the unique experience of deciding on a major during that time). More importantly, women have to study STEM on a university campus before they can have a career in STEM, so how they make decisions about whether or not to study STEM will obviously affect the ratios of men and women in STEM careers; this means that the religious values that young women have seriously affect their future

earning prospects as they move forward in their lives. By choosing a religious campus for the setting of the study, the researchers are controlling for the religiosity of the students as much as possible (meaning that students who choose to study on a religious campus will be more likely to talk candidly about their religious values and how those values are impacting their life choices).

Data

The data for this study were collected in 2013 by a research team located at the university site of this case study. The team emailed an electronic survey to 10,448 students, both male and female, that were randomly selected from an administrative list. The randomized target population was representative of the campus as a whole. Of those contacted, 3,108 students responded and were thus surveyed on a wide variety of topics, including factors that influenced decisions on majors and career paths. From the respondents, female students who either majored in STEM or had dropped out of STEM fields were contacted via email and asked to participate in a follow-up semi-structured interview. Several students agreed to be interviewed by the research team, of which twenty-four of those interviews are useful for this exploratory study. The interviews were conducted using the same interview guide for each interview and then were transcribed for use in the research project. The interview guide is included in the Appendix. According to STEM faculty on the case study campus, the ratio of men to women enrolled in many STEM programs on this campus is comparable to the national average for the ratios of men versus women in their respective fields. This suggests that the number of women enrolled in STEM majors at this university is not necessarily smaller than at most other universities.

Descriptive Statistics

In the sample of twenty-four interviews with female students, each student was either majoring in STEM or had dropped out of STEM and switched to another major at the time of the

interview. Each student had completed at least one year of school. Most of the interviewees were around 21 years of age. The majority of the students were upper-middle class and white, which also reflects the typical characteristics of the campus as a whole. For this paper, each student was given a pseudonym to protect their identities (see Appendix B). See Table 1 for the full descriptive statistics of the sample.

[Insert Table 1 about here]

Methodology and Analysis

To analyze the interview data, the Grounded Theory approach (Charmaz 2014) was used to address the research question: what is important to religious young women as they make decisions about STEM majors? The literature provided most of the initial themes. A preliminary reading of the interviews identified some other themes. More themes emerged from deeper analysis of the data. After completely coding each of the interviews, I used the software tools in Dedoose to examine the codes throughout all of the interviews, looking for frequencies and patterns in the data. After exploring the data, I produced many possible explanations to explain how traditional religious women who are interested in the STEM fields make decisions in their young lives about whether or not to pursue STEM as a major and a career. Those findings are presented next.

FINDINGS

The themes of decision-making that present very important findings for the goal of the project are represented by the following three categories: The Status Quo, Against the Grain, and God Versus Gut. The Status Quo goes over how the experiences of the women in this sample closely follow themes presented in the literature review, showing first and foremost that this sample of women is not an unusual sample; many of the findings were expected. However, there

were several layers shown in the interviews of this sample that the literature review did not prepare for. The findings section under The Status Quo will walk the reader through the findings that were expected, as well as discuss findings that were not expected and that may be unique to religious women. The next section, Against the Grain, show the experiences of young women who acknowledge their religious teachings but still do not follow convention. God Versus Gut, the third section, was only suggested by the literature review during the overview of the importance of mentors. The literature review suggested the importance of mentors (which was also shown in The Status Quo). In that section as well as in the literature, mentors were parents, teachers, friends, peers, career counselors, and employers. Surprisingly, this group of religious women also mentioned another mentor that the literature does not: God. What was even more interesting was that not all of these religious women mention God as a mentor. Because religious people may believe that God guides them through life down a particular path, it is incredibly important to note religious women's belief about what they perceive God is telling them about their life paths.

[Insert Table 2 about here]

The Status Quo

This section provides data from the interviews that relate to relevant concepts in the literature review, where it was shown that the nuanced ways that women are socialized in this country affects how they study STEM and think about STEM careers. Specifically, in this section interview quotes illustrate how religious women in the sample followed gendered norms in society. The findings presented here are important when considering how religious women make decisions about STEM majors and careers. There are nine subcategories here, as shown in Table 2.

The Status Quo: Do women belong in STEM?

If so, what sort of female belongs there? Building upon the concepts related to cultural stereotypes reviewed above, in the following quotes women speak directly about how women fit into STEM. Somewhat surprisingly, many women themselves believe that they belong in a subordinate position to men. Some women have the opinion that most women do not belong in STEM, and indicate that men "get it" better than women do; importantly, the suggestion that they are different than most women and that is why they do well in STEM. Lynn (not her real name) mentioned that women in her STEM major do not like women and actively try to avoid having women in their groups:

> There's always, like, down in the engineering lab there's always groups that work together, and there's always a group of guys with one girl, and there'll be a bunch of them. And all of them are the same, there's a bunch of guys with one girl, and they all kind of like, they get the girl and then the girl gets all that help, generally. And the girls are actually kind of weird in engineering. They're kind of more territorial, I've found. Like, a girl will get her group of guys, and then she doesn't want another girl in the group. Which I find is interesting. The guys I don't think are that weird, but the girls are kind of more standoffish. Like they don't want girlfriends, they want guy friends.

Meagan, on the other hand, indicated that she wished there were more women in STEM because she wanted more solidarity with females:

> I do wish there were more women in this field. I feel like it would be easier for me also if there were more women. Not that that's the hardest part of being in the major at all, but it would just be nice to have that common background with some people, and a common perspective.

She expanded on this opinion, showing that she felt stress due to the lack of women in her field. A specific mention of stress may indicate that she would feel more comfortable overall in her major if more women were a part of it:

> Yeah, it stressed me out that there were so many men and not very many women because I felt like I was such a minority and I felt like—I don't know, because men and women are different if I had a different opinion than the majority I might feel like it wouldn't be heard as much. So, in the program we were on teams and we had, if there was a girl, they

always put two girls on the team, so I always had a support, which is really nice. I don't even know how to describe it, it kind of sounds weird that having another girl would be so great, but it really is.

In the same interview, Meagan mentioned that a lack of females in the major made the major more uncomfortable, because male culture was so dominant. This supports the view expressed in the quotes above that if more women came into STEM, then the culture of STEM would be better:

> I do feel like having mostly males in there, it did change the environment. It didn't change the way the professors treated us. The guys started treating us more like, "Oh, another guy." So, it kind of had this whole competitive, testosterone filled room. And really, just really competitive. A lot of the guys got really competitive with each other. And I remember that frustrated me because I was like, "Guys, let's all just work together, and learn together and it'll be great." But they're all like, "It's a curved class, and we need to do the best."

Some women also said that because the culture of STEM majors is male-dominated, women who are in STEM are going to be treated differently. This suggests that a certain type of female would do better in these fields:

> I think naturally men tend to be more competitive and aggressive. Of course, that's in general. There's specific women who are obviously very aggressive and competitive but women tend to be more relationship based and more nurturing, maybe, than men. That probably manifests itself in what people decide to major in, I'm sure. (Penelope)

> I'm very comfortable around guys. So, it's not difficult for me to be in the male-dominated spectrum, I guess. Because I know a lot of women feel inferior sometimes, when they're in—and some of the engineers have that problem when they're in with a lot of guys, they feel like if they're not a guy they can't do it. And sometimes they have experiences to back that up with people being not very nice to them or things like that, but I haven't ever had trouble with that. (Lynn)

> I don't know because I feel like it came more naturally to me than to other women, but it could be because I had exposure to it. Men just naturally have more exposure to those things because, like you said, growing up gender roles. (Lily)

A couple of women considered the physical differences in males and females while trying to place where women fit into STEM:

I think that the major is equal for girls and guys, like it could be. I think the girls and guys are equally as good in the major, but that there are certain jobs that are better for guys than for girls. And a lot of that's for more physical reasons, like there's a lot more heavy-lifting in some engineering jobs, and girls just aren't as good at that. And I think that guys are raised more for, like when they're little they've got the trucks and the racecars and all that stuff … a lot of the engineering stuff is more just stereotypical guy stuff. But girls could be a lot better at some things on the design side. There are some engineering fields that actually have a lot of girls in them, like product design and things like that, because they're more design based. And that is still engineering, it's just a different kind. (Lynn)

I would think maybe men do is if there is any kind of field work, that maybe there's like manual labor, which I'm really not sure if that's a thing in engineering, I haven't figured that out yet, but just because they're more physically built to do heavy lifting and things like that, but I don't know if that really exists in the engineering side. (Kandace)

Beyond physical differences, some said that men and women think differently. This indicates differences in their views of where women and men are useful in STEM:

Men, I find, are very analytical. Like they can write programs like that *snap* for the most part because they know what should be done in each situation. Girls can do that too, but I mean in, let's say if it's like a webpage design thing, I think girls usually have a better design eye than guys do, just with color and things like that, so it kind of just depends on what part of the major they want to go to. I think men and women are equally capable of performing in that major. (Tiffany)

Women also considered information they received about women and STEM that reflected specific religious views. For example, one woman spoke extensively about how her professor explicitly told the females in her major that they did not belong in STEM for religious reasons. The following is an excerpt from her interview:

[My professor] would say a lot of things, that like if both of the parents are working you're like sinning, not obeying the commandments and stuff. He brought in his wife and kids one day and was like, "My wife made this sacrifice, even though she went to college, to stay home with her kids." Then he would go and say things like, "I think it's really great that there's more women in computer science and stuff." But then he would say things like, "But it's not like you're actually going to use this degree." That was really, really frustrating. (Genoa)

The following woman echoed a similar sentiment:

> I heard a story from one of the female doctors who came to talk to us, but that's not my experience. It was just like a [church leader] talking to her, or talking to her husband saying like, "you need to get your wife out of that career it's not where she's supposed to be." Yeah, he really overstepped his bounds. I don't know who he is or whatever, but he was really judging them and telling her to leave her medical career, because she was supposed to be at home. (Daphne)

The women interviewed acknowledged the lack of women in STEM, but there seemed to be different feelings about why that is. Whether it was physical, mental, or emotional differences between men and women, there were different views as to where women fit into STEM (if they fit in at all). The ideas about mental differences between men and women relate to the next category, where perceived biological differences between the binary sexes are explored.

The Status Quo: Cultural Stereotypes about Biology

The most generalizable stereotype about men and women is that women are emotional and men are logical. The following quotes are related to the concept of internalized cultural stereotypes about men and women in society that drive ways of thinking. These were important because women spoke candidly about where they saw themselves fitting into society, careers, and family. Several interviewees asserted that men are biologically more inclined to do well in STEM. This idea discussed in the literature has been scientifically debunked (Dweck 2007; Holland and Eisenhart 1990) but remains strong in our cultural "knowledge." This quote by Sophia sums it up well:

> I guess I would say men fit [engineering], just because you know that logical side, and that personality tends to be more men.

Lynn broke down the STEM fields into ones she felt fit women better and ones that fit men better:

> Biology is a softer science, I guess. It's more, there's more feelings and things in it than physics, where it's very concrete, very like, "These are the laws, and this is how it works, and it never changes." And I think guys are better at that kind of thing, and girls are better at the more natural, biological things…I think that guys are more accepting of things

being inflexible, things that don't change and will never change. Because I think that's maybe more how they are than girls. Just stereotypically, men and women's natures are different, and I think God made them that way on purpose. And there's just something about guys that makes them understand those kinds of things better.

Note how she explains that the differences between men and women exist because "God made them that way on purpose", indicating that there is a reason for the differences and that she will accept God's will because there is a purpose to it. She then went on to expand on why she thinks that gendered differences exist in STEM:

Everybody wants to help you because you're a girl. But I think that there is a reason that it's mainly guys though. I think that a lot of the things you're expected to do and learn and understand are easier for guys to understand. Like, I know that there's a lot of surveys about the sciences, chemistry and biology are a lot easier for girls and physics is a lot easier for guys, which is a big part of engineering.

This quote indicates that Lynn believes that there are scientific studies that show that women are genetically inclined towards chemistry and biology, while men would be genetically inclined towards physics. Recall that she believes that God has a purpose for these differences between men and women. These quotes suggest that some religious women may believe that the inherent difference between men and women was purposefully designed by God, and that they should then follow the feminine path and study biology or chemistry over physics and engineering. Whether or not this alleged belief affects actual female retention rates in physics or engineering is unclear; more research would be illuminative.

The Status Quo: Communal Values

The literature review mentioned that women are driven by communal values when choosing a major (Brown, et al. 2015). STEM fields are largely imagined to be lacking in communal values, a factor that has been shown to be a reason why women leak out of STEM (Blickenstaff 2005). The following quotes support that part of the literature review, indicating that these women emphasized the social or "people" aspect of their choice of major.

Comments such as the following from Kassandra acknowledge that there is a gendered reason as to why women are more apt to look at communal values in their career choice:

> I feel that men are a little bit more money-oriented, while us women are a little more, "How can I help you? How can I be of service to you?" Just a little bit, but you get some on both sides.

She expands about her opinions that women are interested in communal values:

> Mostly it's all just about helping others. Because life, I've never believed life is all about me, and like, what can I get out of it, you know? But more of, what can I do for you?... if you just focus on yourself and what you can gain from things, you don't get very far.

An interest in communal values was part of the decision by Tina to switch out of her STEM major:

> There are a lot of women in the [non-STEM major]. I think in general it's just that they want to help people … I realized instead of working with numbers or with kind of the science part of it, I wanted to work with people.

Note that neither Kassandra nor Tina seem to believe that people who work in STEM are interesting in helping others. Tina mentioned specifically that if someone was to work "with numbers" or "science", they would not be working with people. These notions probably come from stereotypical depictions in the media about what it is like to be a mathematician or scientist. Kassandra's and Tina's ideas may not be unique to religious women (as opposed to women in general), but what may be unique is the emphasis that Kassandra put on service to others. In Christian teachings, the role of charity is emphasized (see 1 Corinthians chapter 13). Because charity implies nurturing, this may be seen as more of a feminine role than a masculine role. It is unclear as to how much stereotypes about the sterile environment of STEM is affecting religious women's goals to be charitable to others.

Not all women, however, felt that STEM fields lacked the opportunities to interact with and help other people. Some felt that STEM was the right place to accomplish those goals:

I love that sometimes I just come out of class with that Christ-like feeling, "I can help so many people." (Angela)

I really want a career that I can make a difference in people's lives and make a difference in society. (Sophia)

Although not the general feeling of the interviewees as a whole, there was some mention as well of not wanting to work with others:

…especially in information systems, because the trend is that we don't like working in teams because one, we either think we can do it ourselves, or two, we don't want people looking at our code, because that's cheating. And we don't want them to go like, "Oh, I'll just copy what you're doing." (Tiffany)

Women are socialized to be amiable, which makes them more inclined to state the importance of working with people and helping people as part of their life path. The literature review suggested that those communal values were a reason that women leaked out of STEM, and this sample reflected that.

The Status Quo: Manifestations of Doubt

The literature review showed that women are more inclined to act on self-doubts than men are (Schiebinger 1999). One specific thing that came up for two of the interviewees in this sample was their lack of confidence related to an application process (some STEM fields require an application package to be accepted into the program). It is interesting to note that a couple of women talked about being nervous about the STEM application process. As a reflection of how women are socialized in general, the apprehension women expressed directly pertains to entering STEM. This culturally-based fear may affect self-efficacy. An open enrollment process, however, allows them to choose their field without that fear:

There's not very many of us so they kind of take everyone who comes, which I highly appreciate. An application process probably would have scared me off, if I had to be honest. (Nancy)

> I just hadn't done much experimentation in high school with actual majors, just hobbies. And I looked into a couple…But the biggest obstacle of those was that you had an application…I got to college and realized that I was a terrible student, and an application was just not going to work. (Kassi)

Nancy actually expanded her views on an application process even farther, noting that she had a professor who had a negative experience with a male peer who felt that he deserved her spot on the basis of sex. This reflected Rosser's (2004) discussion about backlash from peers due to a perceived benefit from affirmative action:

> I kind of feel is the beauty of having it as an open major because if it was competition then they would be more assertive about things like that. My professor actually had that problem. She got into a grad school and this guy who applied for the same place, it was either her or him, she got in because she was a girl. He was like, "You took away my livelihood. I can't provide for my family now because you decided to go to grad school". I was like, that is awful. That's just mean. It didn't happen to me, but it happens, which is sad.

Notice that Nancy herself believed that her professor was chosen for the position in graduate school due to affirmative action.

Another way that women acted on self-doubt was when they felt that their STEM classes were too hard. Consider Zelda:

> The biology was too difficult for me. I felt very overwhelmed and there was a lot of upperclassmen and I didn't feel prepared and I guess I felt I just don't understand and I can't do this. I feel like, it took a little while to get into the study habits of university and my first semester I didn't have those, so it was really overwhelming. And my pre-dental class, they had a lot of lectures from dentists which I liked, but I felt like a lot of it was a lot of "you won't get into dental school and you need to start studying now" and I thought, well I'm not cut out for this.

In that quote, she talked about feeling overwhelmed in her STEM major and she expressed many doubts about her ability to perform. She also noted that she did not have good study habits at the time. The notion that she got from the visiting dentists that talked about the difficulties being accepted into dental school was related to the quotes above about the anxiety over application processes.

The Status Quo: Support from Peers

Following the discussion about whether women belong in STEM, it was notable that

many of the women interviewed talked about the support that they got from their peers (both

male and female), and how incredibly important that was to them, especially during times of

self-doubt. A shown in the previous section, women are more prone to acting on self-doubt than

men are. Thus, it is acceptable for women to question their life choices and perhaps fall out of

their rigorous STEM major to fill the anticipated role of wife and mother. The peer support

structure seemed to be a key for women who continued to feel that they belonged in their major,

despite any setbacks:

> I was really stressed out about it and I ended up calling one of my friends who's a
> computer science major and we just spent like five hours on a Saturday walking through
> everything and he kind of retaught me everything. So that's how I made it through. Like
> you know, got external help. (Meagan)

> Because since she knew Java already, whenever I had a problem that I absolutely could
> not solve by myself, and I would be on the verge of tears, she's like, "it's okay, here I'll
> talk you through it and we'll figure it out." So, she didn't give me the answers, but she
> gave me a lot of emotional support in the times when I just, I had no idea what to do.
> (Tiffany)

Meagan felt that she got extra help from her peers because she is female, but seemed suspicious

about the motivation behind said help:

> Sometimes I get the feeling that guys are more willing to help girls. I don't know if that's
> a dating ploy. I don't know if they think we're incapable. I just would have to ask them
> about that. But I think it's easier for girls to be friendly to guys than guys to be friendly to
> guys, if they don't already know each other.

A couple of women mentioned a surprising amount of support from their peers, considering their

religious context:

> One of the guys overheard me talking one time saying, "Oh, I'm thinking about getting
> my MHA," which is Master's in Health Administration, and he thought I was saying
> Masters in Humanities or something, and he came over and was like, "What are you
> doing? You're in information systems! Stay in information systems, get a good job!" It

was kind of funny cause it was the reverse of what you'd think. In that situation at least. He wasn't saying, "Don't go get a job, stay home." He was saying, "What are you thinking? Get a job, stay in the field." (Meagan)

Yes, because they all think I abandoned them. There's so few of us. They're just like, "You're leaving? Why?" And I just tell them I'm having a kid. I'm like, this isn't going to happen in grad school. And they are like yeah, they know. They are really understanding. (Nancy)

On the opposite side of the spectrum, women also mentioned their peers making their experience harder for them or making them feel unwelcome in their major. The following experience shared by Meagan illustrates how she felt she had to defend herself to her peer group online:

So we had a Facebook group for our whole section so we could all just post on it and stuff, and one of the guys posted something on there that was really offensive to me, because it was about women and it was kind of degrading about women… some of the other guys had already clicked "like" on it, and it was like a joke, and I was just really mad and it took me a while to forgive him for that.

Another example is indicated in the following discussion by the same student, who felt she was expected to play a certain gendered role because she was the only female in her study group:

We were working on an assignment, and I had my computer open, and they were like, "Okay, let's get started." And they were looking around, "Alright, let's get started." And I'm like, "Oh, do you guys want me to type it up?" And they were like, "Yeah, we do." And then I was like, "Okay." And then we were working on a second assignment after that and they were like, "Alright, let's start." And they all kind of look at me and I'm like, "Oh, you want me to type this up too." And I was like, "Okay guys, I'm not the secretary…"

In the following quotes, Hailey described her experiences in STEM classes in which, despite the contributions she wanted to make, she was not taken seriously by her peers because she is female:

Like in the past, the people I've done homework with, either they, or people sitting around them who had questions, they wouldn't really take my help. And it's just like, I don't know if it's they think that I'm stupid, or if they like have to prove something cause you know they're a guy. And I don't know what it is but a lot of times they will just completely ignore you if you try to help them with the problem. Or they'll just be like, "You know what, I'll just ask the TA." And I've seen this with other girls too, so it's like, not just me. And I don't know what kind of complex this is in a guy, but, they just, it's

hard for them to accept help from someone, like a girl, that they're just doing homework with. So that's kind of sad.

Hailey goes on to explain why she felt that the men in her major were less likely to take help from her. She uses the traditional male role as the provider as the reason:

I guess guys just kind of assume that they're supposed to be, I don't know, like more athletic, more like, mathematical. Like they're just supposed to be the money-makers eventually. You know, and so it's just hard when they hear from someone who's not like that. It's hard for them to get help from that. They just feel like they have to do it by themselves or they have to ask another guy. I don't really know why it matters, actually. I'll take help from anyone, really.

In this last example, Nancy expressed her belief that she was ostracized from her peers and disliked because of her sex:

I guess the big disadvantage is that most of the guys who don't do as well as you and like secretly hate you, but they still work with you. You just know they don't like you.

Beyond the impact of professors and other mentors, the support of peers (or lack thereof) is an important factor in how welcome women feel in their majors. It was interesting to note the religious context of some of the quotes in that regard.

The Status Quo: STEM is Lucrative

The literature review showed that all current top-earning jobs in this country relate to STEM fields. It was notable that many interviewees thought about the earning potential of a STEM major as it related to their interests in having a family. This interviewee stated that the ability to support a family financially was a priority for her in choosing a major:

I just didn't want to be like that home-ec graduate. One that's like, "Well alright, I know how to do all these things around the house, which is great, but I can't really do much as far as supporting a family at all." (Tiffany)

Some women chose a STEM major because they felt that they could earn some money working part time, specifically to help support their full-time working husband in earning potential. Here is Penelope:

I see myself getting married within the next 5 years, maybe. I'm thinking that I would get three years of experience working full time at an accounting firm and then at that point I would probably start having kids and maybe stop working or go to part time, depending on what the situation was. I don't plan to work full time for the rest of my life.

Other women spoke about being able to have a backup career to financially support themselves

and their children, should "something happen" to their husband as the primary breadwinner:

A lot of the girls want to be moms. But they're like in the same boat as me. I want to be able to have a good career because I mean, I have had friends where their father died and their mother had to pick up a career like that, and they were able to because of their college education. And that's what I want to have. (Angela)

But [my husband] didn't want me to work after we got married and had kids. I was just like, you know what, if something happens I need to be able to work. So, we were just like what could I possibly do so that I could be at home with the kids and work? (Nancy)

I'm not married yet, but I'm hoping that I'll at least be able to have a career that I'll be able to use to support a family in the event of an emergency. Because it's always good to be prepared. (Meagan)

Some women mentioned mentors in their lives that wanted them to major in a STEM field

because of the earning potential:

At first, especially my dad, was just kind of frustrated with me and wondering why, when my goals had been so great, why they were changing to something that is not as marketable, maybe, and won't make me as much money. (Samantha)

Like I said with the engineering that was kind of like my dad. He's like, "You really have to do that". He really wanted us to all, all of us girls, go into really technical things. He's like, "That's where the jobs are. That's where you're going to make money." (Genoa)

Daphne noted that there were different earning potentials for men and women in STEM, pointing

out some specific reasons that were also supported in the literature review:

I think they are some general gendered things within each major, like if you're going into biology or something, typically if you're going to medical school you're going to be an OBGYN or a pediatrician whereas the men are more likely to be surgeons or just other types of doctors, neuroscience or neuro-brain surgery I don't know. But, and those are typically the lower paid, the female ones, are usually the lower paid more relaxed jobs, supposedly.

Women who dropped out of a STEM field acknowledged that leaving a STEM major would lead to less earning potential:

> The disadvantage [of dropping out of STEM] though is that you definitely take a big pay cut. My top salary [in non-STEM field] would be somebody else's [in STEM] starting salary. (Nancy)

> [My dad] just kind of told me, like, "Successful to who?" And it was kind of like the world's "successful" is money, and your "successful" might be in the home. (Valerie)

Some women truly did not consider the potential of earning money when choosing a major:

> I just didn't consider money as much because of being a girl… if I had been a boy, I might have chosen something different. (Angela)

The reasons as to why this is, and to show what was more important to those women, will be explored next.

The Status Quo: Family Oriented Goals

Some spoke about the roles of men and women in society, and how that was an important factor in their goals. Because these notions are so strongly related to the accepted role of women in society, it supports the themes discussed thus far. These interviewees discuss what they felt were important differences concerning why women (vs. men) are studying STEM: women study what they love to study, and men study to be able to get a good job and provide for a family someday. To make this point a bit more nuanced, Mickelson (2015) has shown that women's goals in gaining an education may be more linked to their perceived increased value on the marriage market rather than the job market; that is to say, women may tend to believe that men who earn more money due to their own education and training level will look for a partner that has been educated as well. This was explored in the literature review as well, when women's goals in gaining an education may be more linked to their increased value on the marriage market rather than the job market.

The opinions expressed in the following quotes reflect the traditional familial model where it is the man's place to have a career and the woman's place to nurture and care for children in the home.

> I think men feel that need to be a provider and so they want to have a career that's stable and needed and that can provide for their family in the future. (Sherri)

> That's one of the responsibilities of men, right? To provide for their families. (Penelope)

> I think that men might be more driven with the financial reasons, maybe, like the thought of being a provider. (Terri)

In the previous section, many women spoke about how a STEM major could help them balance their goals of having a family while also meeting financial needs. Lynn did not mention the financial benefit of studying STEM, but instead saw more nuanced benefits in how she could apply the knowledge gained from her studies to a future family life:

> Really, in the end I want to be a mother. I want to be a stay at home mom. And that doesn't directly relate to engineering specifically, but I think getting a good education in anything is going to help me be a better mom and be able to teach my kids.

The same student elaborated on how her mother encouraged her to see education beyond just a way to make money, but also as a way to become a better person, as it were:

> [My mom] always taught me that I needed a good education even if I was just a mom forever. I needed a good education so I could teach them and I could contribute to society, things like that.

It is clear that a future traditional family life is an important driver for some women while they made decisions about their schooling plans.

The Status Quo: Time for Family

To expand upon the ideas represented in the quotes in the previous section, it is helpful to specifically consider the time that it takes to study STEM. This goes back to the literature

review, and how the study schedule and the career schedule is harder on women because it is

based upon men working away from home (Ridgeway 2011; Rosser and Taylor 2008).

> Time management. Oh my gosh. That's ridiculous, it's so bad. Just trying to take things one step at a time and not get overwhelmed and keep up with all your classes and rearrange all your studying so you actually sleep and you eat at normal times. It's ridiculous, it's crazy. (Sophia)

The following example illustrates in detail how the time it took to study STEM was a motivating

factor in Nancy's switch away from STEM:

> I kind of made a deal because I was just like, "If I get pregnant then I will switch majors," because I didn't want to switch. Even though I thought it would be a better fit I just didn't want to. I was really stubborn…I had been considering it for about a year before I switched, so kind of that whole time, on and off, thinking about it… I knew I should. I just didn't want to… My family was kind of rooting for the change the whole time but didn't tell me until after I made the decision… Apparently, they had also been praying for the switch. When I did, they were like, "Hurray!"…With astronomy I had kind of just retreated to the [physics building] in the 5th floor and nobody saw me… They saw that it was sucking my soul away so they wanted me to come back.

In that quote, Nancy talked extensively about how much she loved physics, but that her family's

views trumped her interests in physics because she also talked about how close she is to her

family. In the end, her family obligations were more important to her.

> Beyond the time that it takes to study STEM, Daphne also mentioned that she was afraid

that a career in STEM would not work well with her goals of having a family due to the time

away from home that it would cost:

> I actually talked to my uncle, who's a cancer doctor. And he was giving me a lot of tips, and like job ideas and like, "this is what you should do if you wanna go to medical school." … but he's like, "just so you know though; it's really hard to have family. Not trying to discourage you, just keep that it mind."

She also mentioned that there were some female Christian doctors that came to her class and told

her about some of the difficulties with combining career goals and family goals:

> Like, when my uncle told me "women make the best doctors, but they can't really have families." Like, they won't really be there for their kids, or they won't have as many. You

know, the dad has to take a lot of roles. And also there were a lot of female doctors that came to that preview of medicine class, and they told us about the challenges of being a female doctor and I wasn't sure if I could take that. You know? … They were like talking about how their kids would cry for them, and they just couldn't be there for them because they had to go run off and help somebody in an emergency.

Clearly, having any career at all would take time outside of the home, but for Daphne it was the primary reason that she dropped from her STEM field.

The Status Quo: Non-STEM is a Better Choice

Valerie felt that dropping STEM would allow her to be a better mother than majoring in STEM, and that this was a main motivator in her decision to drop. She specifically stated that her new major helped her to become a better person in general, which indicates that she felt that her STEM major did not help her to become a better person in general:

> I love my [non-STEM] major. Because the classes that have to do with that major really focus on how you impact other people, and they talk about like the research behind different theories, and different parenting styles and stuff like that, but it's—I mean, it helps me be a better person overall. In one of my classes they said, "The better the person, the better the parent." And so it helps me become better, just all around, and so it'll help me be a better parent.

She admits in her interview that she did not consider her new major to be "successful", but she rationalizes that she would be operating primarily in the home anyways.

> I kind of had always felt like pressured to be in a more, I guess successful major, but after talking to her it was – I kind of got the feeling that my education is best used in the home. And that's kind of what I always wanted was to be a mom, and I'm interested in families, but it's kind of like I finally decided that I was going to go after what I wanted…that I wanted to study families and apply that knowledge.

Valerie also stated that her mother was particularly impactful on her decision to drop, particularly in sharing that she had regrets about not spending all of her time in the home as a mom. Valerie did not seem to want to make the same mistake:

> Something [my mom] said was really interesting to me, because she said that this wasn't the path that she chose. If she had gone the way that she wanted to, she would have strictly been a mom, and that was, I don't know, really impacting to me. Because she, I

don't know, I guess saw the value of her education, and so I had to decide. The value of my education was up to me. And so I just changed my major [away from STEM] and then told people about it after.

The following women spoke with specificity in comparing how the non-STEM field that they switched to was a better choice for their family-oriented goals than the STEM field that they started out in was:

> Because like with chemical engineering you can't really do much from home and stuff, which is what I wanted to do you know, be a mom and stuff. But you can't really do much with chemical engineering from home, you kind of have to be out in the field. But with business, you can use those skills at church, with your family, it's just easier to use those skills. So that was one of the major factors [in dropping out of engineering]. (Kassandra)

> In accounting you have a lot flexibility in your career. You can work part time, you can work full time, you can work basically in any part of the country or the world or you want to if you have good enough education and good enough experience. So that has an impact on [my decision to drop STEM] because I eventually would like to be a mother and have a family and be able to spend time with my children and all of that. Whereas, I don't know that I would have been able to had I been a clinical lab scientist or gone on into medicine because I feel like that would have given me less flexibility. (Penelope)

> So human development has been really good because it has taught me a lot that I think will be really helpful for all aspects of my life—my career, being a mom, being a parent, and a wife—whereas exercise science was just really learning science and being good at that. (Samantha)

In the following quote, Tina discussed her considerations of the time demands for study STEM. She concludes this the effort it would take to be in a STEM major was not worth her time; she could not see the point, when she ultimately wanted to be a full-time mother:

> I think for me it was the fact that it was such a long-term time commitment because when I kind of decided I didn't want to necessarily go to medical school, a large part of that was I ultimately want to have a family and hopefully be a stay at home mom. The idea of spending that many years getting a degree and then not getting to use it kind of steered me away from that. So, I decided to try and do something that I could get sooner so that I could hopefully have time to use it for a while before having a family.

Overall, there were many reasons that women in this sample felt that switching out of STEM would benefit them for their life goals in ways that a STEM major could not provide.

Against the Grain

This begins the second major theme, where women discussed their plans to go into STEM fields despite their perception that it was an unusual decision. In this group, religious women acknowledged their religious teachings and respected them, but still decided to go "against the grain" and act in opposition to many of those teachings. The concern of this section is not whether the students interviewed had true "faith" in their religion; that is to say, it is not important whether the students interviewed are actually convinced by Christianity. What is important is that due to their choice of religious campus, they probably have been raised in a religious environment which includes an alleged socialization in which they may be encouraged to act in accordance with their religious upbringing. However, not all women acted in the prescribed religious roles. This section will explore four ways that women acted against the grain.

Against the Grain: STEM Fields Need Women's Perspectives

In the first section, many of the interviewees shared ideas about the differences between men and women and why men are more suited towards STEM than women are. Some women believe the above-mentioned stereotypes about men and women, but also believe that those differences are a strength in the field. The following interviewees said that the fact that women see things differently helps to solve problems that men cannot solve because they do not think like women do:

> I guess that conception that girls aren't good at math, girls aren't maybe as logical and so they don't think the same way or something. But I think being a female in it is a great opportunity just because we don't think the same and so having that new perspective. Like guys will just, all of them think at least similarly, and girls, we think more creatively. Whereas they might just go at a problem just straight head on, and just keep hitting the same wall over and over, girls are the ones that are like, "If you go around the wall, or you go over the wall, under the wall." It just adds a variety that you don't really have. (Sophia)

[It] might be more for men, just because that's what history has always done in the past. But I think now women have so much more to contribute, because I think we see more as women, that we have a bigger perspective than men sometimes do. So, I think women have a lot to contribute. We just have to be able to open our doors to them. You know, to women, and accept the skills that they do have and can contribute. (Kassandra)

And it's really great to have, like, because women bring different perspective than men do to things, just in general. Everyone brings their own perspective, but also the genders bring different things to the table. (Meagan)

I'm kind of sexist and I think that it's easier for women to think bigger and to multitask than men, and so to grasp the concepts I think is easier [to be a woman]. (Lily)

One woman thought that women take their careers more seriously than men, because they have

to work against societal norms in order to be there:

Girls are always the ones that want to help people. Girls that go into engineering and science like that, they are usually pretty talented and what they really want to do is help people. For guys it's usually, "I want to, maybe, be successful, or maybe provide for my family." So in a sense I almost feel like the girls take the career more seriously because if you're going to go on to something where you are not the majority, you can't just follow everyone else. You have to really want it. (Sophia)

These quotes were completely different than the interviewees who indicated where women fit

best in STEM (if they fit in at all). In this section, we see that some women acknowledge their

religious teachings that God made men and women differently, but that those differences bring

strength to the STEM fields. These perspectives seem to go "against the grain" because they

acknowledge that women have a place in society, but assert that the traditionally male-dominated

place (STEM) needs more women in it.

Against the Grain: Naysayers

Some women acknowledged that there are naysayers when it comes to the idea of women

in STEM, but they did not care and chose to study STEM anyways. Many spoke about wanting

to prove people wrong. A couple of women used the word "stubborn" when describing

themselves to indicate a personality characteristic that was beneficial in such situations:

There aren't women, generally, in physics; not very many. I'm a stubborn person. Lots of people told me, actually, like, "you're a girl, you can't do physics." That bothered me so I wanted to prove them wrong. So, I'm like I get to do what I love and I get to show these people up. So, I'm like yes, I'm a girl. I can do physics. …They didn't think I was smart enough. My friends just thought it was weird and I'm a girl so I should go do something pretty, I guess. My parents just wanted me to have a life, I guess. Once you are a physics major you don't have a life. It's like that is your life. I think they were also scared that I would never get married. (Nancy)

I guess I'm a little bit stubborn, I like proving that I can do something when the odds are against me, so that's why. (Lynn)

It was important to a couple of women to show people that females can do STEM because they felt that there were people who would write them off on the basis of sex:

Sometimes it's actually beneficial to be a girl, because professors or other students will be more welcoming to you because you're different. And then you get some people who are like, "I don't think you can really do this." And you kind of have to prove it to them. (Sophia)

And I also wanted a challenge, because information systems is one [major] that if you went to any of the classes, there aren't many girls in it. So, I wanted to prove myself, I guess, in a way…I've been peer-pressured, I guess, to not be the stereotype of a [Christian] girl. Just like, "Oh, I'm going to go to [school] and be like a family life major." … But I just didn't want to seem like I wasn't capable. (Tiffany)

Sometimes, other people on the religious campus did not understand why a woman would spend the time and money on school that STEM requires. Samantha explores this impression:

Like I said before, people would just wonder why I would want to devote so much time to school when I am a female. I mean, pharmacy, for example, it's a good part time job if you want to be a mom. So, people would be impressed with that and that I would want to go through that much difficult schooling. But they would also kind of wonder why.

She shares how her peers would demean her desire to study STEM due to her potential to carry a child:

I think sometimes other students would be like "You're a girl. Why would you pursue school that's gonna put you in thousands of dollars of debt and you're gonna be a mom?"

Ellen also shared that her peers did not understand her desire to study STEM:

People think that's weird that I want to go to school for like six years, and I'm a girl…I think a lot of people, especially here [on this campus], just assume that you want to get married and have babies right away. And I'm like, "Well, I kind of want to go to school for a few more years and work a couple years before I do that." So that's kind of just a typical reaction from people.

These women talked about grappling with their STEM major because they felt like there was pressure from other people who would say that they were not following their family values as taught by their religious upbringing:

Especially because if you aren't doing both a career and a family someone thinks you're doing something wrong. Then if you are doing both it's like why aren't you taking care of your kid? So, it's hard. It would be so much easier if you got to be a guy all the time. You don't have to give birth to kids. You don't have to stay home with them. (Genoa)

Just because when you're a girl in engineering, you really want it, and you're really a career minded kind of individual. Just guys will tease you, especially because I'm dating someone, they're like, "oh, so are you going to get married or whatever? Have kids, stay home." Because it almost comes to a point where you have to choose between your career and kids, at least for a couple years. (Sophia)

There were several ways that women felt that others were not approving of their choices to study STEM because of their gender. These quotes showed some of the ways that women fought those notions.

Against the Grain: A Desire for a Career

A few of the women interviewed were more concerned with potential earnings in a career field than they are about being wives and mothers. This goes "against the grain" of their traditional feminine upbringing.

I always wanted to be able to work, to provide my part, at least, for a family. I never wanted to be a stay at home mom, and even if I was a stay at home mom, I wanted to work. (Tiffany)

Many interviewees acknowledged that by them going into career-oriented fields, they would have to find a way to balance their lives when they had a family later in life.

I mean it's hard. At [this school] we have the whole, like, you know, women doing the whole work-life balance, getting married, having kids, that sort of thing. But I don't know, with my major I'm planning on using what I've learned, going into a technology field, so I'd say it like, it's really influenced my future plans. I mean I'm in an internship right now for it. I did an internship last summer in the same field. So yeah, I'd say in the future I'm planning on working and just seeing what happens. You know, if I get married and stuff, which I hope I do… Like I still feel like I want to incorporate my major into my life decisions. I'd still like to keep up, especially with a major like technology, you kind of have to keep up with it after you graduate. So, I'm open to flexible options, so I just need to make sure I find someone else who is open to being flexible. (Meagan)

Like I've thought about, like maybe I'll do my master's while I have kids at home, so then I can go out into the work field as a new graduate. And then I've thought working part time, because it really is a problem that you have to figure out for yourself. Because my mom went into food science engineering and she had to give up her job to raise us. And so now she's having a problem of trying to get back into the industry. So, it's like, it's not something that you can actually ignore. (Sophia)

In some cases, women believed that STEM fields had the potential to allow them work from home (in this sample it was specific to computer science majors). This seemed to be a good compromise for the traditional gender role of motherhood being combined with the desire for a career:

Well, I am hoping that I'll be able to get a career where I can stay at home if necessary and take care of a family while at the same time working… I spent most of my childhood in a daycare, and so I never really had a strong relationship with my mom…So I'm hoping to fix that with a major that I can do from home and at the same time raise a family. (Tiffany)

So, when I was looking at computer science, I'm like well that's definitely something I could probably do online and at home. So that definitely is part of the thoughts of the future. (Starla)

It certainly was not the majority of the respondents that prioritized the desire for a career over having a family, but a few from this sample mentioned those desires. It is important to note that Davis and Greenstein (2009) showed that women who have children and who also educated and/or work increase the likelihood that their children (particularly their sons) may place a higher importance on gender equality than the children of women who do not work or are not educated.

This suggests that women who place a priority on their career while also being mothers may be raising children that place a higher value on gender equality, which is involved in generational transitions on gender roles and values.

Against the Grain: Talents

This section somewhat builds upon the previous section on the perceived biological abilities that people may have in STEM, but this section has a specific religious connotation to it. Some women see their skill in STEM as a "talent"; note the connection with the Parable of the Talents in Christian teachings, where the Lord gives people talents and expects them to magnify their callings (see Matthew 25:14-30). Note that the notion of a "talent" is not based on a specific believe about the biological differences between men and women, as the previous section was, but a religious belief about a blessing bestowed upon an individual by God. This Christian teaching was sometimes rated with equal or more importance than the potential role as a mother, which has already been explored above.

> My purpose in life is to develop all my talents that I've been given, to become a mother and to perfect myself, so become more Christ-like. I think that, like, according to, I think it's [religious leader], I think it was in a priesthood session. He was talking and he said, "You're going to have a priesthood interview with your Savior Jesus Christ and one of the questions he's going to ask you is how have you used the talents you've been given? And how have you developed them?" And I want to pass that test, so I—let's see, I wanted to pick something that would challenge me, so that I could be at the very top of my talent range, and something that would make me, give me a broader view of the world so I can better teach my children. Which I think civil engineering will. And also, like I think I'll have a greater capacity to serve with this. (Angela)

> I guess having a talent in it makes it so you're like, you know, I actually understand this, this is really interesting to me. And especially because it's something that not everybody can do maybe? And just having something that's unique, that really defines, really what you want to do, really helped me to decide that. (Sophia)

> I wanted to enjoy it for one, and I also wanted to know that I could do it, that I was somewhat good at it already. And that's what I found with programming, much more than with chemistry or biology or anything like that. (Tiffany)

Sometimes, talents can be connected so much to mentorship. Often times it is a professor or other mentor that tells the student that she has a talent in something, which stays with the student:

> My [course name] professor actually, that I really got along well with and he encouraged me. He's like, "You've got a really great talent for this. Even if you don't get into the program just continue working on the side." (Genoa)

> Probably most important was my [course name] teacher. Cause I never would have though of engineering in the first place if she hadn't said, "you really should do this." And I really just have a lot of respect for her, cause I've always loved math and she was a great teacher, so she was probably the most important factor. (Hailey)

The perceived lack of talents is sometimes a reason why a woman does not remain in the field:

> So, I came to school, and I started doing my science classes and realized that I was terrible at them. (Tiffany)

> I just felt like the department was just really frustrating because a lot of people in my classes had been programming since they were in diapers basically. They just kind of expected you to already know how to program and all of that. It's just really frustrating because I wasn't as ahead as some of the other people, so I really felt like I was behind. (Genoa)

> I remember doing really poorly on one test and on one occasion calling my mom and being like college is so hard, I can't do this, it's too hard. I don't want to do biology. I don't want to be in these sorts of classes for forever. (Elizabeth)

Do these examples indicate a lack of talent, per se? For some people it may, especially for women, who are already socialized to have self-doubt.

Another relevant study in the literature review showed that people tend to believe that talents in STEM are inherited abilities and also that people tend to believe that men have a greater chance of having those natural abilities than women do. The study showed that for children in eighth grade math, when that myth is debunked girls do just as well as boys do in math. In light of that study, the above quotes about the perceived talents in STEM follow the

norm; however, a few women in this sample asserted a different view: wanting to learn and the desire to succeed are more important than having an inherited ability to perform in STEM.

> They admire the girls that can do physics because they think it's really hard. It's interesting. I don't get it. It's not hard. Everybody can learn physics. It's learnable. The thing is just not many people want to. (Nancy)

> I think that if you like it then you will succeed in it, and if you have the desire to succeed you will. (Terri)

> Just everyone is like, "oh, you're smart." I'm like, "no." They just see it as, I don't know, cause technology is like, I guess you have to have to right mindset for it, and if you've never learned anything, it is really intimidating. And so people that don't know anything about it just see it as something like, "oh my gosh." But it really isn't, once you start learning about it. So, it's just like, the ideas that people have in their heads, I guess. (Josie)

A study discussed earlier indicated that women internalize grades differently than men (Goldin 2015). So, for example, if a woman gets a B in a class, it may indicate to her that she did not try hard enough or that she simply is not good at that subject and should quit. Feeling that one has a talent in a field may allow her the mental and emotional reassurance and self-confidence to persevere on a bad day. In contrast, for others having a bad day at school may stroke internal fears that a woman is not cut out for STEM.

God Versus Gut

In addition to the Status Quo and Against the Grain themes, a third major theme relates to the role of religion in women's decisions. Some of the women interviewed relied heavily on their religion when making decisions about their major, and some women did not. Remembering that the setting of these students is a religious campus, it was surprising that not all of the women relied on their religious upbringing when making decisions about their futures. Consider the following two categories, where we explore the times that women relied on God as a mentor and when they did not.

God Versus Gut: Relying on Religion

Many women spoke explicitly about how their religious teachings, specifically from

religious texts, played a role in switching out of STEM:

> Well, I mean I prayed about it. I felt like the rec therapy, what they were teaching, went along really, really well with some of the teachings of the church and I really enjoyed that. (Genoa)

> I think another thing is just how much of an emphasis [our] church does put on family. I have seen how my mom being home when I was growing up made a huge difference. I want to be able to be home, so I think that played a role. (Tina)

Parents can be influential guides in applying religious teachings to one's life, as shown in quotes

from women who counseled with their parents:

> One thing my dad said too is that I had to decide what Heavenly Father would want for me, and so in [a religious text] and everything like that my main role is to be a mother. And so I figured if Heavenly Father is okay with it, I probably am too. (Valerie)

> Yeah, that was definitely something I talked about with my mom a lot. She's always saying - because you know in the church we're always talking about you want to be a mom and you need to have a family, so she's always talking about what's something you can do at home? (Samantha)

These women spoke about advice that they got from a religious leader in a blessing format:

> From my… blessing there were just a couple of things that I just really didn't feel like it was the right fit and that I was building the strengths that needed to be built upon and developing certain talents that I had been ignoring, maybe, or not pursuing. So from that, and praying about it, and just talking to my parents, it just felt like I needed to do something else and then I realized that I wanted to pursue social work instead. It was kind of a huge flop. (Samantha)

> Interviewer: And did you have any spiritual experiences that played a role in your decision to change?
> Terri: In my …blessing there's a very specific line talking about my education. I reviewed that multiple times over the course of school, especially when trying to pick a major. When getting into health education I thought about it a lot. I prayed about it a lot. It felt right, it sounded right when going over that with my …blessing in mind.

God Versus Gut: Lacking the Mention of God

In contrast to the views expressed in interviews quoted in the previous section, another pattern also emerged: many women did not mention their religion in significant life choices, such as choice of major. Again, remembering the upbringing of these women, it was unexpected to find how many of them did not mention their religion in their decision-making process. These women spoke about acting on their "gut feelings" to form a decision and omitted the mention the influence of a deity:

> I did talk to other people, but a lot of people just told me to do what I thought was right, so I did. (Penelope)

> And then I enrolled in engineering, and I still like it, so I've just kind of—there was never like a moment where I really decided on it, it just kind of happened. (Lynn)

These interviewees explicitly stated that they did not seek the advice of God:

> It just kind of felt right. I mean I didn't ever really pray about it or go soul searching or anything, but it just clicked. (Hailey)

> Interviewer: What role did your personal or religious beliefs play, if any, in your decision to change your major?
> Penelope: I'm not sure if they did because I think both clinical lab science and accounting are respectable honest careers where people can make a good living and help people. I think it's pretty neutral between the two on that.
> Interviewer: Did you seek any spiritual confirmation about that decision?
> Penelope: I can't remember. I don't think I did. I think I just felt good about it at the time and felt like it was the right switch for me.

This interviewee spoke specifically about her mother praying for her and attending the temple for her, but not her own spiritual path to enlightenment when it came to her future:

> My mom was significantly involved. I think she prayed a lot for me. Like I said, initially they were super unhappy with it and thought I was making a dumb decision. But then one day my mom called me and said she had gone to the temple and felt really good about it and that I should do what I wanted to do. (Samantha)

These women talked about praying after their decision was made, but not how God influenced their decision:

So I thought about it a lot and I took some more business classes to make sure I liked them and then I just had to make the decision and then after I made the decision, you know, you pray about it and it just felt better than the chemical engineer, and so that's how I switched. (Kassandra)

So, I prayed about it after I made my decisions, didn't really feel any huge push one way or the other so I just went with what I wanted. (Penelope)

Tina indicated that although religion was a source of support in her decisions, it did not specifically guide her decision. She mentions that God supports her decisions, not the other way around:

I think [my religion] played a huge role but I think it was more on a personal level. I changed my major at the end of my junior year and so I think it just kind of required faith to trust that's what I felt I should do, and if that's what I wanted to do then it would all work out.

The lack of mention of God in some women's decisions about the future is quite interesting, especially considering the religious context of these students. This point will be further developed in the Conclusion section of this paper.

Discussion of Findings

The literature review set the stage for the first part of the findings, under The Status Quo, by working through the ways that women are socialized in terms of gender ideology, and how the institutions in which they work reflect those ideals. The examination included cultural stereotypes and gender framing (Ridgeway 2011), the place of women in science (Rosser and Taylor 2008), how relationships with peers affected performance (Schiebinger 1999), how women earn money in STEM (Valian 2006), and tensions between familial goals and career goals (Brown, et al. 2015). The interview data presented in those sections indicated support for the literature and showed that this sample fits, in many ways, how one would expect a sample of women in the United States would fit into the scholarship on STEM. As each of those themes

was addressed, this data presented also showed some nuances of the established themes in this field that were made possible by the examination of religious women in STEM.

Next, the impact of religious values in the US were discussed in the literature review and it was suggested that the context of religious women has not yet been considered when examining the retention of women in STEM. The section Against the Grain showed women in this sample pushing back against those impactful social forces. These women talk about balancing the desire to follow their religious upbringing while also having genuine desire to pursue STEM. This section presents two curiosities. First, it suggests the subtle evolution of religious culture in the US in that some women are shifting away from traditional roles. Second, it also suggests the push to change the STEM fields to accommodate the inclusion of minorities as women become more demanding of their place in STEM. It should be noted, however, that transitional factors addressing attitudes about gender ideology over multiple generations has many nuances; see Davis and Greenstein (2009).

The examination of views of women who believed their decision process to study STEM was against their religious teachings revealed several central themes. One is represented by the opinion that STEM fields needed a woman's perspective, and that was what kept certain women in STEM. Another theme brought up repeatedly was that there were people who tried to project conservative ideas and stereotypes about women's roles onto female STEM students, and those students refused to conform on the basis that they wanted to prove those people wrong. Some women acknowledged their religious beliefs, but still maintained that they wanted a career, and talked about the struggle to balance those two desires (see Rosser 2004). Finally, in relation to the sub-theme Talents, interviewees in this unique group rated pursuing their talents in STEM as just as important as their roles as religious women. The dual interests of these women showed

that they were balancing multiple layers of their religious ideas while choosing a life path. It is especially interesting to note how women rate their potential careers in STEM just as highly as they rate their religious goals and future roles, and how they planned on balancing the two.

Third, an unexpected theme not suggested by the literature review was the dichotomy between relying on God to make a decision (be that through prayer, attending a temple, fasting, meditation, or other religious means to obtain an answer from God) and then relying on her gut to make a decision (talking about what "felt right" when choosing a major). This seems to be an incredibly important aspect of making decisions in STEM in this sample. Although the literature suggested practical reasons for women not wanting to remain in STEM, the turning point of someone dropping out often has a more emotional dimension – a feeling. For some women, that feeling comes from a religious source, and for others it does not. More exploration needs to be done to understand how religious women in STEM rely on their religion to make those types of decisions. People will often rely on those patterns that have been taught to them from a young age, so it makes sense when women mention their religious teachings when deciding what to do. A unique or unexpected element entered the analysis when women with similar religious upbringings failed to mention their religious upbringing in relation to their decisions.

Overall, themes identified in this case study supported key concepts and empirical findings discussed in the literature review. At the same time, the second and third sections of this paper showed some of the differences and nuanced findings of this study.   An additional purpose of this study is to develop a framework for future research on other groups of religious women who study STEM. The following section suggests how the themes identified in this study may be relevant.

CONCLUSIONS

The purpose of this exploratory study was to identify how religious women in STEM

make decisions about their majors and their futures and to give some possible explanations for

these decisions. This analysis provided detailed explanation in this regard, and successfully

addressed the research question: What is important to young women who study STEM on a

religious campus? This study provided some intimate insights into the thought processes of

religious women and showed that there are many nuances to women's decisions and how they

picture their futures. The most important aspect of an exploratory study is to assemble the

foundation for future studies, and this study provided the groundwork for future studies on other

groups of traditional-minded women.

Future Studies

Because this was an exploratory study, a central purpose was to use the themes identified

to form some hypotheses and an analytical framework that could be used to examine and clarify

the decision-making experiences of other religious women who study STEM. The following

sections suggest ideas for future studies that appeared in the process of analyzing the interview

data.

Future Studies: God versus Gut

A preliminary analysis was conducted of some of the interviews of non-STEM female

majors from this data set, and some of those women seemed to talk about their choice of major in

more religious terms than the STEM women did. An analysis of data from the same time period,

the General Social Survey, suggested that women in STEM may be more liberal than women

who are not in STEM. Although that aspect of analysis was outside the scope of this project,

future study designs could include a comparison of religious women in STEM with religious

women in non-STEM fields and investigate how women in these groups view their futures and choice of major with regard to their religious teachings.

For example, consider the lack of evidence in the material coded "religious answers" versus the "non-religious answers." Most of the interviewees did not reference their religion when speaking about their decisions about their major: Consider the following:

> Starla: I talked to my parents a lot about it…They were always really supportive of it, of everything that I ever thought of. They were just kind of like, "Well, you got to try it to know." That's pretty much how they've always been for everything I've tried so far.
> Interviewer: Was there anyone else you spoke to besides your parents?
> Starla: Roommates. Not really too much else.

It is interesting to note the lack of reliance on religion, considering the very religious campus.

Consider another example:

> Interviewer: Was there any other experience that influenced the switch?
> Lily: Well, my mission in general. I went to St. Louis and for seven and a half months I was in really poor areas of the projects. We saw a lot of things that I was like, "I don't need to go teach white kids how to take cool pictures."

She doesn't speak explicitly about God giving her a direct answer. According to her interview, her decision was more related to the cultural experiences she had, which led her to think to herself that she wanted to go in a different direction.

This next quote from Terri was a good example of the thought process when making decisions about her major. Notice, again, the lack of mention of her religious feelings:

> So, I bounced around a lot, playing around with different things, and took a lot of really random classes. I declared other majors; I know I declared exercise science at one point so I've always stayed in the sciences. And then I took a class from [a professor]. I took substance abuse and prevention and I absolutely loved it. I fell in love with it. I decided I wanted to be an addictions counselor. So, I met with some advisors on how to become an addictions counselor. They said major in psychology, but there's really not a whole lot to do with psychology unless you continue moving. We talked about health education, how I could have a career afterwards if I needed to in teaching. So, kind of was like a nice stepping stone, a good mediator, I guess.

It would be useful to be able to make a detailed analysis of religious women in STEM majors compared to religious women in non-STEM majors. Such a consideration may illuminate some of the specific nuances surrounding the notion of God as a mentor for religious women and how that impacts their decisions in STEM. Furthermore, should researchers be able to measure the level of religiosity in the respondents, they may or may not find a correlation with the level of impact that God has when giving perceived advice to religious women studying STEM.

Future Studies: Stereotypes about Biology

Quotes above suggested that perhaps religious women could be affected by the ideas of gender differences. Specifically, the idea that men are more biologically gifted than women are for certain STEM fields was suggested by one of the respondents in this study. She spoke about perceived biological differences in brain structure between men and women that make one sex more successful in STEM than the other. This misconception may be related to Christian teachings that tend to emphasize the different roles of men and women in society. This finding could a reason why, for example, there are more women in biology than in engineering. It raises the question of how much these religious notions of perceived biological differences are affecting which STEM fields women choose to study.

Future Studies: Manifestations of Doubt

The data showed that women's sense of self-doubt may manifest itself in certain specific areas, such as in an application process to a STEM field. More research could be done to explore that and other specific ways that doubt comes to play in how women make decision in STEM. Particularly, what do those doubts look like for religious women? We know that women are more likely than men to act on self-doubts, but what specifically does that look like? For example, this paper showcased aspects of the beliefs on Talents; could socialized self-doubt be

connected to religious women's inferences on their talents? There are several possibilities that could be explored in this arena.

Future Studies: How Educated are Women in STEM about Women in STEM?

In the Findings section, religious women's beliefs about biological differences between men and women were explored, showing that many women in this sample believed that men are more suited for STEM. This leads to the question: How educated are women in STEM about women in STEM? There seems to be a surprising gap in knowledge about the factual characteristics of their own group. Recall that one woman even believed that there was scientific support for the notion that men are better suited for physics than women are. Many women in this survey suggested that the reason that more women are not in STEM is because men are better at STEM than women are.

Consider Nancy, who anticipated future hiring prospects for men and women indicating that men are hired more in STEM positions post-graduation because of their innate ability to understand STEM. Although this showed a long-range thought process in her field of study, it is noteworthy that she does not acknowledge (or know about) the actual reason that women are not as present in STEM (as reviewed in the literature):

> When they hire physics teachers, administrations, they like the way men are just because of their presence and their attitude. And men are better at physics, just because they think—they have that one-track brain and they can focus on it really well. As you know, girls are a little bit more scattered.

More research should be done to understand exactly why religious women believe they are a minority in their fields.

Future Studies: Mentorship

I expected "mentorship" to play a larger role in my analysis (Dua 2008). I expected religious women to have sought advice from more of their leaders or their parents. However,

many of the women who mentioned the role of their parents talked about their parents supporting

whatever it was that they wanted to do.

> It was mostly just me. Like, I talked to my parents about it, but they really left the decision up to me. They said, "we'll support you whatever you do," but they weren't going to help me, like, decide for me. (Kassandra)

Some women spoke about their parents (usually their father) pushing them in a certain direction.

Students seemed to speak the most confidently about their choice spoke with guidance or career

counselors or had experience with internships or clubs. The following excerpt from Sophia's

interview show some of the thought process that involved mentors:

> I did a couple internships because I thought maybe I would want to go into bioengineering, and so I worked with some geneticists, and I was like, yeah, it's too much politics, it's too much, I guess, it's not as straightforward as I would like it to be. And so then I did an internship with an environmental engineer, and they were collecting waste and rehabilitating it to make it into new things. And actually that's really what I want to go into.

Sophia tried many internships to discern which field of engineering was right for her. She was

mentored by other engineers, in that case. Nancy also bonded with professors:

> I actually talk to [my professor] a lot because I was just like, "I don't know what I'm going to do anymore about this or something" and she's just like, "Ok, this is what I did. This is what can happen. These are all your different options". She was really valuable.

Hailey went to an academic adviser, who helped her decide to switch majors by helping her to

understand he logistics of the switch, and if it was a viable option:

> And he told us that if we switched this is what we would be doing and like you could still graduate in this amount of time and it was just like, really reassuring to have someone kind of like help you through and then make the decision to switch.

Although there were some good examples of students reviewing advice from mentors, more

questions need to be asked about the people who really made a difference in how women made

choices. The interviews were not as explicit as expected about the people that one talks to; the

range of people that were consulted did not automatically come out in the interviews about how

women made a decision. This makes sense, because usually people need to be prompted by the interviewer. In future studies, more probing questions should be asked about the roles of mentors in women's lives.

Future Studies: How Does Marriage Affect Retention in STEM?

The literature notes that men may behave in more traditional ways when entering into marriage than when they were single and that women are likely to become less egalitarian upon getting married (Davis and Greenstein 2009). Several sub-sections in the findings above note that many women in this sample had goals to become married and to have children. Although it was beyond the scope of this sample, an idea for future research that could prove quite fruitful is looking into how marriage affects retention in STEM for religious women. Many of the women in this sample talked about how they wanted to balance both career and family, but will those goals remain constant even after they are married and bear children? How interested do religious women remain in having careers after they are married? Does their gender ideology change after entering into the institution of marriage? Does it further change after they bear children? Is that affected by whether or not they are actively raising their children to be quite religious? There are many unknowns on this topic, and future research in this regard would prove quite illuminative.

Contributions to the Literature

The current literature is lacking in explanation of religious women's retention rates in STEM majors. This study assembled some theoretical analytical findings that present themselves for a framework for future studies on other groups of religious or otherwise traditional women. This may include such groups as Native women, Muslim women, Jewish women, or more Christian women. This study shows many of the nuances about women's retention rate in STEM majors that were not present in the literature review before, as well as suggests some reasons that

are not very present in the existing literature. The section on Future Studies presents some of my

ideas concerning the ways the literature could be added to in the future. Overall, this study

assembled some important factors concerning the retention rates of religious women who study

STEM.

Final Thoughts

As women continue to be a part of the STEM fields, they are slowly changing the culture

of STEM to be more inclusive of women. The more open that women are to each other about

their career goals enables them to redefine paths in STEM to include more of the nuances that

are uniquely important to women, especially as they pertain to religious goals. The literature

needs to be expanded to include the motivating factors of religious women specifically, and this

project identified many of those. Should some of these themes be utilized in future social

research, we can greatly expand the literature on Women in STEM. Hopefully, the views of the

women in this sample that depict how different religious women make decisions in their young

lives will increase understanding about how women view their roles in STEM fields.

Additionally, since Davis and Greenstein (2009) show that increased personal exposure to

gender equality in multiple capacities (e.g., in school as well as in the workplace) lead to the

development of gender equality ideals, the findings in the present study suggest that religious

women may want to change the culture of STEM and how their presence may contribute to

doing just that.

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TABLES

Table 1. Sample Characteristics

Variable	% Sample	M	Min	Max	SD
Age:		21.2	19	26	1.77
GPA:					
Mostly A's (3.75 - 4.0)	46%				
Mostly A's and B's (3.25 - 3.74)	38%				
Mostly B's (2.75 - 3.24)	4%				
Mostly B's and C's (2.25 - 2.74)	12%				
Annual Parental Income:					
More than $100,000	42%				
$90,000 - $99,999	13%				
$80,000 - $89,999					
$70,000 - $79,999	8%				
$60,000 - $69,999					
$50,000 - $59,999	4%				
$40,000 - $49,999	4%				
$30,000 - $39,999					
$20,000 - $29,999	4%				
Unknown	25%				
Race:					
White	79%				
Asian	13%				
Hispanic	8%				

Table 2. Summary of Findings

Major Themes	Minor Themes
The Status Quo	Do Women Belong in STEM?
	Cultural Stereotypes about Biology
	Communal Values
	Manifestations of Doubt
	Support from Peers
	STEM is Lucrative
	Family Oriented Goals
	Non-STEM is a Better Choice
	Time for Family
Against the Grain	STEM Fields Need Women's Perspectives
	Naysayers
	A Desire for a Career
	Talents
God Versus Gut	Relying on Religion
	Lacking the Mention of God

APPENDICES

Appendix A. Interview Guide

Thank you for taking some time to speak with us today. We appreciate that you took the survey last year and then were willing to catch up with us after so long. We have become particularly interested in understanding the experience of women who were in a Science, Technology, Engineering, or Math (STEM) major at one point in time and then decided to major in something outside of STEM.

Hopefully in our discussion today we can understand a little bit more about your personal experience behind how you went through the process of moving between majors and what influenced your choices. We hope that these interviews will help us better understand why females at [this university] major in different fields.

Interview Questions:

1. Let's start at the beginning! When you first came to [this university], did you already intend to major in [original STEM major]?
    a. If not, what was your intended major and why?
    b. If so, why did you want to major in that major?
    c. Did you have preconceived career plans?
    d. To what extent was your major just an interest as opposed to career-oriented?

2. Was it difficult to make the choice to major in [original STEM major]?
    a. What made it easy or difficult?
    b. Do you feel your gender played into the decision to major in [original STEM major]?
    c. Was it difficult (competitive) to get in?

3. Tell me about your experience in [original STEM major].
    a. How long were you in [original STEM major]?
    b. What percentage of students in the major were female?
    c. Did you ever feel that your experience in [original STEM major] was different because you were female? How so?
    d. Did you ever feel that males and females were treated differently? By students or faculty?
    e. How did career expectations differ for men and women in the [original STEM major]?
    f. Did you ever get negative feelings from men in your major for "taking a spot?"
        i. What about people outside your [original STEM major]? (e.g., parents, friends, leaders) Did you ever feel like you had to justify being in a STEM field?
            1. What influence, if any, did your parents have on your decision to major in STEM? (either away from or towards STEM)

g. Was there competition between men and women in the major?
h. Do you think that men and women differ in their natural abilities?
i. How would you describe dating experiences in this major? How did they differ from dating experiences outside of your major?
j. Did you talk with other students to overcome difficult challenges in the major?

4. [Optional]You're here because you ultimately switched to a non-STEM major. The big question: why?
    a. What were the most important factors that motivated the switch?
    b. What role did your personal or religious beliefs play, if any, in your decision around your major?
    c. How have spiritual experiences played a role in your decision?
    d. Did you seek spiritual confirmation about your decision?
    e. Who else was involved in the decision making processes?
        i. Did a relationship-change or significant other influence the decision?
    f. Did any particular experiences in your previous major influence you to leave?
    g. How did future career / family plans influence the switch?
        i. Did you ever worry about employment opportunities and how those might be different based off of being in [your new major]? What was most concerning?
        ii. How do you think your employment opportunities would have been different had you remained in [original STEM major]?
        iii. How did expected motherhood impact your decision?

5. Tell me about your experience in your [current major].
    a. How long have you been in your [current major]?
    b. What percentage of students in the major are female?
    c. Do you ever feel that your experience in [current major] is different because you are female? How so?
        i. What is the perception of females in this major?
    d. Did you ever feel that males and females are treated differently? By students or faculty?
    e. How do career expectations differ for men and women in [current major]?
    f. How do people outside your major typically respond when you tell them you're studying [current major]? (e.g., parents, friends, leaders). Did you ever feel like you had to justify being in this field?
    g. How are your dating experiences different in this major as compared to [original STEM major]?

6. What are the advantages and disadvantages, in your view, between [your original STEM major] and [your current major]?
    a. How have future career plans changed?
    b. Expected earnings?

Appendix B. List of Interviewees and Their Majors

Pseudonym	Original Major	Changed Major
Elizabeth	Public Health	N/A
Daphne	Dietetics	Sociology
Angela	Civil Engineering	N/A
Penelope	Medical Laboratory Science	Accounting
Samantha	Biochemistry	Family Life
Kandace	Computer Science	Civil Engineering
Lily	Biology Science Education	Sociology
Meagan	English	Information Systems
Tiffany	Biology	Information Systems
Lynn	Mechanical Engineering	N/A
Valerie	Exercise Science	Family Life
Tina	Exercise Science	Public Health
Kassi	Family History	Communication Disorders
Kassandra	Chemical Engineering	Business Management
Starla	Computer Science	N/A
Terri	Physiology & Developmental Biology	School Health Education
Ellen	Exercise Science	N/A
Nancy	Physics	Physics Teaching
Sophia	Mechanical Engineering	N/A
Sherri	Spanish	Exercise Science

Josie	Computer Science	N/A
Hailey	Mathematics Education	Manufacturing Engineering Technology
Genoa	Mechanical Engineering	Recreation Management
Zelda	Pre-Dental	Family Life