Factors promoting persistence of African American students in undergraduate engineering
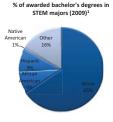
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Rationale for Study:

- Certain ethnic and racial minorities are still underrepresented in science, technology, engineering, and mathematics (STEM) majors due to low persistence rates.
- Need to focus on sub-fields of STEM and specific racial ethnic or racial groups to fully understand the complex situation.

% of awarded bachelor's degrees in STEM majors (2009)[1]

Native American 1%
Other 16%
Hispanic 9%
African American 9%
White 65%

Research Question:

How do African American engineering students' experiences in their academic, social, and institutional environments, as well as their individual characteristics, influence their persistence toward degree completion?

Research Design:

- To identify positive outcomes (i.e., persistence) rather than negative outcomes, such as attrition
- Two semi-structured interviews with African American engineering upperclassman (i.e., juniors and seniors)
  - Interview I – to understand participant's relevant life experiences (i.e., family, pre-college experiences, salient identities)
  - Interview II – to understand participant's academic and social experiences as they relate to his/her pursuit of an engineering degree and how they influence him/her
- Two observations to provide context about the eng. community
  - Upperclassman meeting of a STEM enrichment program
  - National Society of Black Engineer's student chapter meeting

Participants:

- African American juniors and seniors at a top-ranked research-based engineering school

Pseudonym	Class	Socio-Econ. Status (SES)	Parent's Education
Anthony	5th year senior	Lower SES	F: some college
Chayla	4th year senior	Lower SES	M: college degree*
Danielle	5th year senior	Middle SES	F: some college; M: college degree*
Raymond	5th year (junior status)	Middle/Middle Upper SES	F: college degree; M: some college

*earned during student's high school years

Data Analysis:

- Open-coding to identify themes and categories
- Summative memos on data collection
- Constant comparative analysis and analytical memos

Preliminary Findings:

Centrality of Race in Student's Experiences of Engineering School

- Students felt the visibility of their race on campus, both in academic and social situations and often experienced feelings of isolation

> There was a group of three or four black girls, we are all in [the same major]…we had these office hours review sessions and **we were the first people there, we started a list so our names are on top of it.** And then when the professor finally got there, **there was a whole other list that like we were just not included on...** It was really upsetting, like, I didn't—we didn't know what to do. **I shouldn't have to assert myself, no one else asserted themselves.** (Chayla)

Factors Influencing Persistence – "Why" Persist

- Expectations and sense of responsibility

> I just feel like I can't fail. Because like **people expect you to fail**, so it's like I can't really fail…I'm the only black engineer from [community]. The team is on my back in a sense—it's really not, but it is…By the team I mean your race. Black engineers—like that's what I mean by the team. **Like putting them on my back and making sure that you look good so that everyone else looks good.** (Anthony)

- Utility of engineering degree

> So when I looked into what I wanted for college, it wasn't to go to college because that's what you did after high school, **you go because you don't have any money and you need a degree to make money.** So it was really, very much so, **what degree do I need to get to make as much money as possible.** So I don't have to go through [living in poverty] again. (Chayla)
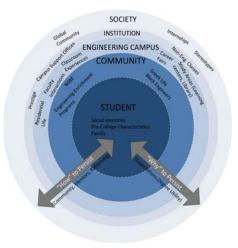
Factors Influencing Persistence – "How" to Persist

- Self-organized communities increase academic and social support

> …I guess **the most positive thing that I've experienced would be the groups that I've built.** …I have never made a schedule or signed up for classes having not talked to [the other black students my major]. We take all our classes together, purposely, …..**we take classes together, we study together, it kind of makes it easier.** It's really been a strong sense of community between all of us. Because we look out for each other….**the sense of community is really what kept me [in engineering].** (Chayla)

- Find and learn from informal mentors

> ….my involvement in the National Society of Black Engineers … it allowed me to know get to know upper-classmen and **they helped me with my classes, choosing the right professors, feeling out campus** in a way that you wouldn't get on a guided tour in was way that a professor wouldn't tell you, they would, **kinda be mentors, and even as far as helping me with my homework or telling who to go to for help with my homework.** (Danielle)

- Reframing negative experiences

> …it was really discouraging when I entered college, it was kind of I had to prove myself even more just to be on the same [level as my peers]…. **It taught me a lesson** that I had to speak up for myself and had to assert myself so my opinions… **it helped me in my internships and it helped me have leadership positions in my organizations** it was a tough lesson and it can be seen as a negative but reflecting back on it, it was probably a positive because it helped me grow as a person. (Danielle)

Emerging Conceptual Framework:

- Based on the Brofenbrenner[2] model which describes individuals as embedded within a series of systems; individuals are shaped by their environments
- The African American students in the pilot study had a strong sense of community that shaped their lives and helped them to navigate their engineering campus and their institution

Conclusions:

- Students feel that race is an extremely salient identity in both academic and social situations
- Students leverage each other by building communities and establishing mentoring relationships to aid in persistence toward degree completion

Future Work:

- Expand pilot study into full-scale study with particular focus on students' experiences
  - Juniors or senior status
  - Variety of engineering disciplines
  - Leaders and non-leaders
- Continue with multiple interviews and observations of relevant engineering activities

Acknowledgements:

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[1]ww.nsf.gov, S&E Indicators (2012).
[2]Brofenbrenner, U. (1979). *The ecology of human development: experiments by nature and design.* Cambridge, MA: Harvard University Press.