Doctoral Student Research Briefs
School of Education
Drexel University

Comparing Engineering Labs for Organizational Analysis from Global Perspective

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Volume 2 Number 7 January 12, 2018

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Abstract

Underrepresentation of women in STEM exists in the world. In the United States, engineering has one of the largest gender imbalances in STEM and nearly 40% of female engineering degree holders leave the field or never enter the field after graduation from college. Several factors contributing to the phenomenon have been identified. However, the majority of them focus on women's individual preferences and skills. In this study, intersectional analysis of gendered organizational practices including gendered leadership in diverse engineering labs from global perspective is proposed.

Aim

The purpose of this research brief is to provide descriptions of factors contributing to gender imbalance in STEM from the literature, to discuss how each student's lab experience might be different depending on her/his backgrounds, leadership of the lab, and peers, and to propose a future research plan with an aim of deconstructing gendered organizational practices in engineering labs.

Background and Literature

Gender imbalance in STEM exists in the majority of the countries in the world. The average across regions, only less than 30% of women were employed in scientific research and development in the world in 2013 (Catalyst, 2016).

In the United States, female students became the majority at college in 1979, and nearly 60% of all college students have been female for the last decade. However, the gender gap has been persistent in STEM. In the 1990s, the metaphor of leaky pipeline between undergraduate and PhD STEM students seemed to be closed because an equal percentage of female and male STEM bachelor's degree holders have been pursuing and earning PhDs in STEM although the gap in actual number of STEM degree holders among male and female students is significant (Miller & Wai, 2015). Even if a female student in STEM made it to a PhD program, nearly 40% of women who earned engineering degrees left the engineering field or never entered the profession. The field of engineering has one of the largest gender gaps in all the STEM fields and less than 20% of bachelor's degrees were awarded to women in 2015.

This phenomenon also applies to the workforce. In the United States, women made up of less than 15% of all engineers in 2016. Some of the factors contributing to the phenomenon revealed in the literature are structural barriers in K-12 education, socio-cultural factors, psychological factors, environmental factors, and organizational factors (Pollack, 2015; Kanny, Sax, and Riggers-Piehl, 2014).

Some researchers argued that individuals' background characteristics such as gender, race, class, and parents' highest education are the dominant factors contributing to gender

imbalance in STEM (Kanny, Sax, and Riggers-Piehl, 2014). However, those characteristics are not inherently problematic. The issue is the stereotypes associated with those characteristics and patriarchal hegemonic culture of white race and class privilege in the American society through which problematic structures are reproduced.

Ely and Meyerson (2000) proposed a new approach to organizational analysis. They asserted that it is important to recognize organizational culture and issues around social practices that are designed by and designed for white heterosexual class-privileged men being the norm or the basis of the culture.

Thus, I propose a study with an organizational analysis in engineering labs at graduate level in order to deconstruct gendered organizational practice that might be contributing to gender imbalance in various engineering contexts.

Theoretical Framework

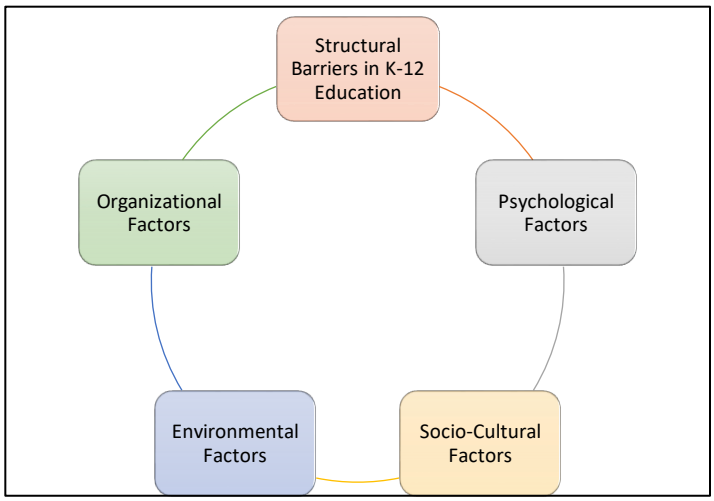

Figure 1: Theoretical framework

Research Questions

1. How do engineering-major graduate students negotiate and construct meanings about their identities from their personal background characteristics and organizational practice that is led by leadership style of their professors in their labs?
2. How does their experience in the culture of their labs influence their motivation for success in the lab work and desire for pursuing a career in engineering?

Hypothesized Factor Negotiation

People who have personal characteristics (gender, race, ethnicity, class, cultural values and norms) that deviate from the ones of her/his leaders and peers tend to experience disadvantage in engineering labs and less likely to succeed in the lab work and more likely to leave the engineering field or never become engineers.

Methods and Future Research Plans

This study is approached with ethnographic multiple case studies involving semi-structured interviews and observation in engineering labs. The participants will be engineering-majoring graduate students and professors. Maximal variation sampling in terms of gender, race, ethnicity, class, nationality, and study or research abroad experience will be conducted. The

focus of the study will be the students' lab experiences and leadership practices of the professors in four different types of labs— (1) female-led female-majority, (2) female-led male-majority, (3) male-led female-majority, and (4) male-led male-majority. The culture of gendered organizational practice in each lab through the lens of the theoretical framework will be recorded and analyzed. Additionally, each student's lab experience and her/his career aspiration will be analyzed from an intersectionality perspective.

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Author Biography

Leona Donaldson is a second-year PhD student. Her research interests focus on gender, intersectionality, STEM, global, and social justice. She earned two degrees—one in Japanese and another one in Education—from two universities in Japan and taught Japanese calligraphy in Japan. After she moved to the United States, she earned a master's degree in Education at Portland State University. She is a certified PreK-12 teacher and taught in high school prior to entering the PhD program at Drexel. Currently she teaches Japanese to adults at Japan America Society of Greater Philadelphia.