

The Underrepresentation of Black Males in IT Higher Education: a Conceptual Framework for Understanding Individual Differences

Research-in-Progress

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ABSTRACT

Among the many research challenges in studying underrepresented groups in IT is understanding the appropriate theories to apply and much needed analysis at the individual level. This paper presents findings of two studies, which coupled with the application of the Individual Differences Theory of Gender and IT, led to a conceptual framework being developed to delve deeper into the understanding of Black males in IT higher education. The use of the conceptual framework will lead to a better understanding of the factors impacting underrepresented groups participation in IT.

Keywords

Race, Ethnicity, Individual Differences Theory, STEM, Computer Science, Information Science, Engineering, Diversity

INTRODUCTION

The United States Department of the Interior – Office of Civil Rights (2012) 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 Science, Technology, Engineering and Mathematics (STEM) is particularly low.

In 2003, 12.4 percent of the population was comprised of Blacks¹, of which only 16 percent had obtained a college degree (U.S. Census Bureau, 2003). In comparison, nearly one-third of Whites had obtained a college degree. The representation of Black males particularly in STEM fields, is even sparser. In 2008, 68,806 master's degrees were conferred in STEM fields, of which 4.47 percent were awarded to Black men (NSF, 2008). At the doctoral level in 2007, 19,595 degrees were conferred in STEM fields and Black men accounted for 1.95 percent of doctoral degrees (NSF, 2009). These statistics become more daunting when we continue down the pipeline to look at Black professors in academia. The total number of doctorate degree holders in STEM fields employed by universities and 4-year colleges is 269,400 and Black men account for 2.15 percent (NSF, 2007).

Despite the dismal outlook for many Black males, there are those who successfully navigate through the higher education system to attain a baccalaureate degree. These are the men able to provide new insights about Black males who do participate in this higher education system and persist, and perhaps their experiences illustrate strategies that may assist those who do not. Studies which analyze the factors that influence Black male participation may provide new insight into the disparity of Black males and their White counterparts.

LITERATURE REVIEW

Significant research has been done on the digital divide, academic pipeline, and stereotypes and stereotype threat. These issues combined impact Black male participation in IT.

Digital Divide

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, than Whites, and thus have felt the greatest impact of the digital divide (Morgan, 2008).

Digital inequality on the other hand takes the digital divide a step further. It references not only differences in access, but also inequality among persons with “formal” access to the Internet (DiMaggio & Hargittai, 2001). Formal access is defined as computer ownership and Internet access. DiMaggio & Hargittai (2001) 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. They 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 while LaGrange provided Internet with a set-top box. 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 so much about access as it is 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 text messaging. It is being able to use the Internet and digital technology to communicate, access information, and engage in commerce. Thus, the problem is that users of IT, particularly Black males, should be empowered by the promise of the technology. Furthermore, aspects of the academic pipeline impact how Blacks interact with technology and continue to pose obstacles to the success of Black students academically.

Academic Pipeline

There has been a significant amount of research done on the adjustment, academic achievement, persistence, and rates of enrollment and graduation in postsecondary institutions. A large amount of the literature on Black males within educational environments, however, features quantitative studies comparing them with other subgroups. The academic pipeline refers to how individual, environmental and institutional factors influence, hinder or divert a person as one progresses along the path towards a goal (Margolis, Estrella, Goode, Holme & Nao, 2008). 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).

Jackson (2003) found that 68 percent of Black males graduate high school compared to 79 percent of white males. The gap grows from 11 percent to 68 percent between Black male and white males when successful completion of the baccalaureate degree is considered (Jackson, 2003). The gap becomes even greater when looking at faculty positions of which there is an 81 percent gap between Black males and white males (Jackson, 2003). Jackson’s study looked at the state of higher education holistically.

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.

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Stereotypes & Stereotype Threat

A stereotype is a widely held but fixed and oversimplified image or idea of a particular type of person or thing. Blacks are generally stereotyped, in the media, as superstitious, lazy, happy go-lucky, aggressive, intellectually inferior, ostentatious, active in sports, entertainers and poor performers in academics (Fein and Spencer, 1997; Aronson, J. and Good, C., 2000; Aronson, J. Fried, C.B. and Good, C., 2002). Black college students tend to obtain lower grades than their White counterparts, even when they enter college with equivalent test scores. Past research suggests that negative stereotypes of Black students' intellectual abilities play a role in this underperformance. Awareness of these stereotypes can psychologically threaten African Americans, a phenomenon known as "stereotype threat" (Steele and Aronson, 1995), which can in turn provoke responses that impair both academic performance and psychological engagement with academics. Research has shown that Blacks, who enter a predominately white organization, feel that there is a pressure to disprove preconceived stereotyping. Many Blacks feel like they have to say the right thing, not say too much, or agree just to fit in. In many cases, the Black attempts to disprove stereotypes until their technical value can be exemplified to the organization and/or when the organization recognizes their value.

Thus, Blacks are susceptible to stereotype threat (Steele and Aronson, 1995; 1997). 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. The presence of an actual stereotype may not exist but the individual is responding in a way that it is. Steele and Aronson (1995) performed four studies on 114 Black and White undergraduate students at Stanford University. Steele and Aronson entered the study with an assumption that Blacks internalized the stereotype of intellectual inferiority to Whites. Their first study investigated the effect of stereotype threat on the intellectual performance of Black college students. Overall, the results showed the White students performed at a higher level than Blacks in each group. Results indicate that Blacks viewed the test as more biased compared to Whites. Black participants' self-ratings regarding performance were less than the White cohort. Thus, stereotype threat causes Black students to behave more aggressively, for fear of being stereotyped.

When capable Black college students fail to perform as well as their white counterparts, the explanation often has less to do with preparation or ability than with the threat of stereotypes about their capacity to succeed (Steele and Aronson, 1995; Steele, 1997; Davis, Aronson and Salinas, 2006; Hamilton, 2009). These threats emerge from both stereotypical representation and lack of representation in a particular domain. There is evidence to support the conclusion that stereotype threat between racial and low-income groups is a prominent factor hindering beliefs in one's ability to carry out tasks and engage in activities (Shapiro & Neuberg, 2007; Hamilton, 2009). According to Jackson et al. (2001), simply making those aware of their own ethnic and class-based identities through a negative stereotypic association between these group memberships and the ability to use technology effectively can evoke self-doubt and ability to gain mastery in this domain (Jackson et al., 2001). The presence of individual and group identity may be a contributing factor that leads to evoking self-doubt and the ability to gain mastery of a domain.

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 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. Thus, in an effort to address the research question of: what are the societal, environmental and institutional influences on Black male students in IT disciplines? More detailed knowledge about differences among Black males as a group and individual level analysis is needed. The Individual Differences Theory of Gender and IT can assist with understanding the relationship between Black male participation in the White male dominated, IT environment.

THEORY

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, Quesenberry & Huang, 2009; Trauth, 2002). In Trauth et. al’s critique of essentialism they argue that while some relevant differences in ability maybe biologically based 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 & Quesenberry, 2007, p. 23).

Social construction identifies social forces, which may shape the male or female life, but minimizes individual agency or different 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 group homogeneity 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 relationship to technology.

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 et al, 2009; Morgan, 2008; Quesenberry, 2007). The individual identity construct consists of two sub-constructs: personal demographics (e.g. ethnicity, socio-economic class, family background) and career items (i.e., type of IT work). The second construct, individual influences, consists of two sub-constructs: personal characteristics (e.g., educational background, personality traits) and personal influences (e.g., mentors, role models, and significant others). Lastly, the environmental influences construct consists of four sub-constructs related to the geographic region; cultural influences, economic influences (e.g. cost of living, cost of education), policy influences, and infrastructure influences (e.g. institutional climate) (Trauth et al, 2009).

Table 1. Individual Differences Theory of Gender and IT			
Major Constructs	Individual Identity	Individual Influences	Environmental Influences
Sub-Constructs	Personal Demographics	Personal Characteristics	Cultural influences
	Career Items	Personal Influences	Economic Influences
			Policy Influences
			Infrastructure Influences

The Individual Differences Theory of Gender and IT has been used to explain the underrepresentation of women in IT (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 that account for within same-gender variation, to explain 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 et al., 2004, p. 115). This theory is being applied to a new research domain for this study: Black males.

Two studies, involving 14 Black males were conducted during 2011 to gauge whether the Individual Differences Theory of Gender and IT would be an appropriate method of evaluating Black males majoring in IT. The studies were conducted at a Predominately White Institution (PWI) and Historically Black College and University (HBCU). One institution is located in the Mid-Atlantic and the other in the South. Students were interviewed using an established interview guide (Trauth, 2002) which was then adapted to these studies. The original interview guide was developed with funding from an National Science Foundation Grant which was "A Field Study of Individual Differences in the Social Shaping of Gender and IT" (NSF, 2002; NSF Award # 0204246; Trauth, 2002). In the study, the constructs of the theory were used to analyze interview data on the presence of stereotypes and coping mechanisms of Black males who are studying IT education at a PWI. The second study, was to identify where the leaks are in the academic pipeline affecting Black male students in IT.

The individual identity construct was applied in the studies to analyze ethnicity and family. The second construct, individual influences, was used to study the presence, or lack of, mentors and role models for Black males. Lastly, the environmental influences construct was adapted to examine the organizational and societal climate for Black males pursuing IT degrees (Trauth et al, 2009). These studies contributed to the development of the conceptual framework.

Study 1

In the first study, the constructs of the theory were used to analyze interview data on the presence of stereotypes and coping mechanisms of Black males who are studying IT education at a PWI. The research questions explored for this study were 1) Are Black males in IT education exposed to stereotyping or stereotype threat? and 2) To what extent do stereotypes explain Black male participation in IT? The individual influences construct relates to stereotypes about personal characteristics (i.e. personality). The individual identity construct highlighted stereotypes related to race (i.e. ethnicity). The environmental influences construct presented stereotypes coming from the societal climate (Cain & Trauth, 2013; Cain, 2012).

The findings of the study suggest three insights about the stereotyping of Black males in the IT field. One insight is the prevalence of Black males who wish to overcome stereotypes rather than succumb. A second insight is the acknowledgement that Black males understand that they will be stereotyped in an environment that is White male dominated. A third insight is that regardless of whether the student attends a Predominately White Institution (PWI) or Historically Black College or University (HBCU), they understand that outside of the institutional structure there are barriers and overcoming these barriers are key to a successful career 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. The study shows that years later these problems still exist with the current generation and that current research has not alleviated these concerns for Black males (Cain & Trauth, 2013; Cain, 2012).

Study 2

The purpose of the second study, was to identify where the leaks are in the academic pipeline affecting Black male students in IT. To accomplish this, we launched an interview based investigation of Black males to identify how individual identity, individual influences and environmental influences affect retention in the academic pipeline for underrepresented students at a HBCU. The study was designed to help to understand leaks within the academic pipeline, which could lead to barriers for multicultural students. Semi-structured interviews were employed, which were informed by Trauth's Individual Differences Theory of Gender and IT (Trauth, Quesenberry, & Huang, 2009).

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 was observed with issues related to organizational climate and societal climate for Black males pursuing IT degrees (Cain & Trauth, 2012).

The findings of the study suggest three themes. One, the absence of positive mentors and role models for Black males. A second theme is that Black males feel a sense of marginalization within the IT field. A third theme is that there are differences between PWIs and HBCUs students. The main differences between PWI and HBCU students presented in the studies was the value of coursework and team building at the PWI versus the value of a one-on-one relationship with the academic advisor at the HBCU. These three main themes are related to the three constructs of the theory. While these findings assist with revealing some of the factors that contribute to Black male underrepresentation in IT, there needs to be a deeper level of analysis of the factors (Cain & Trauth, 2012).

There is evidence that a diverse work force can contribute to increased staff retention and productivity. It can enhance the organization's responsiveness to an increasingly diverse world and increase the organization's ability to cope with change,

and expand the creativity of the organization. Understanding the factors that could contribute to decreasing underrepresentation could lead to the thoughts and ideas of underrepresented groups being brought to the forefront. The variation in response to the different factors shows the need to probe the individual level (Cain & Trauth, 2012).

Conceptual Framework

Therefore, the investigation into Black males and IT needs to be conducted at both the individual and group levels of analysis. The conceptual framework will serve as the tool to understand one overarching research question: what are the societal, environmental and institutional influences on Black male students in IT disciplines. The individual level of analysis will lend itself to the understanding of unique characteristics and interactions that are enacted by different Black males. The group level of analysis will be employed to look across the demographic characteristics in an effort to better understand the role that these factors play in participation. These levels of analysis together are appropriate for the type of inquiry that was carried out due to the importance placed on individuals' backgrounds and attributes, as well as their actions and ideas.

Individual Identity	Individual Influences	Environmental Influences
Personal Demographics	Personal Characteristics	Policy Influences
Career Items	Personal Influences	Academic Environment
Black Male Identity	Stereotypes	Infrastructure Influences
Black Occupational Statistics		Economic Influences
		Cultural Influences
		Home Environment

Table 2 is a conceptual framework that aggregates information gathered in the literature review and studies. It focuses on adding nuance about factors influencing Black males. Each of the concepts listed above can be tied back to the literature review, theory and results from the studies. The individual identity construct highlights Black male identity and statistics (i.e. ethnicity). The environmental influences construct correlates with the academic and home environments. The individual influences construct relates to internalizing about stereotypes and occupations.

These constructs will guide the development of a structured interview approach to gathering data, which could lead to further understanding the underrepresentation of Black males participation in IT. The specific constructs: academic environment, stereotypes, Black male identity, home environment, statistics and occupations from the theory that are shown in the research framework are those being explored in the structured interview process.

FUTURE WORK

The conceptual framework will serve as the tool to understand one overarching research question: what are the societal, environmental and institutional influences on Black male students in IT disciplines? More interviews are being conducted utilizing the framework to identify and provide nuance to the participation of Black males in IT. The data gathered could be used to inform efforts on recruitment and retention as well as interventions.

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