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Comparative Study of the Effect of Numerical Majority and non-Majority Status on the Intersection of Professional and Cultural Identity of African American Engineering Students

Dr. Lesley M Berhan, University of Toledo

Lesley Berhan is currently the Assistant Dean of Diversity, Inclusion, and Community Engagement for the College of Engineering and an Associate Professor in the department of Mechanical, Industrial, and Manufacturing Engineering at The University of Toledo. Her research interests are in the areas of composites and fibrous materials and engineering education. She received her B.Sc. in Civil Engineering from the University of the West Indies in St. Augustine, Trinidad, her M.S. in Civil Engineering from the Massachusetts Institute of Technology, and her Ph.D. in Mechanical Engineering from the University of Michigan, Ann Arbor. She joined the faculty at the University of Toledo in 2004. As the Assistant Dean of Diversity, Inclusion, and Community Engagement she leads the development and execution of initiatives and programs to facilitate the recruitment, retention, and success of women, students from underrepresented groups and first generation students. These duties are well aligned with her current research interests and external funding in engineering education.

Dr. Revathy Kumar

Ph.D. in Education and Psychology from the Combined Program in Education and Psychology, University of Michigan. At the graduate level, she teaches courses in Adolescent Development, Motivational Theory and Application, Cultural Perspectives in Learning and Development, and Self and Identity. Her research focuses on social and cultural processes involved in constructing a sense of self and identity among adolescents in culturally diverse societies. Of particular interest are the role of teachers, teacher-education programs, schools, communities, and families in facilitating minority and immigrant adolescents' development, learning, and motivation. Her work is published in Journal of Teacher Education, Journal of Educational Psychology, Journal of Research on Adolescence, Contemporary Educational Psychology, and Cultural Diversity and Ethnic Minority Psychology. She received a Spencer Foundation Grant in 2007 to examine academic prospects, interpersonal relationships, and social well-being of students in school districts with a high concentration of students of Arab and Chaldean origins. Recently, she received internal grants from the University of Toledo to conduct mindfulness intervention projects with elementary school students and preservice teachers. She is also the recipient of the Fulbright Specialist Fellowship to pursue her interest in culture, mindfulness, and motivation in cross-cultural and international contexts.

Dr. Aaron Lee Adams, Alabama A&M University

Aaron Adams is an assistant professor in the Department of Mechanical and Civil Engineering at Alabama A & M University. Before pursuing graduate studies, he worked at the National Academy of Engineering & Ford Motor Company as a product design engineer focusing on Minority STEM education and environmental policies. His research interests include nuclear radiation detection and thermal electric material development. He also works with the Center for Entrepreneurship Innovation and Economic Development to encourage African American students, and underrepresented groups in developing business innovation and ideas.

Ms. Marjory A Goodloe

Marjory Goodloe is a doctoral student at the University of Toledo with expertise in educational policy and educational leadership. An acclaimed community activist and writer, Marjory is dedicated to improving the lives of youth in foster care; as such, she has spent nearly a decade developing programs geared toward improving the educational outcomes of youth in foster care. Her passion for education reform led her to pursue a doctorate in Educational Theory & Social Foundations with a minor in Educational Administration.

Mr. Jimmie Karl Jones, University of Toledo

Jimmie Jones is a doctoral student in the Judith Herb College of Education's Educational Psychology program at the University of Toledo. His research focus is concerned with understanding the ways in which culture and climate impact student's cognitions, attitudes, behaviors, and outcomes. His population of interest is racial/ethnic minorities, with African American student experiences as the focal point.

Comparative Study of the Effect of Numerical Majority and non-Majority Status on the Intersection of Professional and Personal Identity of African American Engineering Students

Low enrollment, retention, and graduation rates of African American engineering students in the United States are a cause for concern [1]. Consequently, over the last decade there has been an upsurge of research identifying factors that have contributed to the problems encountered by African American students in higher education institutions in general, and in STEM fields in particular [2, 3]. The key factors identified as contributing to the attrition of minority African American students include perceptions of racism on campus, internalization of stereotypes, feelings of alienation and rejection, and inadequate support systems [4, 5]. In this context, considerations of institutional demographic characteristics, including the ethnic makeup of the student body is essential. Studies demonstrate that African American students at Historically Black Colleges and Universities (HBCUs) experience lower levels of isolation and overt racism, and higher levels of retention compared to African American students in Predominantly White Institutions (PWIs) [6, 7]. While some studies suggest that African American students experience lower levels of stereotype threat in HBCUs [8, 9], other studies indicate that there is little significant difference between students attending PWIs and HBCUs in their perceptions of stereotype threat. Based on qualitative and quantitative data from a national sample of engineering students, Brown, Morning, and Watkins report that students enrolled in HBCUs had more favorable perceptions of their college experience and that the higher graduation rate of African American students in HBCUs compared to their PWI counterparts could be attributed to lower perceptions of racism and discrimination [10]. It may be that the levels of stereotype threat experienced in the two types of institutions are different [11]. Based on the literature reviewed, the purpose of this study is to examine whether African American engineering students' numerical majority status in HBCUs enhances the compatibility between their racial and professional identities and facilitates their integration; while their numerical minority status in PWIs diminishes the compatibility of the two social identities and stymies their integration. We examine this issue within the Social Identity and the Identity-focused Cultural Ecological Perspective theories. Before we turn to the two theoretical frameworks we describe the multiple context-dependent representations of majority-minority status with particular focus on African American college students in the United States.

Majority Minority Status

Majority status group denotes a valued, dominant, powerful and higher status group; while minority status group signifies an oppressed, subordinate, stigmatized, counter-normative and relatively powerless group in society [12]. There are multiple representations of majority minority dimensions. These include power and status [13], numeric size [14], distinctiveness [15], group context [16], and target of treatment [13]. The most salient dimensions for minorities with regard to majority-minority status are the lack of power, numerical minority status in society, stereotyping, and being the target of prejudicial treatment [17]. Not surprisingly, the awareness, expectations, and experiences of rejection associated with being members of a devalued minority group has a significant impact on their quality of relationships and sense of belonging [18], psychological well-being [19, 20] and goal pursuits. As members of a

historically excluded group, African Americans students are, therefore, at a higher risk for negative psychological and academic outcomes associated with expecting and experiencing rejection and alienation in institutions of higher education. However, as stated earlier, majority numerical status in HBCUs is a likely protective factor for African American students, counteracting to some degree the risks associated with their devalued minority status in society; while their numerical minority status in PWI likely acts as a risk factor exacerbating the negative consequences of their minority status in society.

Theoretical Perspectives: Social Identity and Ecological Systems Theories

Social identity theory [12, 13] emphasizes the distinction between relevant and meaningful social groups and an individual's commitment to and identification with specific social groups. The theory examines the psychological processes associated with identity negotiations based on in-group affiliation and social categorization of self and others. Specifically, social identity negotiation is a social phenomenon that becomes subjectively meaningful by defining an individual's place in the world, satisfying the need to belong.

Social identity is not singular; rather it is multi-faceted with the salience of any particular facet dependent on social contexts and everyday life experiences. It is tied to the meaning that individuals associate with various inherited identities such as their nationality, religion, socioeconomic status and gender that is informed by "the cultural repertoires, traditions, and narratives that [they] have access to" and by institutionalized definitions associated with their various social identities [21].

Some social identities, such as role and professional identities are achieved by individuals during their lifetime. Sometimes inherited and achieved identities can differ in status and value [22]. Such is the case for African American engineering students who may experience dissonance and threat as they reconcile perceived status and value conflict between their ethnic and engineer identities. This conflict is not rooted in their ethnic identity, but rather, in the social context and societal stereotypical expectations that suggest that African American ethnic identity and academic and professional identities such as engineering identity are antithetical. The debilitating impact of the awareness of the low academic and professional expectations on African American students' feelings of stereotype vulnerability and threat and the consequent underperformance and disidentification with academic domains is extensively documented [23-25]. Indeed, preserving a positive African American identity while forging an engineering identity in a professional context can be challenging. As Ladson-Billings notes African American students need to develop a "relevant black personality" that allows them to "choose academic excellence yet still identify with African American culture" (p. 20) [26].

However, contextual conditions—proximal and distal—may hinder the development of a healthy African American Engineering identity. For example, Mendonza-Denton, Downey, Purdie, Davis, and Pietrzak found that African American students in PWIs reported experiencing race-based rejection expectations that had a long term negative impact on their adjustment in the university, interpersonal relationships with White peers, and academic performance [4]. This may be attributed to the fact that African American students' numerical minority status in the proximal institutional context renders their devalued minority status in society more salient and, therefore, these students more sensitive to prejudice and discrimination on the college campus.

Such an environment is less likely to facilitate the development of an integrated African American engineering identity. On the other hand, as noted earlier, African American students at HBCUs are less likely to experience racism in their everyday life and more likely to perceive and receive greater academic and professional support from peers and faculty[6, 7]. This greater sense of belonging to the academic institution and to the engineering program is likely to foster an integrated African American engineering identity.

This leads us to question the extent to which a sense of belonging to the institution insulates African American students in HBCUs from feelings of racial vulnerability and experiences of stereotype threat. We draw on Spencer's identity-focused cultural ecological perspective theory to argue that attending an HBCU acts as a partial buffer against racial stereotype vulnerability [27]. This is not to suggest that African American students in HBCUs are invulnerable to stereotype threat. Indeed, they are still at risk for negative academic and psychosocial outcomes because of their numerical and devalued minority status in society. This theory recognizes the importance of the proximal and distal contexts situated within a specific historical period in shaping individual development. Kumar, Seay, and Karabenick extend this theory to demonstrate that in order to understand individuals' multifaceted social identity it is important to account for their mental representations of past spaces and places not currently occupied [28]. This suggests that even though African American engineering students in HBCUs are in a protective learning environment, they are cognizant of societal stereotypes about their group and this is likely to impact the integration of their ethnic and professional identity.

Summary of Predictions

This study focuses on three overarching questions. First, how is African American engineering students' ethnic identity related to their institutional majority-minority status? Second, how is African American engineering students' professional identity related to their institutional majority minority status? And third, how is the integration of African American engineering students' ethnic and professional identities related to their institutional majority minority status?

Regarding the first research question, we hypothesized that African American engineering students in HBCUs are likely to have a strong and positive racial identity that is fostered and supported within the learning context. On the other hand, African American engineering students in PWIs may either try to assimilate into mainstream White culture in order to fit in or they may respond to perceived overt and covert discrimination by developing a strong reactive racial identity at the cost of experiencing alienation within the learning context. This is because we expected African American engineering students in PWIs compared to their counterparts in HBCUs to be more aware of and more likely to experience prejudice and discrimination in the institutional context; however, it is important to note that African American engineering students in both institutions are equally likely to be aware of and to experience prejudice and discrimination in the societal context. With regard to the second question, we reasoned that for PWI compared to HBCU African American engineering students' negative academic and professional stereotypes about their group is likely to be a more salient and palpable reality in their everyday lives. Therefore, we hypothesized that while African American engineering students in HBCUs are more likely to embrace their professional identity as an engineer; PWI students are more likely experience some ambivalence regarding their professional identity as an engineer. Finally, with regard to the third question we hypothesized that despite African

Americans devalued minority status in society and the negative stereotypes regarding African Americans academic capabilities, their numerical majority status within the HBCU context acts as a buffer enabling them to perceive their racial and professional identity as compatible and integrated. On the contrary, the numerical minority status of African American engineering students in PWI exacerbates their vulnerability to feel threatened by the negative stereotypes about their group. Even as they struggle to maintain a positive ethnic identity, they question the compatibility between their ethnic and professional identities. As Du Bois states, it is the tension that impedes "fluid participation in Black world(s) and white world(s)". It is for this reason that African American engineering students in PWIs may struggle more than African American engineering students in HBCUs to integrate their ethnic and professional identities to view themselves as African American engineers.

Sample and Sample Selection

Data in this study were from 11 focus group interviews conducted at a historically black university (n = 7 on average) and a predominately white institution in (n = 4, on average). African American undergraduate engineering students in the HBCU institution were selected utilizing stratified random sampling. The sample selection procedure at the PWI institution was constrained due to the relative small number of African American students in the undergraduate engineering programs. It is important to note that while the PWI institution included both engineering technology (ET) and engineering programs (EN), the HBCU institution offered only engineering majors and did not include engineering technology. Therefore sample selection at the PWI included a further level of stratification by program.

Interview Protocol and Interview Process

The focus group protocol was constructed by utilizing protocols used in our previous research on prejudice and discrimination among college, middle, and high school minority students that included African American, Latino, and Arab American students. Open-ended questions provided interviewees ample opportunities for frank discussion about issues and concerns crucial to their lives in and outside school [29]. The protocol included questions regarding perceptions of the campus and engineering college context including faculty's cultural sensitivity and culturally responsive teaching, perceptions of stereotyping and discrimination in societal and institutional contexts and their feelings of inclusion/exclusion and dissonance on campus and within the professional engineering community.

Focus group facilitators were of African or African American descent in order to build rapport with participants. Students received a twenty-five dollar ($25) gift card for their participation. Focus group interviews were recorded and transcribed and later coded by an interdisciplinary team consisting of six individuals.

Coding and Analysis

Interviews were audiotaped and transcribed verbatim. Transcripts were then coded and analyzed with the assistance of QSR NVivo 11 software. We utilized a qualitative phenomenological approach to conduct a comparative analysis of the experiences of African American Engineering students in the two types of institutions. A phenomenological approach describes what research

participants have experienced, how they experienced it, and the meaning they associate to their experiences [30]. Students shared their experiences and their perceptions of their institutions and their views on issues related to race, ethnicity, identity and career aspirations.

Codes were developed in accordance with the literature review. Next we reviewed each transcript to identify thematic categories (e.g., awareness prejudice and discrimination, collective experience of prejudice and discrimination, personal experience of prejudice and discrimination, sense of belonging to the institution, sense of professional belonging) and their corresponding properties. The coders compared and discussed the coding categories to reach a consensus. We have yet to establish the intercoder reliability.

Results and Discussion

Results reported here are preliminary as we are still in the data collection phase of the study. Student voices, and hence the lived experiences of students from both institutions are included as much as possible to ensure accuracy in reporting.

Results from the data show that while students from both institutions have positive racial identity, that identity is reflected in different ways. Students from the HBCU expressed their racial identity in terms of a cultural congruence between them and the HBCU which led them to feel an immediate relationship with the university. In their discussions, unlike the majority of PWI students, student narratives from the HBCU oftentimes compared their experiences to their firsthand knowledge or perceptions of what happens at PWIs versus HBCUs. For example, one student said:

"I feel like I am more in touch with my culture. As far as just the black culture. I have friends that go to PWIs and they're, I am a little more, the word I would use is cultured than them. At the PWI, they try more so to have to blend in, whereas at HBCUs, you learn how to be yourself when it's time to be yourself and when it is time to blend in, blend in. Versus at a predominately white institution, where you always have to blend in to be accepted in such and such field or at such and such place."

Another student in a different focus group expressed similar thoughts, saying:

"It's a little different. Of course, the majority of students are black. Here on campus, we are the majority…At a PWI, it's more of the norm to conform to I guess the conditional American ways, and being able to blend in and act as such. Here at HBCUs, you are comfortable with your background, your ethnicity, and you don't always have to conform."

Students at the HBCU did not feel a need to assimilate into an academic culture they believed that already shared their own culture. Students' narratives at the PWI related to racial identity focused almost exclusively on race, racial pride, and fitting in at the institution. While these students' narratives suggest they are proud to be Black while attending a PWI, they were keenly aware of their minority status at the institution and their perceived subordinate role. For example, a student in one of the focus groups said:

"I am very much aware of my race on campus. A lot of times you need to double think what you're about to do because of your race. I am a tall black man, so I am already coming off as sort

of being aggressive. Some things you need to make sure you don't say or do because people might rub it the wrong way. Everyone knows I am not aggressive. I have never been in a fight my entire life. I am a gentle giant. But people just see this big guy and he's black too, so you definitely have to be aware of your race."

Another student in a different focus group said:

"You come in with a chip on your shoulder…They look at me like, I can't do as much as the next guy. So you have to be the one that proves them wrong. You got to do more."

The Learning Environment

Four factors emerged from the data that reflect the extent to which the environment provided a positive place to learn, including: Sense of Belonging to the Institution; Sense of Belonging to the Engineering College; Ability to count on Faculty for academic support; Belief that Faculty understands their culture; Black engineering identity; and Black Identity in the professional context.

The HBCU Experience

"At a bigger school, you are just a number. Here it's like, you are so-and-so, how can I help you?" HBCU Student

Students from the HBCU not only indicated they felt a swift sense of belonging to the institution, related in part to their cultural connection, they also felt a sense of belonging to the Engineering College. One student said for example, "Coming here, it was a whole different culture. Everyone was really working together. Everybody was like, if you go to teachers, they are willing to help, have study sessions when there's no class. It was a whole different ball game. I really appreciate that." In addition to faculty providing support, students also indicated a close relationship with Black engineering alumni whom they could access through a specially designed app.

Students at the HBCU indicated they felt faculty, in particular non-American faculty were helpful inside as well as outside of the classroom. One student said:

"…they have high expectations because they know it's going to be demanded of us when we get to the working world. But they are not unattainable expectations. Our professors will help you in any way they can to help you meet those expectations, you just have to want it for yourself. Actually, if they are in their office, they are willing to help you with your projects and stuff. One professor will have extra study sessions at 6:00 or 7:00 at night to help students. Or an extra study session during the day when there's no classes to help students grasp the material better".

Students at the HBCU also indicated that faculty at their institution understood their culture and made conscious attempts to connect with students. Another student noted:

"But then we have some foreign teachers that have been in this environment so long that they have become Americanized. They have adapted to the black culture. They find ways to connect with us. Sometimes they talk slang in class. It's funny because I've never been in an

environment (like that), especially in high school. I came from a terrible high school. When I came here, the teachers were so down to earth. In the middle of class, it doesn't have to be serious. They can joke around and be themselves so you can feel comfortable."

The PWI Experience

"I notice people who typically go to historically black colleges, you see your race. There would be more black teachers, more things like that. Who would have known if I had someone to say, yeah, you are very bright, I want you to be my mentor. You don't get that around here. There was only one black teacher in engineering that I met that really cared."   PWI Student

Couched in terms of seeing other Black students on the university's main campus, students at the PWI suggested they felt a sense of belonging at the institution but felt a sense of isolation and alienation on the Engineering complex, where Black engineering students are a great minority. Articulated from a race lens, students at the PWI overwhelmingly believed they had to prove themselves worthy of being in the PWI's engineering college. For example, one student said, "But as far as engineering, on the first day you definitely feel like some people are thinking you are out of place. Like, does he know what he is doing here." Another student articulated a similar feeling, saying "You could tell your first day of class, people are looking at you like, why are you here. You don't feel like you belong until you get to know them."

Conversely, students at the PWI said they felt a sense of belonging at the institution, in particularly when they ventured to the university's main campus where a larger number of non-engineering Black students took classes. "But as far as the other part of campus as far as belonging, I feel like that's there to a certain extent because I feel like there's other people that look like me and everything on the main part of campus." Students at the PWI indicated a lack of cultural understanding and that faculty are not sensitive to their academic and cultural needs. One student said,

"I did not go to a good school. So I wasn't prepared for college. My Indian professor laughed at me. It was a simple algebra thing, but he skipped a step. I got confused. I told him to show me, but he said he didn't have time to slow down the class for me and I don't know the way you learn, hahaha. He doesn't understand my race because we come from minority driven schools and our teachers don't teach us pre-cal in middle school and stuff like that."

These preliminary data suggest that students' lived academic experiences differ between a HBCU and PWI. While more data needs to be collected related to students' positive racial identity, the early data is clear when it comes to the different learning environments between the two institutions.

Integration of Racial and Professional Identities

Students from both institutions were well aware of the professional challenges they are likely to face in the future. One of the PWI participants demonstrated grit and determination regarding succeeding in the professional world. He stated, "The thing about being black in engineering, you already probably seen every obstacle before you get up out of here. So I don't think it's anything but myself that can keep me from my goals." His words suggest that being in an institution where he was aware of his numerical and disenfranchised minority status was in some

way enabling him to develop the resilience needed to succeed as a black engineer post-graduation.

Participants from the HBCU also discussed the professional challenges they are likely to encounter in the professional world. As one student stated, "You need to know twice as much as the White American." He went on to add, "I know X amount of material and he knows the same amount of material, but he will be seen as the expert and I will just be seen as a black engineer that works at the same company." Awareness of a lack of equitable treatment in the workplace was shared by several participants from both institutions. This awareness seemed to fuel a determination to face any stereotyping and prejudice in the work-place head on.

Analysis of interview data suggests that being in a culturally responsive learning environment helped energize students at the HBCU institution to challenge and question the sociopolitical inequities in society [31, 32] that stymies the collective advancement of the Black community. This is well explicated in the following quote from the interview with senior engineering students:

"I feel like it's important to me personally to accomplish a goal and be a black engineer. There's so many people that don't believe it's possible or don't believe it's attainable because of the stereotypes. So I feel like if I get through this and I can make it to graduation, which, I will be graduating in a couple days. If I can get out here and talk to two or three people and those people talk to two or three people and say, it is possible, I can be a black engineer. He made it, I can make it. He is black just like I am and can relate to what I had to go through. If I do it, I can inspire five or six more people to do it and they can inspire five or six more people to do it. It can spread from there."

The quote above also suggests that HBCU students embraced the "Black engineer" identity for both individual and community advancement. Students experienced a real need to integrate their racial and professional identity. Indeed, another male student from the HBCU made a point of demonstrating that one can project positive racial identity in a professional setting.

When asked "do you think there are any obstacles you will have to overcome? He responded:

"I would say don't change. Be yourself, even though when we do get in corporate America, that judgment is going to be there. Some people get there and change and forget who they are. I would say never forget who you are. Don't be a fool and not get your job, people are only going to take you as serious as you take yourself. If you look any type of way, when that judgment comes in you can't be mad about it. When you go into an interview, look your best, even if you have dreads. Go in with a clean line up and have it braided back or something. Don't go in with a messy face. Go in like a clean cut, looking professional. So they have to take you seriously, even if you have a strong educational background. Even if you don't have one that as strong as everyone else, go in looking professional like you are supposed to be there."

This statement calls upon his fellow classmates to not forget their cultural roots. His statement also demonstrates that Black identity and professional identity are not antithetical. Thus our second and third hypotheses regarding the integration of participants' racial and professional identities were partially supported. We do not as yet have sufficient data from PWI interviewees

to examine the extent to which they were able to truly integrate their personal and professional identities. In a future paper we will discuss results related to hypotheses two and three in greater detail.

Conclusions and Future Work

The focus group interviews conducted at the HBCU and the PWI provide meaningful insight into the experiences of African American engineering students at the two institutions in the study as discussed in the previous section. The predictions outlined in the Summary of Predictions section appear to have been validated by these preliminary focus group interviews. While we have presented and discussed the results in the context of HBCU and PWI, other institutional factors might certainly contribute to the differences in experiences of the students including institution size and geographic location. It is not clear, for example, whether the supportive environment students at the HBCU report experiencing is in part due to the small class size and low student to faculty ratio. A larger study involving students at HBCUs and PWI of various sizes (large versus small) and types (public versus private) would allow for the decoupling of the effects of factors other than majority-minority status.

For students from underrepresented groups in STEM at both HBCUs and PWIs, it is generally recognized that social capital in the form of familial, peer and mentor support is critical to persistence in their major field of study (e.g.[33]). However, the role that embedded networks within student groups in general and minority engineering affinity groups in particular play in engineering identity formation and student success is not well understood. Previous studies have presented evidence to suggest that a variety of factors affect students' ability to be successful in college. Central among those are student involvement and interaction with campus groups and activities [34]. African American students, in particular first generation students, face a number of obstacles, from the lack financial planning and knowledge about the college process to feelings of isolation upon arrival [35]. While at home, many of these students could rely on networks comprised of family and friends to help them navigate life's rough terrains [36]. In college and away from home, however, in particular PWIs, these students become vulnerable due to an absent or weak supportive and familiar network. For example, McKether et al. [35] showed that African American and Latino students either withdrew from the mainstream population and hung out with people of their own perceived socio-economic class, ethnicity, major, or found solace at the recreation center. This suggests that in an unfamiliar environment, students seek out networks of people that provide them a cultural zone that resembles their home culture. Student organizations such as the National Society for Black Engineers (NSBE) provide such a network that enables African American students to survive life at a PWI. In the HBCU context, groups such NSBE and the networks embedded therein do not necessarily enable survival; however they likely positively impact engineering identity formation and student success.

In the next phase of the current project individual interviews of African American students who are members of minority engineering groups such as the National Society of Black Engineers (NSBE) and students who are not members of any such groups at both institutions will be conducted. Using the conversion method developed by McKether, Riopelle and Gluesing [37] individual student ego network maps as well as whole networks will be examined in context of the narrative interviews to determine the role of the networks in the survival strategy, integration

and success of engineering students in these organizations versus African American engineering students who are not a part of the organizations.

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