Black Males in IT Higher Education in The USA: The Digital Divide in the Academic Pipeline Re-visited

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ABSTRACT

Results of a field study of the influences on Black male undergraduate students' participation in IT fields at a Predominately White Institution and Historically Black College and University are presented. This analysis shows how inadequacies within the academic pipeline present themselves as barriers to success for Black students. The findings are evidence that despite barriers Black students are not giving up on the Information Technology discipline despite the low number of Black professors at PWIs and HBCUs. The digital divide is once again shifting from usage to empowerment. Stereotype threat is threatening Black identity as Black males try to adapt to a field in which they are vastly underrepresented. A logical next step for researchers is to identify ways in which Black students are being affected by these inequalities. These findings indicate that Black students are disadvantaged in IT fields and steps must be taken to ensure they do not remain victims of a leaky academic pipeline.

Keywords

Men, Individual Differences Theory of Gender and IT, Masculinity, Digital Divide, Race, Academic Pipeline, IT

INTRODUCTION

The underrepresentation of Black males in the Science, Technology, Engineering and Mathematics (STEM) and Information Technology (IT) is a problem in academia and our society. Cultures need role models and mentors for its youth (Blake & Gilbert, 2010). The concept of identity and seeing oneself in a role opens the door to the possibility of one assuming that role. Underrepresentation in STEM is such an important topic of concern for the United States of America that the National Science Foundation (NSF), funds both research initiatives, such as Gender in Science and Engineering (GSE) and Information Technology Workforce (ITWF), and intervention initiatives, such as Computing Education for the 21st Century (CE21) and Broadening Participation in Computing (BPC), aimed at decreasing underrepresentation.

While the NSF has numerous programs, both research and intervention based, that seek to address the concern of underrepresentation of minority groups, there is a dearth of research that confirms that these programs are addressing the right issues of underrepresentation. In this paper we draw upon pilot data for a larger study, which consists of semi-structured interviews with Black male students from two institutions, a Predominately White Institution (PWI) and a Historically Black College and University (HBCU), to examine in greater depth the barriers facing Black male students pursuing degrees in IT. The purpose of this paper is to add to our understanding of issues related to the academic pipeline which contribute to underrepresentation within the IT field from the perspective of Black male undergraduate students currently pursuing degrees. The findings from this study will add to the growing body of knowledge of minority groups within the IT field and inform subsequent interventions. To accomplish this goal, we begin by reviewing literature related to the digital divide, the academic pipeline and stereotype threat as they relate to Blacks.

LITERATURE REVIEW

According to Mossberger, Tolbert & Stansbury (2003), the term digital divide, coined in the mid-1990s, describes patterns of unequal access to Information Technology (IT). Unequal access to IT was based on varying socioeconomic factors, such as education, race, gender, age and income. Blacks have historically been much less likely to have access to personal computers and thus have felt the greatest impact of the digital divide.

Digital inequality on the other hand takes the digital divide a step further. It references not only differences in access, but also inequality between persons with "formal" access to the Internet (DiMaggio & Hargittai, 2001). Formal access is defined as computer ownership and internet access. They found that as Internet penetration increased and access to the Internet was becoming more widespread and abundant there was a new type of inequality that related to differentiation between groups of people. He suggested that the digital divide must be expanded beyond a binary view, those who have and those who do not. It also needs to include critical dimensions of inequality. They continue by positing that society is the source of digital inequality and policies should be enacted to combat inequality.

Indeed, researchers have studied how the digital divide and digital inequality influence underrepresented minority groups. For example, Kvasny & Keil (2006) conducted a case study in two Georgia cities, Atlanta and LaGrange, in response to the cities' attempts to readdress the digital divide. Atlanta's initiative was to implement community-testing centers[1] while LaGrange provided Internet with a set-top box[2]. Their findings indicated that inequality was reproduced due to the lack of a mechanism that extended beyond access to usage. Their findings were similar to those found in DiMaggio & Hargittai's 2001 study. Other studies have concurred with these findings that inequality exists socially, which deepens the issues of the digital divide (Kvasny, 2002).

Scholars have replicated the results from Kvasny's (2002) and Kvasny & Keil's (2006) studies, which show the digital divide continues on today, but in a different form. Today's digital divide is not about access, but rather about empowerment (Jackson, Zhao, Kolenic, Fitzgerald, Harold & Von Eye, 2008), something that is used to define the next phase of the digital divide. Empowerment references a shift from access and use to educational, workforce and societal gain. It is more than having access to social networking sites, such as Facebook, or using. It is being able to use the Internet and digital technology to communicate, access information, and engage in commerce.

Jackson et al.'s (2008) study of 172 Black children found that there are differences in how people of different ethnicities use the Internet and to what extent. They found that Black males use the internet less intensely than Whites, Latinos, and Black females. Intensity refers to the ways the Internet is used and for how long. The study also found that IT use predicted children's academic performance and that length of time using IT and the Internet was a positive indicator of academic performance. In contrast, Black females were the most intense users of cell phones and use the Internet in more diverse ways than other groups. These findings suggest that Black males may not view IT as a field that they associate with. Jackson et al also found that Black females embraced technology in diverse ways, leading all groups in text messaging, searching the Internet for information, as well as searching for health related information. Conversely, Black males lag behind other groups in IT usage with one exception: video gaming. This study emphasized that research and interventions should bring together culturally relevant tools to increase representation of Black males in computing and increase their level of technical awareness. Surveys seem to suggest greater connectivity among Latinos and Blacks, but a greater percentage of Whites report having broadband access at home, which the Pew Research Center and Neilsen's Research Group have also found.

According to recent Pew Surveys, *Social Media & Mobile Internet Use Among Teens and Young Adults* (Pew, 2010a) and *Mobile Access 2010* (Pew, 2010b), mobile technology has changed the landscape of IT. Latinos and African Americans are more likely than the general population to access the Internet via cellular devices. However, despite the increase in mobile technology among underrepresented groups, the same research found that even with increased access to technology there is continuing segregation among ethnic groups online that correlates to the physical world (i.e. not venturing outside of ones cultural comfort zone). Segregation is inclusive of biological factors such as race and societal factors such as socioeconomic class and education. Researchers' findings suggest that segregation online and correlates to the physical world could be a hindrance to cross cultural learning. Researchers have also found that minority groups are more likely to use their cellular devices for entertainment purposes rather than empowerment. Aaron Smith, a Pew senior research specialist, says there are obvious limitations on what you can do on a mobile device with updating a resume being the classic example. "Research has shown that people with an actual connection at home, the ability to go online on a computer at home, are more engaged in a lot of different things than people who rely on access from work, a friend's house, or a phone," (Pew, 2010a,b). The combination of issues of mobile technology usage and the deepening of the digital divide, put the focus on the academic pipeline as a mechanism to decrease inequality in IT.

The academic pipeline has been the topic of contentious debate in a variety of different contexts. The academic pipeline refers to how individual, environmental and institutional factors influence, hinder or divert one from reaching a goal (Margolis, Estrella, Goode, Holme & Nao, 2008). There are numerous versions of the pipeline for various subsets of the population. Researchers have studied pipelines related to minorities and women for completion of secondary, post-secondary, graduate and professional education (van Anders, 2004; Gallien & Peterson, 2005; Evans, 2001; Hopkins, 1997).

Literature referring to leaks within the academic pipeline references the limited number of women and minorities in STEM disciplines (NSF, 2007; NSF, 2009). A 2003 study by Jackson using national databases discovered that there are wide gaps

[1] Community-testing centers were part of an Atlanta initiative to bring computers, internet access and basic computer literacy training to low-income neighborhoods
[2] Set-top boxes were internet TV boxes. These boxes gave residential users Internet access via a box similar to a cable TV box.

between African American males' and White males' educational attainment beginning with high school (Jackson, 2003). Margolis et al. (2008) posit that America struggles with a stratified intellectual class system for which there are unintended consequences of well-intended policies at every level. They position the argument of inequality as the access and denial of access to Information Technology (IT), satisfactory educators and resources. They state the lack of the aforementioned resources, which are based on race, sex and socioeconomic status becomes the accepted norm. For minority groups the pathway to goals and educational attainment are less than straightforward and stereotypes are more than prevalent (Peckham, Harlow, Stuart, Silver, Mederer & Stephenson, 2007).

Research on stereotypes has shown that minorities are susceptible to stereotype threat (Steele, 1995; 1997; Hamilton, 2009). Stereotype threat is defined as being at risk of confirming, as self-characteristic, a negative stereotype about one's group. In essence, stereotype threat is an internal characteristic (Hamilton, 2009). The presence of an actual stereotype may not exist but the individual is responding in a way that it is. Steele's (1995; 1997; 2010) work has shown that stereotype threat is the greatest hindrance to Black student success. Furthermore, stereotype threat causes Black students to behave more aggressively, for fear of being stereotyped (Hamilton, 2009). Stereotypes and stereotype threat have longstanding ties to the digital divide.

Two problems result from IT being a predominately White male field. First, since there are fewer Black men and women in IT, their perspectives may not be brought to the forefront in policy, instruction, learning style and administration. Second, Black men and women may have a more difficult time adjusting to the profession due to a lack of identity affiliation (Jackson et. al, 2008). Given the current economy, careers which can offer lucrative pay and opportunity are more important than ever. Blacks only represent 1.6 percent of those working in IT-related occupations, which can offer lucrative job opportunities (U.S. Department of Labor, U.S. Bureau of Labor Statistics, 2011). The culmination of these issues motivates a need for a better understanding of the ways in which academia is cultivating and nurturing the needs of Black male students pursuing degrees in IT. With this in mind, this paper focuses on the following research question: *What are the societal, environmental and institutional influences on Black male students in IT disciples?*

METHODOLOGY

The nature of inquiry for this study was interpretative. An interpretative epistemology and qualitative methodology were employed due to the research question being focused on understanding the phenomenon of underrepresentation within the IT field. An interview-based investigation of Black males was conducted to identify how individual identity, individual influences and environmental influences affect the academic pipeline for Black male students. Semi-structured interviews were employed, which were informed by the Individual Differences Theory of Gender and IT. Semi-structured interviews would be a benefit as they allow flexibility to add to the interview guide based on responses from participants to broaden and deepen understanding (Hsiung, 2008).

Individual Differences Theory of Gender and IT

The Individual Differences Theory of Gender and IT, consists of three major constructs to explain gender variation in participation in the IT field: individual identity, individual influences, and environmental influences (Trauth, Quesenberry and Huang, 2009; Morgan, 2008; Quesenberry, 2007). The individual identity construct as one that consists of two sub-constructs: personal demographics and career items. This construct was applied in this study by analyzing ethnicity and family. The second construct, individual influences, consists of two sub-constructs: personal characteristics and personal influences. This construct was applied in this study by analyzing the presence, or lack thereof, of mentors and role models for Black males. Lastly, the environmental influences construct consists of four sub-constructs related to the geographic region; cultural influences, economic influences, policy influences, and infrastructure influences. This construct was applied in this study by analyzing organizational and societal climate for Black males pursuing IT degrees (Trauth et al, 2009).

The Individual Differences Theory of Gender and IT was developed as a theoretical alternative to two opposing perspectives on the topic of underrepresentation of women in the technical workforce, essentialism and social construction. The essentialist perspective attributes women's underrepresentation in IT to biological factors (Trauth et al, 2009, Trauth, 2002). Trauth disagrees with the essentialist perspective arguing while some relevant differences in ability maybe biologically bases they are not based on gender. Further, essentialism does not add contextual factors, which may affect an individual's perspective or interaction with technology. The other perspective used to understand gender and IT is social construction, which describes gender as "two separate groups of men and women who are affected by two different sets of sociological influences. Hence, men and women are viewed as having different or opposing socio-cultural characteristics, which subsequently affect their relationship to and adoption of technology." (Trauth and Quesenberry, 2007, p. 23). Social construction identifies social forces, which may shape the male or female life, but does not consider individual agency or

experiences that affect responses to those factors (Trauth et. al., 2009, Trauth, 2002). Given the two differing theoretical perspectives of essentialism and social construction, they can be interpreted as describing partial elements of the situation experienced by women in the IT workforce. As Trauth (2006) points out, "current theories about gender and IT do not fully account for the variation in men's and women's relationships to information technology and the IT field" (p. 1759). It is this variation that Trauth has argued is central to different people's experiences, decisions, and relation to technology.

The Individual Differences Theory of Gender and IT has been used to explain the underrepresentation of women in IT in a variety of settings (Kvasny, Trauth and Morgan, 2009; Trauth, Quesenberry and Huang, 2008; Trauth, Quesenberry and Yeo, 2008). The theory utilizes socio-cultural phenomena to explain differences and thus suggests alternative reasons to essentialism and social construction, such as within same gender variation, for women's low participation in technology. The theory suggests that "both gender and IT are socially constructed at the individual level" and that "women as individuals experience a range of different socio-cultural influences which shape their inclinations to participate in the IT profession in a variety of individual ways" (Trauth, Quesenberry and Morgan, 2004, p. 115). The Individual Differences Theory of Gender and IT is being applied to a new research domain for this study: Black male students in IT disciplines.

Data Collection & Analysis

Ten Black males were interviewed between March and December 2011. Sophomores, juniors and seniors were chosen due to their familiarity with the dynamics of the collegiate atmosphere and that they are more likely to have already declared a major. Semi-structured interviews were voice recorded and the interviewees were give pseudonyms to preserve their anonymity. Interviews ranged in length from thirty to ninety minutes. An interview guide was developed based on the three major constructs of the Individual Differences Theory of Gender and IT. Open coding was then used for new themes that emerged from the interviews.

To further understand the data, the first author added reflexivity. As a Black male conducting research about Black male students, he is often asked about his role in his research. Interpretative work is influenced by the researcher, which introduces bias; however reflexivity is used to add transparency about how the researcher's perspective influenced the research. This is where reflexivity plays a major role. Reflexivity requires that researchers be consciously aware of how their interactions in the different stages of the research process influence the research participants. Reflexivity therefore assisted in understanding the interview data from Black males.

Willig (2008) contends that reflexivity does assist with controlling bias, but that is not all reflexivity is about. She says that reflexivity allows us to reflect on our own reactions to the research that make understanding possible. Since there is no set format to address reflexivity, it can be difficult to ensure that reflexivity is being addressed. Instead, Willig (2008) suggests that the role of the researcher be included and that those reflections be clear and honest. "A researcher's background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions" (Malterud, 2001, p. 483-484). As such, reflexivity is necessary in qualitative research in establishing that the research is ethical and its findings are accountable (Jootun, McGhee & Marland, 2009; Truex, Holmstrom & Keil, 2006). Reflexivity played a role both in shaping the interview questions and in interpreting the results.

RESULTS

The constructs of the theory were used to analyze interview data about the lived experiences of Black males who are studying IT education. The individual influences construct presented the importance of positive role models and mentors throughout one's upbringing. The individual identity construct highlighted issues related to ethnicity and family, which lead to marginalization within the IT field. The environmental influences constructed presented itself with issues related to organizational climate and societal climate for Black males pursuing IT degrees. The results from this study highlight each of the constructs and how they influenced Black male participation in IT.

Tom, 21, is from West Africa and went to school in France before moving with his mother to the USA in early 2007. Tom's mother and father are nurses. His first language is French and he learned English as a second language. Tom attends a PWI, transferring into an IT program as a junior from Engineering.

> Personally, after I took up to Calc 3 and I had to take more math, that was the primary decision that I came up with to switch. Also, after I did more research based on pay between engineering graduates and IT graduates, I came up with a high percentage that after you graduate from IT you should not be without a job because there is so much you can do and it's not limited.

Tom attended a technical school while in high school which afforded him the opportunity to acquire a few computing certifications. He has worked as an assistant network administrator for a radio station. Tom aspires to work within cyber security in the government. When asked if he feels IT is "welcoming to minorities" he responded:

> We all strive to say racism doesn't exist…it does, so I don't agree with that. Being a minority at a great school ……. and a Black guy, I find it a little challenging…being a Black guy, personally, it's a hard major to get a hold of. Out of all my classes that have 40 or fewer students, which are all except one, I'm the only Black person and I've been struggling with that. However, I see it as a challenge to make the best out of it.

Sebastian is a senior at a PWI studying IT. Sebastian is 22. He has never met his father and does not feel the need to since his father has not reached out to him. Sebastian transferred into IT from liberal arts. When asked about the IT field being welcoming to minorities he said:

> I feel as though, with respect to the different units within the university that the IT unit can do more to be more welcoming of students of different backgrounds. Looking at the concentration of [minority] students in the unit, the sheer low number tells a lot. I look at the involvement of students in the clubs within the college as well and the concentration of minorities is a lot lower, likely indicative of the few that are majoring in the IT unit. You may have none to one or two minorities in the clubs as a whole. I feel as if that is a very good indicator of what's being done to be sure students of diverse backgrounds feel welcomed, feel like they can be involved in organizations and feel like they are a part of the college as a whole. Hearing students talk about how they don't feel diversity clubs are not necessarily important and not understanding the reason behind having an organization like that in the college is telling of how the college is being portrayed to the students as well as how the students perceive the college.

Reggie, 21, is a senior studying Computer Engineering at a HBCU and hopes to be a systems engineer. He is a first generation college student. His mother went straight into the workforce after high school and his father went to the military. Reggie is the youngest of four siblings. His brother is a bank teller, his older sister works at a furniture store and his youngest sister is pursuing her masters degree. When asked about any role models or mentors who have helped him academically and to form his career goals he said:

> My advisor! I've asked him just about every question about computers I could think of. He's really helped me out a lot. He's helping me out with Physics right now. You know….he's just doing his job. He's my advisor so trying to guide me and telling me about careers and what I can do with the Computer Engineering major. He's had a helping hand in my major and what I wanted to do. He's helped me with looking at graduate school and fellowships too. What's funny, when I was in high school, I knew I wanted to go to college. However, in college, I had no idea what graduate school was. That hit me around junior year, when I started hearing about graduate school and what it was.

Mike, 21, is a senior majoring in Computer Science at an HBCU. He has two sisters and a brother. His older sister graduated from community college. His younger sister went to community college for a semester, but dropped out. His brother went to barber school. Mike is a first generation college student. When asked about any role models and mentors he said:

> That's a difficult question. I had an interview with a financial company the other day and that question came up. I honestly don't have any. My father died when I was young, I didn't get to know him. My stepfather definitely isn't a role model. My counselors, especially those in high school were racist and catered to problematic students that they only wants to see get out of their school but didn't care about my education (i.e. counselors cared more about reliving themselves of troublesome students than nurturing academically gifted students). I have a lot of people in my life that I don't want to be like. So in a way, I suppose you can say, they shaped me in a positive way through their negativity.

DISCUSSION

We entered this research with two assumptions. First, Black males had a poor understanding of the IT field. Second, if Black males did not persist in the field it was due to marginalization. These two assumptions led us to choosing the research participants as well as helping build the interview guide. The first assumption proved to be false, as the students knew about the field and the types of opportunities that it presents. However, the second assumption of marginalization in the field proved to hold true. The findings of the study suggest three insights about the academic pipeline. One issue is the absence of positive mentors and role models for Black males. A second issue is that Black males feel a sense of marginalization within the IT field. A third issue is that there are differences between PWIs and HBCUs students. These three main themes are related to the three constructs of the theory.

The issues identified by the interviewees align closely with the first author's personal experiences attending a HBCU and transitioning to a PWI for graduate education. Often times there was a sense of not belonging due to the dearth of Black students and faculty members, There were certainly times where ethnic differences played a role in a lack of communication between Black and majority students. The interviewees attending PWIs made similar remarks about being marginalized because of so few Black students and faculty. Conversely, the students attending HBCUs spoke about being attached to their advisors who assisted them academically and professionally. The lack of people of similar ethnicity and upbringing makes it difficult to feel welcomed into the field, some that leads to feelings of empowerment.

While attending an HBCU, the first author believes he sheltered from racism because the majority of the faculty and students were Black. Racism did not begin to present itself to him until graduate school. It was at that time that he began to notice differences between the Black male students and majority students. It was not until graduate school that he felt the pressure to conform to what the majority students did and distance himself from his own identity as a method to combat stereotypes. In similar fashion, issues of racism and stereotypes also presented themselves in the interviews. Students at both PWIs and HBCUs have felt marginalized. Despite these issues, the interviewed Black males are continuing their education in IT. These findings give evidence that more research has to be done to identify ways to combat marginalization of Black males in the IT. With the benefit of these findings we will be able to better create future interventions.

CONCLUSION

The findings of this research have implications for interventions and future research, which would lead to a better understanding of the factors influencing marginalization and subsequent underrepresentation of Black males in IT. In this paper, we posited that there were programs and initiatives aimed towards decreasing underrepresentation, but that there was a dearth of research that confirmed whether these programs were addressing the right issues of underrepresentation. Through qualitative inquiry, we identified some of the issues facing Black males. The findings from this study will add to the growing body of knowledge of minority groups within the IT field and inform subsequent interventions.

The results presented in this paper only begin to help us understand Black male adoption of the IT field. Further research is being conducted to identify other issues influencing Black male participation in IT. The ultimate goal of this research is add to the body of knowledge about minority group's participation in IT. One approach, which is the one presented in this paper, looks at not only ethnicity, but gender as a method to understand participation. One limitation of this research is that there were ten participants in our initial study. Another limitation is that the interviewees came from two universities. Efforts are underway to interview to broaden the participant pool, which include additional universities.

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