



“I’m really in charge of my own future”: A Single Case IPA of the Engineering Identity Development of a Black Male Engineering Student

Jerrod A. Henderson^a, Le Shorn Benjamin^a, Rick P. Greer^a, Jared Davis^a
University of Houston^a

Corresponding Author Email: jahenderson5@uh.edu

ABSTRACT

CONTEXT

In spite of the recent focus on Broadening Participation in Engineering, the participation of Black men in engineering, at all levels, remains critically low. There is also a dearth of literature that details the nuanced experiences of Black men in engineering, especially at Historically Black Colleges and Universities (HBCUs) and Hispanic Serving Institutions (HSIs). Identity development may be an important lens for understanding how to recruit and retain Black men in engineering as engineering identity development, which gleans knowledge from engineering, education, psychology, and sociology has been shown to be an important indicator of engineering persistence or the lack thereof. Prior research suggests that this assertion is especially true for women and students of color.

PURPOSE OR GOAL

This project, a part of an ongoing study to investigate the longitudinal engineering identity development of four Black male engineering undergraduates (at a HSI), seeks to add to the literature base via the following research question: 1) How do Black male engineering undergraduate students come to identify themselves as engineers?

APPROACH OR METHODOLOGY/METHODS

Authors conducted a semester-long single-case Interpretive Phenomenological Analysis (IPA). Here we present a detailed idiographic investigation of one participant’s engineering identity development.

OUTCOMES

Based on our preliminary analysis of Mateo’s (pseudonym) freshmen year experiences, we inductively share one theme, continuous calibration. This theme describes the role of balance in Mateo’s process of becoming an engineer.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Crucial to Mateo’s identity as an engineer were his view and perspectives on the role of academic and non-academic balance and the self-authorship of becoming an engineer on his own terms and in his own ways. As with Mateo, presenting engineering as a field where students have time to develop and grow and not “have it all together” may help cultivate and enhance engineering identity among Black men as well as other engineering students.

KEYWORDS

Diversity, Identity, Black.

Introduction

In spite of the recent focus on Broadening Participation in Engineering, the participation of Black men in engineering, at all levels, is bleak (National Academies of Sciences, Engineering, and Medicine, 2018). There is also a dearth of literature that details the nuanced experiences of Black men in engineering (Rodriguez et al., 2018), especially in non- Predominately White Institutions (PWIs) such as HBCUs and HSI (Fleming, 2013). Identity development may be an important lens for understanding how to recruit and retain Black men in engineering (Patrick & Borrego, 2016) as it has been shown to be an important indicator of engineering persistence or the lack thereof (Tonso, 2006; Capobianco, 2012; Matusovich, 2011). Prior research suggests that this assertion is especially true for women and students of color (Pierrakos et al., 2011; Ross & Godwin, 2016).

Purpose

This project, a part of an ongoing study to investigate the longitudinal engineering identity development of four Black male engineering undergraduates at a HSI, seeks to understand: How do Black male engineering undergraduate students come to identify themselves as engineers?

Engineering Identity

Researchers have long examined the concept of identity and the complex ways in which individuals experience and understand it (Erikson, 1968; Gee, 2001; Josselson, 1987; Kroger, 2007). Further complicating the common understanding of the topic is the interchangeable and often conflated nature of STEM and engineering identities reflected in current literature (Rodriguez et al., 2018). Another confounding factor that impacts and impedes a better understanding is the multiplicity and intersectionality of identities (Ross & Godwin, 2016; Capobianco et al., 2012). For example, it is possible for an individual to identify, simultaneously, as an engineering student, an employee at a restaurant, and a member of a research team with fluid levels of salience for each identity (Pierrakos, et al., 2009; Patrick & Borrego, 2016;). Scholars of engineering identity are therefore justifiable in their assertion that identity is neither fixed, absolute, nor prescribed but, rather, responsive to environmental and temporal factors (Patrick & Borrego, 2016).

Though there is a significant body of work that has described engineering identity development among engineering students (Capobianco 2006; Godwin, 2016; Godwin & Lee 2017; Rodriguez et.al. 2018), little research has centered the experience of Black men in engineering (Rodriguez et al., 2018), especially in non- PWI settings such as HBCUs and HSI (Fleming et al., 2013). When centering the engineering identity of underrepresented students, we do however gain some insights.

Engineering identity is a process of self-negotiation and is not easily compartmentalized

Flowers and colleagues (2018) in their investigation of the intersectional identities of eight “gifted, poor, Black males majoring in engineering” demonstrate that their identity journey involved self-negotiation. Also, participants shared holistic views of themselves and their STEM- Identity. For example, their identities transcended social, cultural, and in this case financial boundaries.

Similarly, Ross and colleagues (2021) in their work demonstrate that while engineering identity is socially constructed, individuals self-negotiate their own engineering identities, developing holistic meanings and views of identity. The nine Black women participants in this study chose to anchor their identity in their whole selves rather than the traditional conception of engineers (e.g. anti-social, tinkerers). They found ways to self-regulate their meaning-making of what it means to be an engineer (i.e. resilient engineering identity). Ross and colleagues’ work further emphasizes that when researching non-White groups, researchers should be attuned to participants’ definitions of what it means to be an engineer.

Last, Hughes et al. (2020) in their investigation of engineering identity in focus group interviews with 62 students across 15 engineering majors and three universities in the United States

demonstrated the complexity of engineering identity. Participants revealed that they connected their engineering identity development to multiple facets such as perseverance, collaboration with their peers, and opportunities for real-world experience. Engineering identity cannot be easily compartmentalized.

Engineering identity is supported by social interaction but self-negotiated/regulated

Flowers (2015) demonstrated that Black men in engineering construct their engineering identity based on the cues and support they receive from others. In his study of eight Black male engineering majors, he demonstrated that family (i.e. parents) involvement and support were instrumental in engineering identity development. Flowers' study was however centered on the role of family. Family did not organically originate from the data but "family matters" did.

Matusovich and colleagues (2011) in their study of engineering identity development of 20 students in three different institutional contexts also highlight the importance of social identity in engineering identity development. Like previously described studies, this study revealed that students reported multiple identities and more holistic views of self. For example, being a part of a family (e.g. son, sister, etc.) and having regional identities (e.g. Chicagoan) were crucial considerations as students negotiated their professional identities. They also pointed out that identities were developed while having interactions with peers, typically outside of class. Though the gender of participants was described, race/ethnic identity was not. Therefore, it is difficult to make any assertion on the experiences of Black men in this study.

Context matters

In addition, in their study of seven Black men (two from PWIs, one from an AANAPI, and four from HBCUs) who participated in maker spaces, Greene and colleagues (2019) demonstrated that interaction with peers in maker spaces promoted agency and supported engineering identity development; however, the PWI settings students' conceptions of engineering identity were challenged. A major finding of this study was that context matters.

Finally, Fleming and colleagues (2013) centered context in their mixed methods study aimed at understanding "how underrepresented minority students come to identify themselves as engineers" at HBCUs and HSIs. They demonstrated that as early as sophomore year students had started to identify themselves as engineers as evidenced by believing that they possessed the characteristics/skills that engineers must have. Interestingly, students at HBCUs were more likely to consider attending an HBCU to their identity; however, HSI students in most instances were not even aware that their university was a Hispanic Serving Institution. Unfortunately, it is unclear how many Black men participated in this study. Though gender was specified, race/ethnicity was not.

Method

For this study, we employed an Interpretive Phenomenological Analysis (IPA) approach. Authors determined this method to be ideal; since, it allowed us to use our meaning-making lens to explore how participants made meaning of significant life experiences (Smith & Nizza, 2021; Smith & Osborn, 2008). The dual interpretation that characterizes IPA is particularly powerful and requires the analyst to employ the method to integrate empathy into their inquiry (Smith & Osborn, 2008). Given IPA's requirement for researchers to situate themselves within the richness of participants' data, authors allocated significant time to understanding the research phenomenon within individual cases as well as across the collective of participants' experiences.

Research Design

The authors developed a semi-structured interview protocol. We, therefore, prioritized flexibility in our questioning and were willing to disregard rigidity for the opportunity to probe for rich context as Smith and Nizza (2021) suggested.

Limitations

At several stages of the research process, researchers employed pragmatic decision-making to advance the study. For example, since the goal of the study was not to obtain generalizable results, the team chose to approach the study using the less popular single-case IPA design. Given the dearth of literature that explores the engineering identity development of Black men, a delimitation around the sample size was intentionally set. Focusing on one single participant allowed for consideration of Mateo's unique contextual (institutional, college, classification) experiences, which might have been lost or overlooked in a larger sample. As a result of which, readers should be keen when considering the transferability of findings to other contexts.

Research Context

The study took place at a large Southwestern public university, Elijah McCoy University (pseudonym). Elijah McCoy University is designated as a HSI and Asian American Native American Pacific Islander-Serving Institution (AANAPISI). The college of engineering is comprised of 5.66% Black students, 24.84 % Asian students, 35.85% Hispanic students, 21.69% White students, 7.05% International students, and 4.91% Other.

Participant

We recruited students through a purposive snowball sampling procedure, word of mouth approach to identify students who met a specific set of criteria (Patton, 2002). We sent our IRB-approved study recruitment email to an institutional gatekeeper who had extensive contact with engineering students. The gatekeeper sent the recruitment email to eligible participants. Participants had to be freshmen at the start of the study. The sampling technique yielded four Black male engineering students who selected their own pseudonyms. The work presented here focuses solely on Mateo.

Meet Mateo

Mateo began this study as an 18-year-old electrical engineering major. At the time of the last interview, he had turned 19 years old. Mateo is multi-racial (Black and Latino) and he identifies as a Black man. He decided to major in electrical engineering because of his early interest in building and discovering how things work by reverse engineering them. He decided to attend his institution because of very practical reasons such as location and the likelihood of remaining in the city post-graduation because it is the home of a variety of engineering companies that interest him.

Analysis

The first, second, and fourth authors were guided by Interpretive Phenomenological Analysis procedures (Smith & Osborn, 2008). These researchers completed independent transcript reviews, which involved several passes reading each transcript in detail. Following their review, these authors recorded hand-written descriptive and linguistic notes across the left margins of each transcript (Smith, et al., 2009; Smith & Nizza, 2021). As an adaptation to the traditional IPA design, we concurrently examined the description of the experiences that participants recounted while examining their choice of language (Ross et al., 2021).

After significant words and phrases were identified, the authors reconvened to compare and discuss descriptive and linguistic notes. During these sessions, authors developed conceptual-level annotations to interrogate these data within the context of their pre-understandings of the phenomenon (Ross et al., 2021; Smith et al., 2009; Smith & Nizza, 2021). These convenings, which we later coined calibration meetings (Henderson et al., 2022), gave rise to conceptual questions which would ultimately inform emergent theme development in earlier IPA literature (Smith & Nizza, 2021).

By proceeding through these iterative stages of analysis, it allowed authors to idiographically focus on the nuances of individual cases before engaging with cross-case levels of abstraction.

Next, the third author, serving in the capacity of a research auditor, conducted an independent audit. This audit involved "check[ing] the validity" of previous data analysis and developing a summary of themes based on the findings of the other authors (Smith et al., 2009, p. 183). All

research team members came to a consensus on the final themes, as suggested by the auditor, and proceeded to make significant contributions to the preparation of the final manuscript.

Findings

For the purpose of this paper, we share one theme which we inductively describe as, “**being in charge.**” This theme describes how Mateo navigates his first year of discovering his agency and defining what works for him as an emerging engineer. We proceed by reporting some ways that we saw it.

In relationship

Mateo demonstrated an ability to “take charge” in the ways he works with his peers. First, he acknowledges the interdependence he has with his peers when he said:

I think peer support is the most important because you’re getting support from people that are going through the same things you are. They’re feeling the same things that you are, and they’re really the ones that can help you get through whatever you need to.

Here Mateo acknowledges that his identity is anchored to his peers. He sees himself in his peers not only through common experience but also, as he describes it, common “feelings.” This indicates a deep understanding or acknowledgment of shared or co-constructed identity. Perhaps one that they had described to each other- so much so that he is able to explain that they “feel the same things.”

On the other hand, Mateo also discusses how he takes charge/manages his relationships with his peers. He balances it all through the skillset to both work with peers but also work alone.

I think there’s good things and bad things to both studying with other people in a group and by myself... In a group, you can bounce ideas off of each other or like help each other learn or whatever. Even if you all aren’t studying the same thing or the same concept or whatever, you can hold each other accountable to make sure that you’re not going off-topic, I guess. But also, you could end up just talking about whatever if you’re in a group. You just start messing around.

The value Mateo learned during his first year was that he had the authority to take charge and decide when it was best suited for him to study with his peers or alone, even though they might be connected through some common experiences.

In defining success and balance

We were also able to see how Mateo took charge of defining what engineering success identity looked like. He says “I think if you’re doing good in your classes while you’re in a good mental state also, that’s success to me.”

At the same time, there appears to be tension between being in a good mental state and this expectation to have it all together. Mateo also describes success as

I think obviously it’s like having good grades, but other than that, to like really be on top of everything, to not be like rattled. You’d be on top of your school or maybe on top of your personal life and to still be confident that your school work and your personal life is intact and it’s going well. I think that would be confidence or that would be successful for me.

The implications of this quote, while some might see it as idealistic, are entrenched in a lot of pressure (e.g. engineering stress culture) for a 19-year-old. What is hopeful is that Mateo’s definitions of engineering identity appear to be in transit; we gain further insights as he negotiates who he is with his definitions of engineering. For example, he said “I would be honest. I still try to set time aside to enjoy myself or whatever, but sometimes you have to say no to going to do stuff that is fun in order to get things done. He is okay studying and sacrificing sometimes, but he is also careful to carve out time to enjoy himself. He also says “As far as my personal life, I make sure that I also set time aside to hang out with friends or go workout, go to the gym or whatever just to make sure both are in balance.” Both of these quotes exhibit that Mateo is learning to take charge.

In negotiating his identity

Last, we saw that Mateo was often negotiate whether his conceptions of what it means to be an engineer fit with his peers and whether they had to fit. For example, he said

... I don't really like portraying myself as smarter than everybody in the room. Honestly, when I think about an engineer or something like that, I think of them as like they're smarter than everybody else in the room. They're just like smug and just like, "I'm smarter than you," but I don't portray that. ... that's not me.

Mateo illustrates a keen awareness of both his thoughts of what an engineer is and how it might not line up with who he is. He possesses the wherewithal to proclaim "that's not me." And he takes ownership by proclaiming

I'm really in charge of my own future and stuff. I'm in charge of myself. I mean you can have close people to mentor or guide you but at the end of the day, it's really you and what you have to do and I've noticed that no one else- it is really me... I just have to do what I have to do and get it done...

Discussion

Unique to this study, our use of a less explored approach, single-case IPA, enabled us to gain, to a certain extent, a glimpse of Mateo's engineering identity development. That is to say, we were not only able to identify Mateo's identities as others have done in their work, but we were also able to see his engineering identity development journey/process, which we preliminarily described as his process of taking charge.

Similar to previous studies we came to understand that social identities, for example, peers (Matusovich et al., 2011) are crucial to engineering identity development. This study, while confirming these assertions, further unpacks the process. Mateo not only describes the importance of peers, but he demonstrates how he self-authors the role of peers in his development. He engages peers in the classroom, and outside of the classroom, and decides when and if to participate in study groups.

Our work also further highlights the assets that Mateo brings to the engineering environment (e.g. the capital he brings that support his journey). Mateo had the wherewithal to accept definitions of engineering identity that supported him and reject those that did not.

Conclusions

Our contribution is clear, we add to the conversation, but also center the voice of a Black male in engineering. This work stands to address current "gaps" in the literature and helps push the field forward as it relates to the participation of Black men in engineering. Cultivating and enhancing engineering identity may be key to the recruitment and retention of Black men. As there has been little dissemination related to interventions and policies aimed at recruiting and retaining Black males in engineering (Griffin & Muñiz, 2011), this work, stands to provide insights on how to support Black male engineering students, and perhaps how to design intervention strategies that build upon their strengths as emerging engineers. One might envision designing interventions aimed at supporting students' agency development and helping give voice to the authorship of their identity. Also, given the interconnection between an individual's multiple identities, it would be of interest to further investigate how Mateo's calibration competence within his engineering education experience is reflected and/or manifests within the other constituents of his intersectionality

References

- Capobianco, B. M. (2006). Undergraduate women engineering their professional identities. *Journal of Women and minorities in Science and Engineering*, 12(2-3).
- Capobianco, B. M., French, B. F., & DIFES-DU, H. A. (2012). Engineering identity development among pre-adolescent learners. *Journal of Engineering Education*, 101(4), 698-716.
- Erikson, E. H. (1968). *Identity: Youth and crisis* (No. 7). WW Norton & company.
- Fleming, L. N., Smith, K. C., Williams, D. G., & Bliss, L. B. (2013, June). Engineering identity of Black and Hispanic undergraduates: The impact of minority serving institutions. In 2013 ASEE Annual Conference & Exposition (pp. 23-510).
- Flowers III, A. M. (2015). The Family Factor: The Establishment of Positive Academic Identity for Black Males Engineering Majors. *Western Journal of Black Studies*, 39(1).
- Flowers, A., & Banda, R. M. (2018). When giftedness and poverty collide and why it matters: Gifted, poor, Black males majoring in engineering. *Journal of African American Males in Education (JAAME)*, 9(2), 1-22.
- Gee, J. (2001). Identity as an analytic lens for research in education. *Review of Research in Education*, 25, 99. doi:10.2307/1167322
- Godwin, A. (2016, January). The development of a measure of engineering identity. In ASEE Annual Conference & Exposition.
- Godwin, A., & Lee, W. C. (2017). A cross-sectional study of engineering identity during undergraduate education.
- Henderson, J. A., Hines, E. M., Davis, J. L., Le Shorn, S. B., Alarcón, J. D., & Slack, T. (2022). It'sa Vibe: understanding the graduate school experiences of Black male engineering faculty. *Journal for Multicultural Education*, (ahead-of-print).
- Josselson, R. (1987). *Finding herself: Pathways to identity development in women*. United States: Jossey-Bass Inc., U.S.
- Kroger, J. (2007). *Identity development: Adolescence through adulthood* (2nd ed.). Thousand Oaks, CA: Sage Publications (CA).
- Matusovich, Holly M., Brock E. Barry, Kerry Meyers, and Rachel Louis. "A multi-institution comparison of students' development of an identity as an engineer." In 2011 ASEE Annual Conference & Exposition, pp. 22-69. 2011.
- National Academies of Sciences, Engineering, and Medicine. (2018). Indicators for monitoring undergraduate STEM education. Washington, DC: The National Academies Press. doi: <https://doi.org/10.17226/24943>.
- Patrick, A., & Borrego, M. (2016, June). A Review of the Literature Relevant to Engineering Identity. In American Society for Engineering Education Annual Conference.
- Pierrakos, O., Beam, T.K, Constantz, J., Johri, A., Anderson R. (2009). On the Development of a Professional Identity: Engineering Persists vs Engineering Switchers. 39th ASEE/IEEE Frontiers in Education Conference. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5350571&tag=1
- Rodriguez, S. L., Lu, C., & Bartlett, M. (2018). Engineering identity development: A review of the higher education literature. *International Journal of Education in Mathematics, Science and Technology*, 6(3), 254-265.
- Ross, M. S., Huff, J. L., & Godwin, A. (2021). Resilient engineering identity development critical to prolonged engagement of Black women in engineering. *Journal of Engineering Education*, 110(1), 92-113.
- Ross, M. S., Huff, J. L., & Godwin, A. (2021). Resilient engineering identity development critical to prolonged engagement of Black women in engineering. *Journal of Engineering Education*, 110(1), 92-113.
- Smith J. A. and Nizza, I. (2021) *Essentials of Interpretative Phenomenological Analysis*. Washington DC: APA.

Smith, J.A. and Osborn, M. (2008) Interpretative Phenomenological Analysis. In: Smith, J.A., Ed., *Qualitative Psychology: A Practical Guide to Research Methods*, Sage, London, 53-80.
<http://dx.doi.org/10.1002/9780470776278.ch10>

Tonso, K. L. (2006). Student engineers and engineer identity: Campus engineer identities as figured world. *Cultural studies of science education*, 1(2), 273-307.

Acknowledgments

Sincere thank you to our single participant, Mateo who went on this journey with us for an entire academic year. Thank you for allowing us the opportunity to learn from your experiences. Thanks to the entire Henderson Research Group for your lively conversations and discussion about this work.

Copyright statement

Copyright © 2022 Jerrod A. Henderson, Le Shorn Benjamin, Rick Greer, Jared Davis: The authors assign to the Australasian Association for Engineering Education (AAEE) and educational non-profit institutions a non-exclusive licence to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The authors also grant a non-exclusive licence to AAEE to publish this document in full on the World Wide Web (prime sites and mirrors), on Memory Sticks, and in printed form within the AAEE 2022 proceedings. Any other usage is prohibited without the express permission of the authors.