Work in Progress: Connecting Engineering & Religious Identities: A Window into One College Woman Student's Journey

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Feeling a sense of engineering identity is essential to becoming an engineer. However, for many women in engineering, developing and maintaining an engineering identity is challenging. In addition, engineering spaces are often spaces of religious intolerance or indifference, making the melding of identities and feeling able to bring one's whole self to the profession difficult. This paper will share findings and implications highlighting how college students can connect their engineering and religious identities. This qualitative, phenomenological study – part of a larger, National Science Foundation funded project – is focused on two broad questions:

(1) How does an undergraduate college student develop their engineering identity?
(2) How does the religious identity of an undergraduate college student influence the development of an engineering identity?

This study represents a deep dive into the lived experiences of one engineering woman's college student experience with this phenomenon. Over a three-interview series, this college student's journey demonstrates how her religious identity and experiences as a member of The Church of Jesus Christ of Latter-Day Saints has influenced her engineering identity.

Literature Review

Women & Engineering Identity

Engineering identity refers to the collective characteristics, values, beliefs, and behaviors that define engineers and their profession. Within the higher education context, engineering identity refers to how college students view themselves as engineers, and what they believe is needed to be an engineer. Constructs include performance/competence, interest in the subject, and recognition from others (Godwin, 2016). This theory is related to Eccles' expectancy-value theory, which has been used to analyze students' motivation to persist in rigorous engineering programs (Matusovich, 2013).

Similarly, religious identity refers to similar characteristics, values, and beliefs and directly affects behaviors of many individuals within the communities. For more than a generation, studies have shown religiously engaged individuals to be more civically engaged (Wuthnow, 1999; Lewis, Mcgregor & Putnum, 2013; Rockenbach, 2020). This characteristic may directly relate to women from religious communities finding more meaning in careers such as engineering as they relate to contributions to broader society.

Women are less prominent in engineering fields than men (Pawley 2019). While there has been growth and change in recent years, there are many women who have experienced harassment and remarks from male colleagues that degrade their worth as an engineer (Masta et al., 2022). Helping women to find and express their identity as an engineer can help them gain confidence to persist within their field. Consistent with Godwin's theory, women (and underrepresented individuals) need to perform, be interested and competent in the field, and be recognized as engineers to have a strong engineering identity. Within a male-dominated space, finding different avenues of identity to relate to engineering could help with this recognition.

In particular, the Church of Jesus Christ of Latter-day Saints (Church of Jesus Christ) has a long history of encouraging and supporting education, including in engineering fields. The church's emphasis on education has contributed to the success and representation of its members in STEM fields, and its efforts to increase STEM engagement and outreach are helping to cultivate a new generation of STEM leaders

and innovators. However, scholarly research is limited on how their beliefs influence their engineering identities.

The Church of Jesus Christ of Latter-day Saints

The Church of Jesus Christ of Latter-day Saints is a monotheistic, Christian denomination. It was organized in 1830 in the United States and as of 2021 has approximately 31,000 congregations worldwide (*Statistical Report, 2021*, n.d.). Some of their beliefs include that individuals are children of God, Jesus Christ has saved humankind, life has a purpose, scriptures (e.g. The Bible and the Book of Mormon) guide humankind, individuals should strive to become like Christ, and Christ's Church was established for individuals to become like Christ (*Our Beliefs | ComeUntoChrist*, n.d.). However, there is little research on how a religious identity can affect one's engineering identity. For the purposes of this paper, we define *religious identity* as, "a sense of affiliation with a religious group [that] incorporates the beliefs, values, and practices of that group" (Héliot et al., 2020). While there have been studies of perceptions of students that identify as Muslim, Evangelical, Jewish, and atheist (Bowman et al., 2017, Mayhew et al., 2017, 2018; Riggers-Piehl & Lehman, 2016; Rockenbach,), few focus on how people who belong to these groups make sense of their religious identities, particularly within engineering spaces.

In a study that directly looked at the views of students on members of the Church of Jesus Christ, they found that STEM students expressed more favorable views towards Latter-day Saints than business students (Rockenbach, Bowman, et al., 2017), suggesting some connection between career, religion, and identity. Another study shows that Latter-day Saint students more often seek answers to existential questions (e.g. Who am I? What is the meaning of life?), compared to other religious groups (Rockenbach, Bowman, et al., 2017). These existential questions are formative in one's personal identity and lead us to wonder how their sense of identity is linked to daily actions in a school or work environment. In the wider STEM scholarship, scholars have demonstrated the impact of religious identity on students' overall college experience, including the ability to see connections between religious identities and their STEM identities (e.g., Rodriguez et al., 2018).

Within engineering, foundational research in this space found that college students use religion as a lens to understand their other identity dimensions (Cross, 2016). Religion has also been used as a coping mechanism and a way to connect with others within engineering (Cross, 2016). Overall, the relationship between engineering identity and religious identity is complex and can vary depending on a wide range of factors (e.g. gender, race/ethnicity, individual beliefs, salience). Some individuals may see their work as a form of spiritual service, while others may be guided by religious beliefs when making ethical decisions in their work. We believe this study will give a glimpse into how a woman's religious identity can influence their engineering identity which could lead to greater understanding of the role of religion in engineering spaces and encourage more effective support structures.

Methodology

This study was part of a larger National Science Foundation (NSF) funded qualitative, phenomenological research study which examined the engineering identity development experiences of electrical, computer and software engineering students engaged in an S-STEM program at a predominantly white public institution in the Midwest. S-STEM is a federally funded program aimed at diversifying STEM fields by increasing the enrollment and persistence of low-income students. Using phenomenology allowed for meaning making and exploration of both religious and engineering experiences (Moustakas, 1994).

The present study focused on the experiences of Theresa, a traditionally aged, Asian American (Southeast Asian) computer engineering student who participated in three in-depth, semi-structured interviews about her engineering identity experiences. From all of the participants of the larger study, we chose to go in greater depth with Theresa because her engineering identity experiences were unique and provided a distinctly different perspective on how students might make sense of their engineering identities.

Each interview with Theresa lasted approximately one hour for a total of three hours. The first interview focused on understanding her development of an engineering identity while the subsequent interviews served as follow-ups to go deeper into how she made meaning of the various experiences that she had with her religious and engineering identities. Interviews were transcribed and coded using engineering identity theory (Goodwin, 2016) and related religious and engineering focused literature. The research team engaged in a series of peer-debriefing sessions to determine the salient essences of Theresa's experience as evidenced through her interviews.

Results

Engineering Interests

Throughout her interviews, Theresa related how the foundational Church of Jesus Christ teachings (e.g. continuous learning, community engagement) have positively shaped the kind of engineer that she has become. She is devoted to continuous learning of engineering concepts, similar to how she has been devoted to the teachings of her faith. She describes religious teachings of the Church of Jesus Christ as highlighting how individuals must use the gifts, like her competence in engineering, that they are given in order to better the world around them. Her religious identity enables her to stay true to her values as she navigates how to engage with both the engineering and larger communities around her.

Engineering Performance/Competence and Recognition

Theresa expressed concern about being perceived as using both engineering and her religion (i.e. a religion that has a complex history of persecution and white supremacy) to become the "white savior" of racially and ethnically marginalized communities but continues to serve those around her anyway. Although she identifies as Southeast Asian, she might be perceived as "white passing" (i.e. considered white in appearance) and struggles with how to navigate these complexities. During the course of her college career, she at times struggled to see herself as an engineer, but by being able to bring her full self to the engineering context (i.e. woman, religion) she feels as though engineering has become a salient part of her core identity and career trajectory.

Notedly, Theresa did not mention income or socio-economic status within the context of her interviews. Because she was an S-STEM participant and, therefore part of a program focused on low-income students, we thought that it might emerge within her interviews. However, we should note that she reported her family income as $100,000+ which, in the Midwest context would not traditionally mean that she was low-income, so this may not have been a salient part of her experience.

Conclusion

The paper has several implications for future research and practice, including ways that educational stakeholders can honor and leverage aspects of students' various identities to establish synergy between their engineering careers and religious beliefs. In this way, campuses can encourage students to bring their whole selves to the college environment as well as to their future engineer careers.

Implications for research:

- Utilization of feminist and critical frameworks, including intersectionality, to understand how religious and engineering identities interact, especially for women of color.
- More expansive research is needed about how religious identity and engineering are related, including a greater breadth of research on multiple religious backgrounds, in particular those which have been marginalized by mainstream cultures within the United States.
- Expanding the study to include more perspectives of engineering women students from the Church of Jesus Church, including those from both faith-based institutions and secular institutions, to more fully understand how institutional context might influence engineering identity.

- Further investigation of engineering fields including the medical field and impact of religious identity, especially with students from Muslim, Hindu, and Sikh identities
- Further investigation regarding the intersections of gender, religion, and socio-economic status when examining engineering identity and what it means to be served by programs intended to focus on low-income students.

Implications for practice:

- Understand the student engineering experience as a multi-faceted identity experience in which religion can have bearing on the kind of engineer one becomes and the decision-making involved with careers.
- Creating spaces and opportunities for engineering students to bring their full selves, including their religious identities, to engineering contexts.
- Understanding and leveraging the spiritual wealth that might accompany students from the Church of Jesus Christ (among other religions) in order to tailor support programming and inform faculty, staff, and administrators.
- Considerations of practices and policies regarding the intersections of gender, religion, and socio-economic status when examining engineering identity and what it means to be served by programs intended to focus on low-income students.

Moving forward with this work, we hope to delve more deeply into the narrative of Theresa in order to write a comprehensive article that outlines how she developed her engineering identity and how her religious identity influenced that development. It is our hope that this student's narrative might be instructive in thinking about the role that multiple identities, and particularly religion, plays in the lives of our engineering students.

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