Black is Gold: The Importance of Racial Identity to Black Undergraduate Students in Engineering

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Abstract

Black men and women continue to be underrepresented and underserved in Engineering. In current engineering literature, the focus for Black students is primarily about preparedness, sense of belonging and motivation. Few studies explore the importance of racial identity and its impact on students as they matriculate through engineering programs. Researchers tend to focus on the importance of identity organizations but not the importance of identity in engineering culture. The purpose of this study is to understand the importance of racial identity on Black students matriculating through engineering programs. This paper explores a subset of questions that were asked during a larger qualitative study to understand how important racial and ethnic identity is to Black students in engineering. During semi-structured interviews, students were asked to rank distinct aspects of their identity. We found that 100% of the participants ranked their racial or ethnic identity as number one or two as their top identifier. This paper explores the differences between how Black men and women rank their identities. Of the eleven students that were interviewed in the study only one student mentioned engineering as an important identity metric. Our results suggest that engineering must do more to improve the racial climate and understand racial identity. Once engineering communities understand the importance of racial and ethnic identity the more inclusive the spaces can be that will help ensure participation and increase representation of Black students.

Introduction

For decades, administrators, researchers and scholars have been reporting on the demographic disparities in representation amongst Black students in engineering [1]. Workforce development has been asking for more diversity and an increase in representation, but numbers have remained stagnant [2] – [3]. Culture in colleges of engineering have been described as chilly [4]. There are noted campus climate issues around race, class, and gender which cause hostile campus climates that lead to students of color changing their majors or leaving STEM fields altogether before graduating [5].

Race is often linked to educational outcomes. It is important to examine how systemic bias within systems and with teachers impact equity and the performance of Black students [6]. Researchers examine the differing types of racism: Everyday, institutional, structural and colorblind racism often intersect and impact educational spaces [7]-[10]. Blacks live and learn in cultural and social space that is racialized [11]-[13]. Racism continues to play an integral role in academic achievement. Because of the social status and subsequent treatment that comes with being Black, identity becomes a salient marker for comprehending school learning and participation of Black students [14].

The gap in knowledge, however, is how central the marginalized identities are for students of color, especially Black students, and the impact their identities have on their matriculation through engineering programs. It is important to understand and have a genuine appreciation of Blackness the uniqueness and the strengths cultures across the African diaspora can bring to the field.

Our study will focus on the importance of racial and ethnic identity on Black undergraduate engineering students. Students share the nuances of their identity and the impact on their

experience. The goal of this paper is to elevate voices that are traditionally and historically excluded from the engineering narrative, emphasize the need for engineering education to understand the experiences of Black students and what is needed to improve those experiences.

This study provides support for Black students who are often excluded from opportunities. Their stories present opportunities to educate engineering faculty about the historical challenges that marginalized groups have faced. It also represents an opportunity to assist faculty in helped create more equitable spaces.

Our research is guided by the questions, (1) What are Black student self-reported level of identification with racial and ethnic identity? (2) How has their identity impacted their engineering education experience?

Framework

Belonging to a social group is critical to everyone's sense of belonging. Belonging to a group contributes to the self-worth and importance of the individual. Kurt Lewin [15] asserted that an individual's health and mental stability was tied to their group belonging. Social identity theory, as defined by Lewin, highlights the importance of having a positive view of their personal identity. This includes their connection to racial, ethnic, cultural and gender-based groups.

A variety of external factors, including family and peer group influence, can impact how an individual identity is manifested in their daily lives. Phinney [16] focuses on the continuous cycle of ethnic identity search and ethnic identity achievement. Ethnic Identity Search is the process of questioning the views of ethnicity and trying to make sense of ethnicity. This happens when a significant event occurs in one's life, like an act of discrimination. Students begin to read and study more and engage in their culture in new ways. Ethnic Identity Achievement is when a person is secure in their identity. This represents the highest level in identity development. Experiences, particularly negative experiences can cause oscillation between Ethnic Identity Search and Ethnic Identity Achievement [16], [17].

Positionality Statement

We acknowledge that the experiences of Students of Color at predominantly white institutions are often unwelcoming, microaggressive, and oppressive. We also acknowledge that the voices of Black women in engineering are historically missing due to a lack of representation and innovation to ensure their voice is included. In our research model we strive to challenge the engineering cultural norms centered on white men by highlighting the experiences of the traditionally and historically excluded.

These stories showcase the patterns of Black women in engineering academic arenas. This was not merely as an intellectual exercise, but a very personal and emotional experience for the research team. Writing their stories gave the lead author an opportunity to reflect on her personal journey through engineering. The lead author is a Black woman with a bachelor's degree in biomedical engineering, master's degree in quantitative analysis and a doctoral degree in

biomedical engineering. There were times that she saw herself in these stories and it was an honor to provide insight to the life of Black students in engineering spaces.

Methodology

The current study utilizes semi-structured interviews. Approval for conducting this study was obtained through the university's Institutional Review Board.

Semi-Structured Interviews

This study is based on eleven semi-structured interviews with Black undergraduates in a college of engineering at a large, Midwestern public research university. Participants were recruited from an email list and National Society of Black Engineers (NSBE) student organization meetings. Participants were provided with an incentive in the form of a $20 gift card. Interviews were recorded using an online video conferencing program (Zoom) and transcribed using Ubiqus On Demand. Each interview transcript was anonymized to protect participant confidentiality.

Each interviewee was asked a set of 30 questions. Questions were divided into four sections: (1) general experience, (2) gender, (3) race, and (4) support. *Ad hoc* questions were asked for clarification and to elicit deeper understanding of participants' experiences. In addition, general wrap-up questions were asked to conclude the interview.

Participants

Participants are enrolled in a 5-year program at a large midwestern public institution. All participants self-identified as Black even with a variety of nationalities represented by the participants. For this study, the term Black includes both individuals who were born in the United States as individuals who were born in different countries. Non-US born Blacks represent a large number of engineering students and, as a result, were important to include. Although, they have different cultures and experiences they often share similar experiences that are often centered around their lack of positionality in the U.S. [14]. The binary use of gender in this study is based on how the students self-identified and described their identities. Included in this study is one 1st year, one 2nd year, three 3rd year, four 4th year and two 5th year students. The majors include biomedical engineering, chemical engineering, computer engineering, computer science, environmental engineering, mechanical engineering, mechanical engineering technology, and information technology.

Data Analysis

Researchers used a virtual, asynchronous qualitative coding process using a password-protected codebook via Google Jamboard to analyze the eleven interviews. Three members of the research team took part in the coding process for the interviews to establish interrater reliability [18]. To begin the *in vivo* coding process, members of the research team consolidated the data of a single interview with a descriptive pass, developing codes associated with direct quotes from participants. Each coder uploaded their initial set of codes to their associated Jamboard page. Codes were then consolidated across coders to develop an initial color-coded codebook.

Following the initial pass, descriptive, linguistic, and interpretive passes were conducted for each of the eleven interviews using the initial codebook [18], [19].

Findings

This study explores data collected from eleven Black undergraduate students studying engineering to understand their identity and how it impacts their experiences in engineering and professional practice placements within engineering employment. Their narratives showed that their racial and ethnic identities generally outweighed their engineering or STEM identities.

Racial Identity Matters: "I sometimes forget I'm an engineer [laughter]. I don't know why but it just didn't feel like something that defines me."

All students in the study indicated race as one of their top two identifiers, when asked how they would identify themselves in rank order. Only one student said engineer as a top identifier.

Men

1. Yeah, I would say I guess being male would definitely be important. Yeah, I feel like things are just a tad bit easier *[laughs]*. That sounds terrible to say but, yeah, I would say that probably be No. 1 and, I guess, like I would stick to my race. I've never really thought about changing races. I think it's a beautiful struggle really so, yeah, male and just Black.
2. I'm Nigerian, then Black, then male. Black, male -- engineer doesn't even come up to one of my ranks. I sometimes forget I'm an engineer *[laughter]*. I don't know why but it just didn't feel like something that defines me.
3. Black, and then an engineer.
4. It's just me moving through the world like a black man. Being a black man, I put my race, that's like top of what I bring to the table just because that's what I identify with the most.
5. Black definitely is number one for me. I think number two is male and recognizing the privileges that come with still being a male. I would say three would be I would say son.
6. I guess for me, first is my spiritual belief, which is in the scriptures, the bible. Second, my race – black, African. Third – man. And then, I don't know what would be next.

Five out of the six men in the study identified as male in their top identifiers. Two of the men acknowledged that being a man afforded them a privilege. The acknowledgment of their male privilege highlights the heightened awareness students hold of marginalization.

Women

1. So probably a woman first and then black, because you have to think, okay, well, if people go out, they're going to see that I am black first. But I think of myself as a woman first.
2. I'm Black before a woman
3. I would probably put more so my first-generation immigrant, and then my race, and then being a woman. But I'm aware those just all intersect with each other. But even then, with

being black and like first-generation immigrant, they all come – I could not imagine myself being anything else because it's integral to who I am

4. I would say I would rank myself first as a woman and then Black woman
5. I would say Black first, then woman. Then bisexual, that's, Black first, woman, then bisexual LGBTQ+.

All five women in the study have race as one of their top two identifiers. Four out of the five women identify as a woman. Only one student included their sexual orientation. This may be due to the marginalization of those identities.

As educators learn what students view as central to their identities rather than presuming to know: students want to be understood as whole person, not as an identity or a collection of identities. Jones and McEwen [20] underscored the "importance of seeing students as they see themselves". For all of the respondents, being Black was a central part of their identities and they strongly identified with others in their racial group. This is consistent with findings from McGee in 2009 [14] about racial identity, however, our findings show professional identity was not an important factor in students self-identification.

Inevitability of Race: "I think it's the very glaring thing for America, race is just something America can't seem to escape."

Students felt that American culture does not allow a break from thinking about their racial identity. One student reflected "I think it's important, in today's world, to understand how your race plays into certain stuff." Most students felt their racial or ethnic identity impacted the way they were perceived and navigated through their respective programs. Students understand that due to the United States culture they have a limited choice to ignore their racial identity. One student stated "I think it's made me more aware of how race and gender really play a part in being perceived. I didn't really understand that through high school – or I wouldn't say understand, but it wasn't something I thought about too much. Then coming to school and coming to classes with engineers and actually going into co-ops and seeing how the workplace is, it's just made me more aware of how people perceive me or how people perceive people like me, even though we're not the same."

Another student describes the necessary and persistent focus on race:

I'm aware of how my race plays a factor in society already. So, I think about it a lot, every time I walk into a room, every time I'm meeting my manager for the first time or speaking with them. I think about, "Can we relate on this ground? Can we not relate on my race? If I brought something up, would you understand why I see it this way?" But those are all questions I ask myself before I actually say something or before I do something.

A significant amount of mental capacity and energy is consumed with identity expression. The narratives shared from the students' perspective are that they must be mindful of their identity and how others perceive them to be successful in matriculating through engineering spaces. The students shared the common articulation that their educational pursuits were situated within the

larger contexts of Black political and educational struggle [21]. As a result of their experiences with race-based oppression, the concept of race played a major role in the lives of the participants.

Sense of Belonging: "I didn't really feel like I belonged mostly because of my race."

A sense of belonging has been described as an essential and critical aspect in retaining all students, especially students of color [22]. One student stated, "I didn't really feel like I belonged mostly because of my race." Another reflected on their experiences interacting with engineers and realized that they are in situations where there is a lot of implicit bias about who they are and what they are capable of. They stated, "I've definitely interacted with some engineers that are just like not used to seeing any people of color just when they were growing up. And I guess they're just ignorant and, yeah, sometimes their actions just kind of show their ignorance. And I feel like there's a lot of fear and assumptions instead of just like open-mindedness"

The experiences shared how a pattern in creating low sense of belonging and an unwelcoming environment. Another student stated:

> In my classes I believe for the summer, and part of this semester, previous semester as well is just certain things go on within the Black community and people that are of minority races and stuff and they just don't talk about it. So, it's just like does it affect you guys are you guys kind of like avoiding it? None of my professors really even stop to check on anybody who was of color and there's about three of us I think in my classes. So it's not that much work to just be like, hey, I hear about what's going on, just letting you know if you need anybody to talk to or something like that here's what you can do, that kind of thing would have been nice, but no one did that.

Given Black students' engagement in engineering education, it is imperative that engineering educators explore issues, such as sense of belonging and implicit bias as factors in broadening their participation in engineering careers. Engineering educators need to be knowledgeable about how much the unrelented focus on race impacts the student's ability to matriculate through their programs. Ignoring culture and current events is harmful to their mental health and well-being.

The students' narratives are in line with higher education's effort to address the lack of representation in educational institutions [23] – [24]. University offices have created programming designed to recruit racially and ethnically diverse students as well as students from various socioeconomic backgrounds. Despite representation efforts, however, little successful work has been done to address the problem isolation for these students [25].

Implications

This study explores data collected from eleven undergraduate Black students studying engineering to identify their perspectives of their racial/ethnic identity in their engineering education. Their narratives highlighted how students' racial/ethnic identity is central to who they are. Moreover, based on the different references underrepresented people deal with differences in ethnic culture values and socialization, stereotype isolation perceptions of racism and inadequate program support [26] and institutional barriers that damage the racial identities of Black in STEM [27]. This culture of disengagement [28] and decrease of self-confidence [29] are major factors in the persistence of underrepresented groups. Also, campus racial climate perceptions contribute to the overall sense of belonging among racially diverse women in STEM and Engineering majors [30].

Massey and Owens [31] found that students who internalized negative stereotypes from environmental influences tend to become disinvested in their learning experiences, thus resulting in a reduction of academic effort. Some scholars have found that students' experiences with stereotype threat are often associated with scientific dis-identification and an overall decrease in interest in scientific careers [32]. Studies have suggested that microaggression [33], stereotype threat [34], and a sense of belonging [22] have a substantial effect on the learning experience of Black students. Having strong and stable ethnic identities helps with students as they matriculate through their programs. Both students mental and physical health and well-being are improved when they have these strong identities [16]. Given how students rank their racial and ethnic identity, and the importance of strong racial identity for mental health, engineering educators should acknowledge the importance of honoring how students self-identify which will allow for students to have a better learning environment and experience in their engineering education.

There have been studies previously done on the importance of racial identity in higher education and other fields. The research has consistently indicated that students value their racial identity. However, this study has not been conducted in engineering fields. Furthermore, in engineering and other disciplines, while the research has indicated that the problem is understood, very little has been done to systemically create more inclusive spaces for racially and ethnically diverse students.

Limitations

The results presented here are from a single institution and within only engineering disciplines. The purpose of this study was not generalizability but to highlight the importance of racial identity of students in engineering. It will also be important for future studies to understand how international identity and immigrant status has an impact on racial identity.

Conclusion

This study explores data collected from eleven undergraduate Black students studying engineering to identify their perspectives of their racial/ethnic identity in their engineering education. Their narratives highlighted how students' racial/ethnic identity is central to who they are. This paper provides support for needed change in the engineering culture so Black students

can fully participate as their authentic selves. Therefore, institutions must learn to embrace all racial and ethnic identities.

Acknowledgements

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