"It's not about making money, but it kind of is about making money": How Socio-economic Status Influences Science and Engineering Identity for Community College Students in an S-STEM Program

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“It's not about making money, but it kind of is about making money”: How Socio-economic Status Influences Science and Engineering Identity for Community College Students in an S-STEM Program

Abstract

This is a Work in Progress

It is important for community college science and engineering majors to see themselves as the type of person who become a scientist or engineer. Students who do not see themselves in these roles are at higher risk of switching majors or dropping out of college altogether. Despite the growing literature on identity development, little empirical work has focused on the science and engineering identity experiences of community college students. This study explored how community college students in an S-STEM program made meaning of their experiences and developed science and engineering identities, with a focus on how socio-economic status (SES) influenced this process. The current study focused on the following two research questions:

1. How do community college students in an S-STEM Program develop and maintain their science or engineering identities?

2. How does SES influence the development of science or engineering identities for community college students in an S-STEM Program?

Introduction

Validation, community, and creating a sense of identity is an important aspect when it comes to student success (Rodriguez et al., 2019). Validation, community, and creating a sense of identity is important, especially when looking at students who are pursuing a science, technology, engineering, math (STEM) degree at a community college. It is important for these students to see themselves become a scientist or engineer. Especially with the influences of faculty and the importance of validation for these students to do well in the community college setting [8]. Also, the community component and creating a sense of identity is important in a student’s retention within the STEM field [8].

When looking at students who graduated with a bachelor’s in science and/or engineering, 42% of them studied at a community college at some point within their higher education career [3]. When 42% of students came through a community college, it is important to focus on the strong success that students have within a community college setting. Pursuing a degree through the community college route prior to a four-year institution can be seen as a cost-effect way. This leads into the question of, what other factors of ones’ socioeconomic status can lead them to go into a community college setting first? Specifically, within this research, the S-STEM program contributes a significant component for student success, especially in the aspect of validation, community, and creating a sense of identity. The outcome of this information resulted in two questions for the research: Purpose Statement?

1. How do community college students in an S-STEM Program develop and maintain their science or engineering identities?

2. How does SES influence the development of science or engineering identities for community college students in an S-STEM Program?

Literature Review

Community colleges are important to look at, because it is seen as the largest and fastest growing segment of higher education, especially in the aspect of preparing students to enter a four-year institution [6]. It is important to focus on how community college are preparing students for a four-year institution, especially when understanding students who are developing their STEM identity at the community college level. When understanding identity development, it is situated in students' interactions within the curriculum, with their peers, and thus identity development can influence students' academic achievements (Rodriguez et al., 2004). This is why, when researchers do look at development, development is multifaceted, especially with STEM identity development and the intertwinement of how SES can make an impact on that development.

Prior research also shows that engineering and identifying as an engineering is crucial to having a sense of engineering community [5].

Conceptual Framework

Role Identity Theory is applied as the main framework for the study. This theory was utilized to help us understand how community college students felt a sense of identity along with looking at the impact of socioeconomic status. This is important because once the student is able to identify as an engineer, the community aspect plays a strong role in their success. When looking at role identity theory, the theory frames around utilizing social identity theory and symbolic interactionism [4]. Role identity theory focuses on understanding the way individuals ascribe to a context where they utilize their social and cultural roles and in which some identities are more salient than others [4].

In this study, community plays a large role within how students identify with their science or engineering identity. For example, the community college students' largest influencers are mentors on campus that help them seek out programs on campus, through joining these programs, they are able to develop their science or engineering identity. Making meaning and understanding how students develop their identity is how the role identity theory is established. Students define themselves in this role, which is being an engineer, and within the social structures, the students view internal actions and how interpersonal actions are established.

In addition to role identity theory, there are three major facts that influence identity development, they are recognition, interests, and performance/competence [4]. In recognition, students' perception of how others see them has a strong influence on how they see themselves. Mannon & Schreuders [1] also include that it is important to see how recognition from teachers, peers, faculty, and families can influence the students engineering identity development early on. In looking at a students' interests, and preferences for a subject also indicates how this has an impact on the way a student chooses to become an engineer. Lastly, performance/competence is how students understand the knowledge and skillsets of a disciple they are pursuing. It is important to understand and look at how performance/competence impacts a students' identity as an engineer, because through the implications, depending on how well a student persists, can have a large impact on their engineering identity.

Methods

This study was qualitative and phenomenological in nature and focused on understanding how community college identified students developed their science and engineering identity with a focus on how socio-economic status impacted the development. With the utilization of phenomenology, it allowed us to explore how students made meaning of their experiences and understood the principle of their identity development with a focus on their socio-economic status [2]. There was a total of nine community college students in the study. Student family yearly incomes ranged from Under $19,999 to $89,999 with at least half of the students selecting below $49,999 for their family yearly income. The racial makeup of the students were two African identified students, five white identified students, and four students that did not disclose their racial background. Students within this study were participants within an engineering-focused National Science Foundation (NSF) scholar program called the Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) program. Through S-STEM, the program focuses on providing financial assistance along with building a sense of community for the participants.

The primary methods for collecting data were: pre-interview questionnaires, reflective journals, and phenomenological semi-structured interviews for the students. The pre-interview questionnaire helped collect demographic and personal background information, such as their socio-economic status. The data that was collect provided a foundation of understanding the participants identities and how that impacts their science and engineering identity. Table 1 provides brief information about the students and their background. Seidman's [7] phenomenological in-depth semi-structure interviews was utilized. Student had either one or two, one-hour interviews conducted, and along with this, some students completed reflection journal entries every other month (bi-monthly). Within the interviews, the focus was understanding how the community college that they were at, where there was an S-STEM program established, was able to help them develop their science or engineering identity. In the reflection journal entries, the questions revolved around STEM recognition, interests, and performance/competence. Finally, the study triangulated findings from all forms of data (e.g. interviews, reflection journals to understand the students' STEM identity.

Findings

There were multiple themes that were formulated when looking at the findings from the study. Some of the themes that came from the study were influencers and socioeconomic factors. To look back again, the two major research questions were, how do community college students in an S-STEM Program develop and maintain their science or engineering identities and how does SES influence the development of science or engineering identities for community college students in an S-STEM Program?

Influencers

Influencers was a major theme that developed from the study. In the study, community college students within the S-STEM program had influences by staff and/or faculty members that recommended for the program. One of the major findings from the study was how a lot of the influences that the community college students had within the S-STEM program were from staff and/or faculty members that recommended them for the program. Students also talked about how staff/faculty members saw the potential in the student and advised them about the S-STEM program. Both of these findings demonstrated how much of an impact that staff/faculty have on the students. For example, Laurice said this about her experience at her community college:

> "Maybe in that type of, even though you don't know what you want to do in engineering type of thing, those ESCEL instructors and everybody around it can help you figure out what you really want to do. For me, I think being an ESCEL scholar is a great thing. You will have connection with people who will help you figure things out in your type of career field you want to do."

Laurice demonstrates how even though she does not have it all together in figuring out what she specifically wants to do in engineering, she is able to have guidance through the ESCEL program. Influencers also creates the community component for students, and is very vital for the student's success in identifying, developing, and maintaining their own STEM identity. This is strongly seen from our student Carly that said:

> "Just being part of an engineering program makes you feel a little bit more like an engineer, I think. Everything I do that is in this field but is not school related makes this more sense as a community… Being in ESCEL is a thing, because you're gonna meet people that are also going through the same things you are, that are getting help, that are in your field of study, and you have something to talk about. And that helps you make relationships. Like, oh how did you get there? Oh you're in ESCEL? So am I. Are you gonna go to the dinner on the whatever…? Oh awesome, we'll sit together, great. We have each other"

Socioeconomic Factors

Within regards to the second research question, more than half of our students identified having a family income below $49,999. Some of the students discussed how this scholarship helps a lot financially and that they can truly focus on their academics. Others have said how the scholarship was a driving force for their educational success. The students indicate that doing well will help them continue to earn the scholarship once they transfer to the four-year institution of the program. Caleb from the study definitely highlights all of the aspects within this factor and said the following:

> "It's definitely pushing me to keep going because I feel like I've been given this money, and it's kind of motivating to say hey they're supporting me I need to perform to I don't want to let the donors, wherever the money came from, sorry I can't say off the top of my head, but, that I don't want to fail classes. They're giving me this money, they're going out of their way to pay for it, I want to be the best student I can be, pretty much."

Limitations

There were several limitations within this study. Another limitation to the study is the lack of racial/ethnic diversity with the students, a large majority of our students self-identified as white. Another limit is generalizability, it would be important to specify on a group, for example, it would be interesting to look at specifically women in the research study. For future research, it would be important to see if other identities have a large influence on the students STEM identity development and how SES intertwines within race/ethnicity, especially when understanding cultural customs from different backgrounds.

Discussion & Implications

After going through the study, a strong question would be, can community colleges develop programming to support students who are pursuing science or engineering and helping them foster a STEM identity without the accessibility to a scholarship program such as the S-STEM program? It is important to continue to find ways to help community college students develop their science or engineering identity outside of a scholarship program. It is great that these students are tied to a scholarship program and have the opportunity to these resources, but it goes back to questioning about how can a student without a scholarship program develop their STEM identity.

Another important thing to understand is what other factors of SES influencers can impact the development of the students' STEM identity? What this entails is when looking at the SES lens, do other family members' SES impact students STEM identity development. When discussing about family members, it is more in relation to family members that may be in a STEM field. Also, when understanding literature related to SES and STEM identity, there is little work within that field, it would be important to continue to explore the connections of SES and STEM identity development within community college students in the future.

References

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Appendix

Pseudonym	Gender	Age	Family Year Income (Select One)
Ada	Woman	24	Under $19,999
John	Man	26	$20,000-$29,999
Queen	Woman	22	$80,000-$89,999
Bruce	Man	21	Not Reported
Rowan	Man	19	$30,000-$39,999
James	Man	18	$60,000-$69,999
Laurely	Woman	27	Under $19,999
Jacob	Man	20	$20,000-$29,999
Biff	Woman	19	$70,000-$79,999