AC 2009-1959: INTERNAL MOTIVATION AS A FACTOR FOR THE SUCCESS OF AFRICAN AMERICAN ENGINEERING STUDENTS ENROLLED IN A HISTORICALLY BLACK COLLEGE AND UNIVERSITY (HBCU)

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Internal Motivation as a Factor for the Success of African American Engineering Students Enrolled in a Historically Black College and University (HBCU)

Key words: African American engineering students, HBCU, college student retention, engineering education

This presentation highlights findings from a currently funded three-year research project with the National Science Foundation (NSF). Research for this investigation attempts to underscore the critical factors found to contribute to the success of gifted African American students enrolled in Historically Black College and Universities (HBCUs). The research for this project is contextualized within the broader spectrum of US higher education, in which reports of exponential student enrollment among majority (i.e. White) student populations has been documented while enrollment trends among populations of color—particularly African American college-age students remains relatively low. These enrollment disparities are especially apparent in specialized areas of study such as engineering; thus, it is important to identify key factors and strategies that can counter these apparent deficits. One such area of focus that has shown promise is in the area of student motivation. This presentation will explicate the data and attempt to untangle some of the critical aspects regarding motivation that contribute to the success of African American students in engineering programs who are enrolled in Accreditation Board for Engineering and Technology (ABET) programs within HBCUs.

Literature Review

For years, there have been significant efforts to address the problem of the underrepresentation of minorities among engineering graduates. A review of the 2006 Engineering Workforce Commission data reveals that minorities remain underrepresented in engineering colleges with national degrees: African Americans (4.8%), Hispanic Americans (6.5%), Native Americans (0.05%), and Asian Americans (12.8%).

Research has documented the low numbers of minority students who are enrolled in engineering programs and the potential barriers that have contributed to this shortage. The literature exploring the many factors that contribute to this underrepresentation is vast and includes such factors as the low number of minority students enrolled in engineering disciplines as well as the low rate of students that persist in and graduate from engineering colleges. This study presents the role of internal motivation as a factor for the retention and success of African American students enrolled in engineering disciplines at Historically Black College and Universities (HBCUs).

Retention

Student retention is one of the most widely studied topics in higher education in recent years. Researchers have focused on understanding why some students leave and others persist. Much empirical research on degree completion focuses on the development and testing of theoretical models. Astin and Oseguera describe how these models are diverse
and have changed over time ranging from status attainment models popular in the 1970s, to holistic models popular in the 1980s. Additionally models have focused on issues ranging from pre-college attributes and college experiences to comprehensive studies integrating different theoretical models for different groups—studies that were popular in the 1990s. In summary, the literature has found that retention and consequently attrition are mainly related to intertwined individual, familial, social, and institutional factors.\textsuperscript{2,4} A review of the literature pertaining to college student retention reveals how complicated the path to graduation is for some students. This path is further complicated when taken together with academic performance factors such as income, race/ethnicity, gender, type of institution, faculties, and social integration, and others that have proven to influence college student retention.

To better understand this attrition, retention, and motivation conundrum in a science, technology, engineering, and mathematics context, some studies address the underrepresentation of minority students within these disciplines. For example, May and Chubin\textsuperscript{5} examine the various factors that contribute to the success of minority students in engineering programs. These researchers relate student success with pre-college preparation, recruitment programs, admission policies, financial assistance, academic intervention programs, and graduate school preparation and admission. Although a significant contribution to the literature on engineering students, unfortunately this study as do many others\textsuperscript{5,6} combines the results across multiple minority groups and multiple science, engineering, and mathematics disciplines thus failing to identify nuances associated with particular subpopulations (e.g. African Americans). Consequently, there are few studies\textsuperscript{7} that examine the academic experiences of individual groups. Furthermore, the studies cited above also do not broadly consider the uniqueness of institutional context—contexts like HBCUs.

Motivation

Similarly, to college student retention research, a great amount of studies on motivation, and its relationship to academic achievement are found in the literature. Generally, intrinsic motivation refers to personal factors such as interests and enjoyment, while extrinsic motivation refers to observable factors such as rewards or punishments, and peer pressures. Findings suggest that students who are primarily intrinsically motivated persist longer, seek more challenges, and have higher academic outcomes.\textsuperscript{8,9,10} A recent study\textsuperscript{11} on intrinsic versus extrinsic goals and their impact on the quality of academic motivation reveals that intrinsic goals produce deeper engagement in learning activities, better conceptual learning, and higher persistence at learning activities. Compared to the numerous studies on motivation and academic achievement among majority populations, there is little research that has focused on motivation among African American college students cohorts. Consequently, the scant learning and motivation literature that does focus on African American students is largely based upon very limited research. Research\textsuperscript{12,13,14} suggests that African American students tend to display higher levels of external motivation in comparison to their White counterparts; however, these past attempts to understand the motivation of African American students do not consider those
students succeeding within their academic programs. Due to this the research concerning this group has likely been at best incomplete and at worst inconclusive.

In summary, there has been a great deal of research that has primarily focused on the underachievement of African American students.\textsuperscript{5,6,12} However, this approach is what has often been referred to as a deficit approach\textsuperscript{15}, sidestepping the academic achievements experienced among gifted African American populations—particularly in the field of engineering has the lack of focus on success been promoted.

The discipline of engineering has historically witnessed an underrepresentation of African American as well as other students of color in the various program areas. Although the number of students in these areas is increasing (EWC), there still remains an enrollment and graduation rate disparity. One plausible explanation for this disparity is the limited experience and exposure that many students of color are likely to have to the engineering profession. In essence, engineering represents a certain degree of foreignness to these students who have not had family, friends, or role models who are engineers. Perhaps due to the foreignness of this discipline and the lack of support that many students may face, as students of color in their respective institutions, departments, and/or programs may have to assert their internal motivational skills to aid them in not only continuing on in their programs but also being successful in a field and discipline that for many in their background view as a foreign land.

This study contributes to our understanding of why African American engineering students in an HBCU remain in and graduate from their respective programs.

**Methodology**

This manuscript highlights the findings of the initial phase of a three-year funded research project with the National Science foundation (NSF). Research for this project attempts to underscore the factors that contribute to the success of gifted African American students enrolled in Historically Black College and Universities. In the initial phase of this investigation participants included students enrolled in one of the largest HBCUs in the nation and represented several of the fields within the college of engineering. The methodology used in this study was exploratory and descriptive with the intent to identify and describe the experiences of African American students in an HBCU institution and the role of internal motivation in their persistence and success in school.

For this qualitative study, the investigators were the primary data-gathering instrument, in accordance with the constructivist methodology that states “The researcher, by necessity, engages in a dialectic and responsive process with the subjects under study”.\textsuperscript{16} Data were collected from interviewing students in two focus groups. The researchers conducted semi-structured interviews guided by a set of questions and issues to be explored. This format allowed the researchers to be flexible and to explore issues that arouse and were not considered before the interviews. Participants of these focus groups were selected based on recommendations from faculty and administrators at the college and in all cases...
were considered high achievers for their academic achievement. High achievement was defined by the investigators as having a grade point average (gpa) of 3.0 and above. Additionally interviews with faculty were conducted at the institution.

The data collected in this study was primarily analyzed using the constant comparative method as described by Strauss and Corbin\textsuperscript{17}, and also found in Creswell\textsuperscript{18}. After transcribing the data and reading each interview many times, the data were unitized giving each unit a code which consists on the pseudonym of the participant and a consecutive number. The second step in the constant comparative method is called axial coding and consists in relating categories to their subcategories to form more precise explanations of the phenomena; the term axial is used because coding occurs around the axis of a category\textsuperscript{18}. (Initial categories were formed based upon the type of student experiences such as success factors, challenges, relationships with peers, faculty and institutions, etc. The final process of coding consists in interrelating categories, or the process of integrating and refining categories at a higher level of abstraction\textsuperscript{18}. This process of coding data was completed with a group of researchers working together. The researchers discussed and analyzed each unit and assigned it to one of the emerging categories. Sixteen broad categories emerged from this analysis including faculty support, teaching, family, peers, administration, financial, instructional support, environment, passion, self-motivation, having a purpose/vision, perception/knowledge of engineering, networking, internship, employer support, and high school experience. This paper only seeks to underscore student responses related to internal motivation.

One of the limitations of this study includes the fact that the students interviewed were enrolled in one HBCU institution. This study is considered a part of the broader research.

**Findings**

Eight students from two focus groups provided answers to a series of questions concerning their academic success as high achieving African American students in an engineering discipline during an in-person interview. The two specific questions that will be focused on with this data are: Question 2: when you think about your past experiences and the activities inside and outside of school; what would you identify as the most important factors that have contributed to your success as a high achieving student? Along with question 3: If you had to identify the most important academic factors that contribute to your academic success as a high achieving gifted African American/Black student enrolled in an engineering discipline what would you include?

**Results**

*Factors contributing to the success of high achieving students*

Participants in two student focus groups were asked to identify the most important factors that had contributed to their success as a high achieving student. Preliminary results of the study revealed that many of the students attributed their academic success to a variety
of internal motivational factors. These factors were described by the students as having an impact on their success as high achieving African American male and female students in their respective engineering programs. One such factor included the role that self-motivation plays for these students. One student described self-motivation as a factor that helps him persevere through his program:

That’s when that self-motivation comes you just got to keep going so that one day I can graduate and get a good job. You know take everything I learned and apply it to my career and my life and my family.

An additional example of self-motivation playing a role in the success of these students can also be seen from another student’s comment. He described self-motivation as

…self-motivation it comes together and you know it’s important so you give it your all so you can do your best in it. So that’s what helped me through.

Another internal motivational factor that students attributed to their success was having a passion for what they did. It was noted in the student groups that from their perspectives engineering was not a profession that should be sought after simply for the monetary gains. One student asserted, for instance:

When it comes to money, if you’re doing something you love it won’t matter how much money you make. That’s a big thing in engineering. Cause if you work to make the money it ends up not working for them.

In this quote, congruent with the literature, the student reflects in how the enjoyment and passion for the work, considered an internal motivational factor is more rewarding that the money itself which is seen as an external motivational factor.

In addition to self-motivation and passion as internal motivators, some participants also included how their individual visions and purposes for the future aided them in maintaining their academic success. One student stated for instance,

I think one big focus that we need is to figure out what we want to do when we grow up. If you know that before entering college it will be easier for you to matriculate through because you have your purpose and focus and goals and you just have to figure out how do I get to my goal. And that’s the path with going to college.”

Similarly, another student support this idea by stating,

With me I always knew my goal was to construct buildings; something that will be here eons after I’m gone. I just didn’t know exactly what course description I had to go through to get there. And when I graduated high school I went into architecture. I took classes and it’s mostly drawing and I know that I’m not a good artist but I just knew...oh how many math classes am I going to have to take...
cause I’m ready. I’ve been taking calculus in high school and the highest math was trigonometry and I’m like wait a minute this doesn’t sound right. But I came back home went back to my basics and I knew I loved physics. I came here actually as a physics major and I walked into this building one day and that was it!

A final comment provided by another student further illustrates how vision and purpose guide his future,

Even when I was asking high school students and we were recruiting it wasn’t mainly what major do you want but what do you want to do with your life? What are you interested in? Where do you see yourself?

Summary, Conclusions, and Future Work

The results presented in this study are preliminary in nature and focus on one component factor contributing to the academic success of high-achieving African American students in engineering disciplines in HBCUs. With respect to the overall responses regarding internal motivation as a success factor, it was evident that students felt strongly that a variety of factors such as self-motivation, having passion for what you do, along with having a purpose and vision played an important role in their academic success. The significance of these initial results can prove to be beneficial in circumventing the persistent low production of African American students graduating with engineering degrees, the small percentage of these student populations entering engineering majors, and the overall low retention rates of these students—particularly among those who are identified as academically gifted (high-achieving). It is also significant in that this research identifies factors to better understand how to structure successful collegiate experiences for these student cohorts. Ultimately one of the goals of this project is to provide tangible data that will assist higher education institutions in their efforts to develop recommendations that they, along with internal and external policymakers, can follow to achieve and maintain significant increases in the number of academically gifted African American students who graduate with engineering degrees. Data can also be used to specifically gain a better understanding of the motivational factors found to influence the retention and success of academically gifted students of color in engineering disciplines.

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