Engineering Students' Pre-Collegiate Experiences

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Introduction

Abstract

Research shows that woman, underrepresented minorities, first-generation students, and students from low-income backgrounds leave STEM fields at a higher rate compared to their counterparts (Chen, 2013). Research has shown that a lack of a high-quality high school education plays a key role in the number of underrepresented students in higher education and STEM (Demirci, 2020): "Learning environments in K-12 institutions have a vital role in cultivating STEM interest in students." A main determinant for students selecting a STEM major is an interest in STEM (BHEF, 2010) and their previous experiences in STEM. The purpose of this study was to examine how underrepresented students' pre-college experiences influenced their decisions to enroll in a STEM major. I interviewed four undergraduate engineering students. Analysis revealed prior experiences provided them with two types of capital: Aspirational/Navigational and Familial.

Aims of the Research

With an additional focus on underrepresented students, this research aims to understand the STEM experiences of students who identify with any of the following categories: woman, minorities, first-generation, and low-income background students.

STEM Experiences are defined as any student engagement in a regularly or temporarily scheduled STEM program, course, extracurricular, activity, and/or discussion.

The transferability of this study will lie within the characteristics of the participants' pre-collegiate STEM experiences. This will allow us insight into understanding a student's STEM identity development and the internal or external factors that influenced their decision to enroll in a STEM major.

Research Questions

How do students' prior K-12 STEM experiences influence their decisions to enroll in a STEM major?

Method

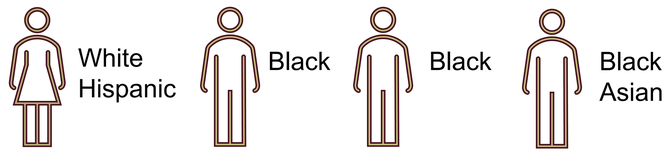
Research Design

I used a preliminary survey to select participants for interviews. I conducted a 1-1 Zoom interview with each participant that lasted between thirty minutes to an hour. Using Zoom's recording and transcription service, I was able to transfer the interview responses into a word document.

I used Yosso's Community Cultural Wealth Model as a framework to examine and identify the types of capital used by underrepresented students, the influence they had on their STEM identity development.

Participants

I interviewed four undergraduate engineering students enrolled at the FAMU-FSU College of Engineering (COE). Compared to FSU, the COE represents 6% of the total undergraduate enrollment (Florida, 2020).



Results

Themes:

Familial Capital

- "…they have always encouraged me to pursue STEM because that is just what I was interested in as a kid, building things."
- "…it's a disparity, but I work to show that even if you don't come from much, you can make it through and probably be better than they are"

Aspirational & Navigational Capital

- "…that [upper level high school math course] was not a requirement. I already had all my math requirements, but like I did that just to challenge myself."
- "…being at those I guess underfunded schools like they weren't really like a big focus on STEM so all the interest was really just me putting it out there."

Conclusion

In conclusion, each participant expressed familial, aspirational, or navigational capital when describing their STEM identity development and how they became interested in STEM. Participants' familial support was also shown as an important external factor, regardless of whether or not they were knowledgeable about the university culture. In addition, all participants suggested the following characteristics of their pre-collegiate STEM experiences were positive influences in their decisions to enroll in a STEM major: STEM projects/activities, discussions with STEM professionals, and courses that embodied an active learning environment.

Discussion

Parental involvement and support, culturally relevant teaching, interest in STEM areas, and early exposer to STEM careers are factors that contribute to the success of underrepresented students in STEM as found by the Association for the Study of Higher Education. Incorporating active learning environments can provide further support for the development of verbal communication skills, academic skills, and leadership skills. In addition, implementing high-impact learning practices that are designed to build self-confidence and mitigate gaps in academic preparation, such as learning communities, are ways institutions can support underrepresented students in STEM.

Key References

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PURPOSE
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