The Role of Tech Corporations at Historically Black Colleges and Universities in American STEM Education

Completed Research

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Abstract

This paper adds to the growing body of knowledge of STEM Education, particularly the role of technology corporations at Historically Black Colleges and Universities. The issue raised is where the barriers exist for technology corporations, how these companies can integrate themselves in the educational space and the benefit for students. We posit that a STEM Partnership Framework can help define these boundaries and easily demonstrate how STEM Education and technology firms can better assist each other with knowledge transfer. Finally, we conclude with research questions that could be explored for the effectiveness of technology partnerships with HBCUs and a description of the Social Cognitive Career Theory that could be employed to explore this emergent research area.

Keywords (Required)

Historically Black Colleges and Universities, HBCU, Silicon Valley, Science, Technology, Engineering, Mathematics, STEM, Tech Corporations, Google, Tech Industry, Diversity, Underrepresented Minorities, Howard West, Faculty in Residence, Diversity of Thought, Race, Ethnicity

Introduction

In the United States, emphasis has been placed on Science, Technology, Engineering and Mathematics (STEM) as fields that are the pathways to success for the next generation of scholars and leaders. Historically Black Colleges and Universities (HBCUs) graduate a third of all Black graduates in the STEM fields. However, technology companies have largely inadequate diversity numbers, specifically in terms of Black employees, in the country. Black students are choosing STEM - in particular technology and engineering - as career options but are finding significant roadblocks to employment upon graduation at some of the most sought-after employers in Silicon Valley (Ford, 2015; LeMelle, 2002; Lum, 2017). As a result, diversity has become a focal area and goal for many tech firms. Some technology firms have created partnerships with HBCUs to gain access to students and faculty, but the results of these initiatives may not be realized for several years, perhaps decades (Holtzblatt, Balakrishnan, Effner, Rhodes, & Tuan, 2016; Lum, 2017). Therefore, the role of corporations in educating and having access to students requires further investigation. In response to the diversity issue in the tech field, partnerships can be created that place HBCU students and faculty in a unique position to address the needs of Silicon Valley, while also ensuring that academics remain in control of the context and content disseminated to their students.
Historically Black Colleges and Universities

HBCUs were founded on the premise of providing Black Americans a place to receive a quality higher education at time when the educational system in the United States of America was still segregated (LeMelle, 2002; U.S. Commission on Civil Rights, 2010). Prior to the establishment of HBCUs, Blacks were typically denied admission to traditionally White institutions. As a result, HBCUs were birthed, not from an aspect of choice, but one of need. During the Civil War, there was no system for higher education available for Black students. Antiquated laws prohibited Blacks, in some parts of the country, from receiving any type of education. The first HBCU was the Institute for Colored Youth, now Cheney University, which was founded in 1837. Following Cheney were Lincoln University (1854), and Wilberforce University (1856) (LeMelle, 2002; U.S. Commission on Civil Rights, 2010).

Although the aforementioned schools were called universities, it was not until the 1900s that HBCUs offered curriculum at the postsecondary level. Prior to the 1900s, HBCUs existed to teach Black students who, up until that time, had been barred any formal education. The 1896 United States Supreme Court ruling in Plessy v. Ferguson established the precedent, in public education, that racially segregated schools did not violate the Fourteenth Amendment and therefore Black schools were deemed "separate, but equal" to White schools, despite the preponderance of evidence that Black schools lacked access to the same resources. It was not until the 1954 ruling by the United States Supreme Court in Brown v. Board of Education where the "separate but equal" doctrine was rejected on the basis of Black children not having access to equal protection as afforded by the Fourteenth Amendment of the United State Constitution. Despite the ruling in Brown v. Board of Education, HBCUs continue to serve all students, particularly Black students, in their pursuit of secondary education and degree attainment (U.S. Commission on Civil Rights, 2010).

HBCUs in the 21st Century have experienced a fundamental shift from the origin of their founding. Which, to be clear, does not depart from their original mission, rather broadens the breadth of that mission. Today, HBCUs play a critical role in producing the vast majority of Black Science, Technology Engineering and Mathematics graduates (Lum, 2017). There are over one hundred HBCUs in the United States, which accounts for 3 percent of colleges and universities, yet they produce twenty-seven percent of Black students with bachelor's degrees in STEM fields. By 2022, the United States will need to add more than 1 million STEM professionals to meet projected workforce needs. Additionally, the IT and Engineering industries in the United States are struggling to diversify their workforce – in which, Blacks are woefully underrepresented. By this account, a two-fold issue is revealed: a problem in academia, by which 3 percent of the colleges and universities produce twenty-seven percent of Black STEM graduates, and a problem in society, whereby STEM, and in particular IT and Engineering, fields continue to lack diversity (U.S Census Bureau, 2013; U.S. Department of Education, 2013; U.S. Department of Labor, 2018).

Tech Firm Diversity and HBCU Involvement

The United States Department of the Interior - Office of Civil Rights (2010) defines diversity as, "a term that is used broadly to refer to many demographic variables, including, but not limited to, race, religion, color, gender, national origin, disability, sexual orientation, age, education, geographic origin, and skill characteristics. America's diversity has given this country its unique strength, resilience and richness." However, statistics show that diversity based on race/color and gender within STEM is particularly low (Cain and Trauth, 2017; Cain and Trauth, 2016; Cain, 2016; Trauth, Joshi, Morgan, Payton and Yarger, 2016; Carter and Glover, 2015).

It is commonly understood that diversity in a group of people (team of engineers or developers) refers to demographic characteristic uniqueness among team members, unique cultural identities or characteristics related to ethnicity. In addition, diversity is at times referenced in terms of differences resulting from educational and environmental background. The changing demographics within the US mandate that for companies to remain competitive, they must have a strategic plan to court customers in the evolving market by including diversity of thought in product and service development (Epstein, 2017; Olbrich, Trauth, Niederman & Gregor, 2016). Engineering operations will also require that teams are composed of great talent and diversity to enhance the workplace and help avoid "groupthink" situations (Mehta & Fine, 2012). While diversity is frequently viewed through the lens of either gender or ethnic minority, what companies have chosen to aim for is a diversity of life experiences to contribute to solving a problem and/or building a product (Trauth, Cain, Joshi, Booth & Yarger, 2016).
In many American technology companies, racial and gender diversity continues to be an ever-present issue. According to diversity reports, Facebook, which includes subsidiary, Instagram, has an ethnic makeup that is 2 percent Black. YouTube and Google comprise of a workforce that is 3 percent Black. Amazon, Apple and Dell employ 13, 12 and 11 percent Black workers, respectively (Wells, 2016; Quick, 2017). While these numbers are sparse, not all diversity reports include a breakdown of the percentage of Black employees who are employed specifically in technical roles (Wells, 2016). Diversity is crucial as people of different cultural, ethnic, religious, and societal backgrounds bring their various experiences with them when they come into the workplace (Gluckman, 2017). The more diverse the employee makeup, the more perspectives that can be applied to any given principle or concept (Neiderman, Ferratt & Trauth, 2016; Olbrich et al, 2016). This is exemplified when companies such as Google realize the value of diversity, but struggle in their own recruiting and retention efforts, as indicated by their 3 percent Black employee makeup (Quick, 2017). In the same respect, Google demonstrates and understanding that partnerships with HBCUs, which produce a third of all Black STEM graduates, could prove valuable partners in their continuous efforts to address racial diversity (Lesesne, 2013).

In the summer of 2017, Google Inc. and Howard University, an HBCU, partnered to launch a pilot program, Howard West (Surratt, 2017; Guynn, 2017; Powell, 2017). Howard West was an experimental program that was designed to immerse students in the Silicon Valley and hi-tech culture. Students would have the opportunity to learn about how one would go about securing a tech job at Google in addition to the ins and outs of the Google campus and culture. In doing so, students would have their technical competence and confidence bolstered by participating in the program (Surratt, 2017). During the pilot, twenty-six juniors and seniors majoring in computer science spent twelve weeks at Google receiving joint instruction from Howard University Faculty and Google Engineers. Students enrolled in four courses, receiving up to 12 credits, during the 12-week period: Software Engineering, Fundamentals of Algorithms, Machine Learning and Mobile App Development. Additionally, students visited neighboring Silicon Valley companies such as PayPal and Facebook and participated in technical interview preparation hosted by Google engineers to better equip students to perform well on internship level technical interviews (Guynn, 2017; Powell, 2017). Google’s diversity report shows that Black employees only makeup 1 percent of their technical workforce and 3 percent of their total workforce (Guynn, 2018).

Recently, Howard University and Google have announced that they would continue their partnership and expand Howard West to encompass a full academic year. Beginning with the Fall 2018 academic year, students from Howard University will have the opportunity to take courses and live in Silicon Valley full time. The goal is that by immersing students in Silicon Valley, a place where few Black students have had the opportunity to spend significant time, the outcome will yield tangible results in hiring for Google as well as provide Howard University students exposure to the Valley’s unique environment. Additionally, Google aspires to encourage additional HBCUs to join Howard University students in Silicon Valley as well (Guynn, 2018; Frederick, 2018).

Howard West is not the only program that Google has invested in in their attempt to address diversity issues. In the summer of 2017, Google also piloted their Faculty-in-Residence program. Similar to Howard West, the Faculty-in-Residence program aimed to bring faculty to Silicon Valley from minority serving institutions, such as HBCUs. The Faculty in Residence pilot program had over 30 Computer Science faculty members from over 20 institutions. The aim of the Faculty-in-Residence program is for Computer Science faculty to partner with Google to develop curriculum that would better align with some of the latest trends in software development and engineering. Another aim of the Faculty-in-Residence program is to familiarize participants with project-based learning, which is a teaching style that centers on the student in a cooperative environment with an emphasis on developing skills through practice (Capraro, 2016; Capraro, RM, Capraro, MM & Morgan, 2013; Smith, 2016; Mehta & Fine, 2012). Faculty were also trained in conducting technical interviews, similar to Google’s technical interviews, and were asked to conduct those types of mock interviews on a routine basis with students at their home institutions (Guynn, 2018).

While these initiatives are but a few, they show promise and highlight the steps that Google is taking to address diversity issues in terms of workplace composition. However, it poses a significant risk to the academic culture and risks alienating other corporations from targeting the same pool of students, if employers believe that a student is already biased towards Google.
In regards to the academic culture, the bias is that faculty members may begin to alter their curriculum to prepare students to work at Google as opposed to receiving a more well-rounded educational experience necessary to position students competitively regardless of company. To address some of these concerns, especially with respect to corporate culture, a partnership should be created between universities, departments, and colleges, as well as corporations to define boundaries, foster collaboration, and promote project-based learning.

**HBCU Framework supports Partnerships Between HBCUs and Tech Firms**

Today, some Tech firms are beginning to increase relationships with HBCU’s to address issues with the skills gap, the aging workforce, and the lack of cultural diversity. The focus on STEM is central to addressing this industry need and the creation of greater technical opportunities (Addae, Singh, & Abbey, 2014).
STEM Partnership framework demonstrates how HBCU’s are designed to foster STEM related courses, interdisciplinary projects, and develop students who are prepared to increase diversity in the workforce. Howard University’s network of schools provide an organic scheme designed to expose students across multiple colleges with curriculum and course offerings designed to strengthen STEM. This framework, also demonstrates how departments provide classes that prepare students for industry jobs, in turn offering them the opportunity to take courses in various schools over the duration of their respective programs. A student majoring in Information systems will be exposed to thirteen (plus) STEM related courses over a period of eight semesters in minimum of three schools. Essentially, graduating seniors are prepared to pursue a successful career in software engineering, corporate infrastructure, and research and development. Most HBCU’s have smaller campuses creating a cohesive network of students and organizations; which, mirror corporate campuses and cultures. As the curriculum in Engineering and Business schools evolve to include increased STEM offerings, this creates greater synergies around interdisciplinary knowledge building, diversity of exposure, and research opportunities. HBCU’s already have an inclusive climate which can be further enhanced by corporate resources to support students who are not only ethnically diverse, but also equipped with complex skill sets which are well-suited for STEM broadly, and technical careers specifically (Adhikari, Bliese, Davis & Halawi, 2014).

Figure 2. STEM Partnership Framework

Discussion

As with any initiative that stirs the emotions of the affected, there are alternate opinions about the role of diversity in tech that run contrary to this paper. An ex-Google engineer penned a ten-page document in August 2017 expressing his discomfort with Google's efforts to diversify in terms of race and gender. He attempted to explain away the difference between men and women employees at Google as biological and went on to state how offended he felt about Google offering programs for underrepresented minority groups. Sadly, he is not alone in terms of his thoughts. His belief is that Google hiring underrepresented minorities is in effect devaluing the work he does personally and at Google as a whole (Weise, 2017a; Weise, 2017b). These types of issues require conversation, education, and intervention (Emerson & Matsakis, 2017).
Diversity is certainly necessary, but perhaps more important, the rationale for diversity should be communicated and supported. Diversity needs to be explained, not as a mission to lessen the majority, but rather an effort to expand the ideas that are crucial to the development of useful and successful products and services. Additionally, people of different backgrounds, whether based on gender, racial, or ethnical differences, add value to projects and helps foster creativity. When there is a lack of communication around why diversity is highly sought after, then the potential exists for the creation of an air of discomfort as though the majority is at risk because people who perhaps share different values are being hired. From 2014 - 2016, the employee composition at Google has remained 2 percent Black. Over the same timespan Google has moved from 30 percent to 31 percent women. And while yes, Google has moved from 61 percent White to 59 percent White, its employee base is still overwhelmingly composed of White males.

If we acknowledge that diversity of cultures and thought are key to diverse product offerings, then we can see why partnerships such as those created between Google and HBCUs have the potential to be effective. Google is making a concerted effort to ensure that those from underrepresented groups that are being hired can perform the work that is expected of them, thereby ensuring the quality of new hires remains high. Additionally, Google is equipping faculty with the tools necessary to teach students the techniques needed to pass rigorous technical interviews, which is a trait that is useful regardless of tech company. Since HBCUs graduate a third of all Black STEM majors these colleges and universities are an excellent place to concentrate diverse recruiting efforts for tech firms.

Furthermore, if the partnership which exists between University Engineering departments and Google is extended, and a similar structure is applied to Colleges of the Arts, Science, Business, and Humanities we may begin to see a proliferation of the diversity of thought among HBCU students that takes into consideration project-based learning. This type of knowledge that is useful to work on interdisciplinary projects that prepares students for the workforce. Additionally, mechanisms can be created that allow corporate structures to access students in a controlled environment to assist faculty in enhancing their curriculum with knowledge of the evolving corporate landscape.

**Conclusion**

There is much left to be understood in the process of diversifying the tech industry. Despite efforts that have been developed, communication about the efforts and intent of the corporations will be key to ensuring the message is well received among all interested parties (i.e. employees and potential employees). Additionally, corporations and educational institutions, while on the surface may appear to have common goals, they often have competing agendas and different measures of success. For example, a corporate goal might be increased hiring within their tech departments and on technical teams. However, for universities, their measure of success may be whether a graduate secures employment within their major, technical or non-technical; or whether the graduate successfully was admitted to and enrolled in a graduate program. Despite differing measures of success, it would be prudent for HBCUs to partner with corporations to allow a level of access to students that may not exist otherwise. HBCUs are positioned to continue to produce, at minimum, a third of all STEM graduates, potentially more.

By leveraging HBCU’s Partnership Framework, universities have provided an infrastructure to continue the development of qualified students through this pure STEM model. Students are placed in the correct curriculum, courses, and projects which in turn effectively grow and prepare students for the industry. As an interdiscplined approach to learning, the Partnership Framework is scalable to grow with the revolving demands and constant changes in the industry, which are not limited to people, organization (culture), and technology. This framework also leads to future opportunites to extend STEM research and increase exposures to other majors to propogate this model horizontally across other academic departments and schools to include Graduate and Post-Graduate programs.

Students attending HBCUs, sometimes find it challenging to take courses for which they are interested but are offered in a college that differs from the one by which the student is a major. Therefore, opportunities may also exist to further expand the pipeline for HBCUs to include more majors in their STEM outreach to outside majors with a focus on project-based learning. Furthermore, providing insulated opportunities for failure, in which students learn from mistakes is crucial. Researchers also have an opportunity to collect data to begin to address some critical research questions, chief among them are:
• What experiences defined the perception (of students and faculty) of the Howard West program (or programs like it)?
  ○ Did the perception change over the life-cycle of the program?
• Based on your University-corporate partnership experiences, how likely are you to enter into the tech industry in a technical capacity?
• Was there an impact on your technical capabilities as a result of your experience at Google (or similar corporate entity)?
• After the completion of the partnership experience, has your interest in tech companies been affected?
• Are there opportunities at your institutions to disseminate your lessons learned among your peers to better prepare them for careers in the tech industry? If not, how can those opportunities be created?

Beginning to explore the aforementioned research questions with participants of the pilot study (i.e. Howard West) would shed light on program effectiveness. By understanding how to optimize the partnership experience and replicate it among HBCUs and tech organizations, it is possible that minority students will be more likely to select careers in tech firms. This then provides an opportunity to make lasting impact to the diversity issue in Silicon Valley and other tech spaces.

In order to further investigate these research questions a qualitative research study would best support understanding the experiences of the students and faculty involved in the partnership. Conducting either focus groups or in-depth interviews would allow the participants in the programs to voice their experiences about their perception of the program, their technical efficacy, the impact of the experience, and their perceived career trajectory. All of which could provide useful touchpoints to continue to ensure that these types of programs achieve their desired outcomes. A theoretical orientation that could help to understand the findings from this inquiry is Social Cognitive Career Theory (SCCT) (Lent et al., 1994). SCCT evaluates the interconnection between individual, environmental, and behavioral attributes which are connected to choices in academic and career pursuits. The theory has been used to study STEM choice and would be appropriate in this type of study because the factors that encompass the theory include entities such as self-efficacy beliefs, outcome expectations, interests, environmental support and barriers as well as choice actions (Lent, Sheu, Gloster, & Wilkins, 2010). All of which are relevant factors to better understand the University corporate partnership and its subsequent outcome and effect on participants. This type of evaluation is just the beginning of addressing the skills gap and the long-standing diversity issue in the technical career space. Arming HBCUs with the proper knowledge, implementation process, and partnership support could be key in working towards a solution for this problem.

Acknowledgements

Pursuing this research would not be possible without the contributions of Howard University and the National Science Foundation (Grant No. DGE-0750756), we are grateful for your continued support and commitment to this research.

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