

Exploring community colleges' role in the success of African American women in STEM undergraduate programs at HBCUs.

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Abstract

African American females have been cited as viable options to fulfill positions in the STEM workforce. Given the need for prepared individuals in STEM and the projected increase of minorities representing a large portion of the U.S. population by 2050, African Americans remain a strong talent. Even with this information, the literature is limited regarding female African American community college transfer students' STEM experiences in the HBCU environment. With HBCUs educating many Americans in STEM and a large population of African American women in the community college environment, this population's voices are essential to the community college and HBCU environments. Utilizing Triple Quandary Theory and Jackson-Smith's Model of STEM Education, Preparation and Career Exploration, this study explores community colleges' role in preparing African American female community college transfer students in STEM from the community college to the HBCU environment. Implications are provided based on the overall results of this study.

Keywords: Qualitative, Research, Community college, transfer students, adjustment, STEM

Lost in transition: *Exploring community colleges' role in the success of African American women in STEM undergraduate programs at HBCUs.*

Increasing the population of competent individuals who are prepared to assume available careers within the STEM workforce is not a new phenomenon for the United States (U.S.). The literature is clear regarding this need for increase (National Science Foundation [NSF], 2006a; Starobin, Jackson, & Laanan, 2013; Jackson, 2016; Jackson, Starobin, & Laanan, 2013) as well different approaches and strategies for preparing competent individuals (Jackson-Smith, 2015; Jackson, 2016). Given the need for an increase, the literature, however, urges educational institutions to pay close attention specifically to African American females in STEM, highlighting the projected national increase of this population (NSF, 2013) as well as their active participation in both the community college and HBCU environments (Borden & Brown, 2004). Community colleges and HBCUs alike have been noted as providing environments conducive to the success of African American females in STEM by providing social support and increasing the self-efficacy among this population (Lent, Brown, Sheu, Schmidt, Brenner, Gloster, & Treistman, 2005; Jackson, 2016). Additionally, the institutions above provided support

systems and hands-on experiential opportunities, which are essential in facilitating African American females' success in STEM areas (Jackson, 2013a; Jackson, 2013b).

Community colleges educate more than 50% of African American females (NSF, 2013), and HBCUs are referred to as the leading institutions in educating African Americans in STEM (Borden & Brown, 2004). This information indicates that African Americans are viable candidates to fulfill STEM-related career vacancies. With proper education and training, African American females can aid in fulfilling STEM-related career gaps. Even with this essential information, the voices of this population are limited within the literature. More specifically, while the literature is transparent regarding community colleges' role in preparing students for STEM degrees at universities, almost absent from the literature are the specific roles of community colleges in the success of African American females in STEM from the community college to the HBCU environment. This study will highlight this very purpose. Due to this study's nature and the varied use of terms among the participants, the terms Black and African American will be used interchangeably throughout this study.

Purpose and Research Questions

This study aims to explore the experiences of ten African American female community college transfer students into an HBCU. More specifically, utilizing the Triple Quandary Theory and Jackson-Smith's Model of STEM Education, Preparation, and Career Exploration, this study takes a comprehensive exploration into the community college experiences that impacted their successful transition and adjustment into STEM degree programs at the HBCU using digital imagery. Given the overall purpose of this study, the following research question guided this study:

How do African American female community college transfer students in STEM undergraduate degree programs at an HBCU describe the community college experiences that assisted in their transition and adjustment to STEM degree programs at the HBCU?

There are many layers of focus for this population including, being female, being African American, being in a STEM-related discipline, being a community college transfer student, being a community college transfer student at an HBCU and a combination of the layers. This study will highlight the experiences of being an African American female community college transfer student at an HBCU.

Framing the Study

Given the overall purpose of understanding the community college experiences that assisted in the transition and adjustment experiences of African American female community college transfer students in STEM to the HBCU, intersecting tenants of Jackson-Smith's Model of STEM Education, Preparation and Career Exploration and Boykin and Toms (1985) Triple Quandary Theory are appropriate. These theories situate Black's racial experiences and the impact of these racial experiences on African American female community college transfer students in STEM. Jackson-Smith's Model of STEM Education, Preparation, and Career Exploration considers three tenants that provide a holistic experience leading to STEM success.

The first tenant is *STEM Education*. STEM education refers to the importance of becoming educated about STEM-related skills, credentials, majors, and careers. This understanding sets a foundation for becoming aware of STEM and the nature of STEM. The second tenant is *STEM Preparation*. STEM Preparation moves beyond STEM Education and refers to the importance of preparing for STEM by engaging in different learning opportunities (such as hands-on experiential learning activities) that allow for the application and development of STEM education or STEM-related skills content knowledge. Engaging in STEM activities allows one to begin to understand what a STEM career would entail. Seeking out advisors and mentors positioned to provide information regarding the STEM workforce, traditional and non-traditional pathways, and needed course options during this application process is also crucial within this tenant. The third tenant is *STEM Career Exploration*. Once STEM Education has been obtained and STEM Preparation has been achieved, making connections to a STEM-related career is necessary. Exploring the diverse array of STEM careers is essential in understanding where a STEM degree can lead in terms of career options.

Situated within Jackson-Smith's Model of STEM Education, Preparation and Career Exploration is Boykin and Toms (1985) Triple Quandary Theory. The Triple Quandary Theory highlights the interchange among the mainstream experience, which highlights the idea of Achieving the American Dream (Boykin & Toms, 1985); the

Black cultural socialization, which incorporates nine dimensions: spirituality, harmony, movement, verve, affect, communalism, expressive individualism, oral tradition, and social time perspective(s); and the minority socialization experience, which includes adaptive responses to help one manage specific experiences that result from oppression (Boykin & Toms, 1985).

African American female community college transfer students in STEM manage complex and multi-dimensional experiences related to their identity. These experiences encompass race/ethnicity, gender, and institutional identities. Coupled with these experiences are the experiences associated with pursuing a masculine dominated area of study, such as STEM. This population must learn to manage their multiple identities while maintaining a sense of self alongside successfully obtaining a STEM degree and, ultimately, a STEM-related career. The application of the components of the Triple Quandary Theory in the Model of STEM Education, Preparation, and Career Exploration is necessary for highlighting the role of community colleges in assisting this population in navigating multiple layers of identity. This application provides a lens in further understanding the STEM-related experiences within the cultural context and its impact on STEM success. In turn, this study will highlight the role of community colleges in this venture.

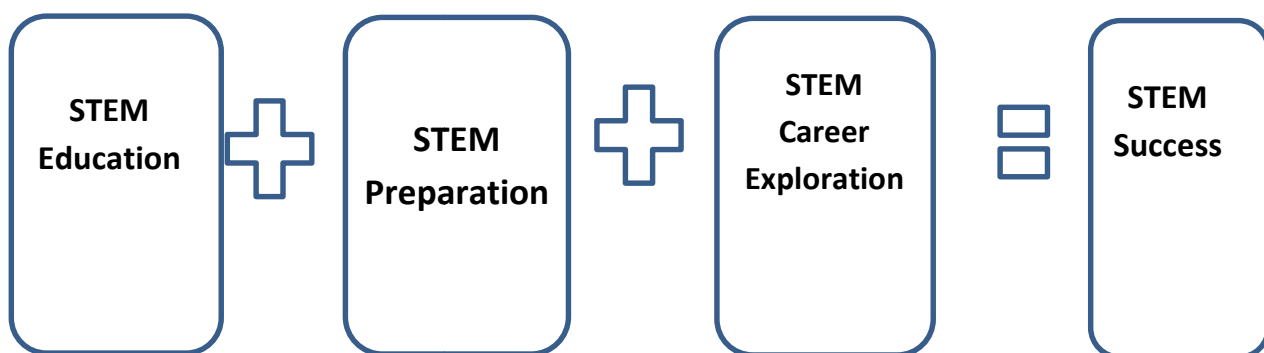


Figure 1: Jackson-Smith Model of STEM Education, Preparation and Career Exploration

Many studies have examined the forces that impact African American women choosing to pursue STEM fields in the United States. A closer review of the literature suggests that the most prominent points are high school academic preparation, the role community colleges play in educational development, the transition challenges into an HBCU.

African American Female Students Preparation in STEM

Like other racial/ethnic groups, Black females' representation in STEM fields is substantially lower than Black males' representation, with the massive engineering gaps in 2011 (NSF, 2014). According to Perna, Lundy-Wagner, Drezner, Gasman, Yoon, Bose, and Gary (2009), African American females received 66% of the total degrees awarded to all African Americans but on 36% of the bachelor's degrees in engineering, 46% in the computer sciences, 56% in mathematics, and 61% in physical sciences (NSF, 2014).

The successful educational attainment for African Americans females in STEM fields rests on their high school academic preparation. NSF (2006, 2016) highlights a decade of longitudinal research that indicates the need to ensure the U.S. workforce's readiness in science in engineering. The NSF study further concludes that improvements in K-12 math and science education would stimulate that development. Also, African American females at predominately White campuses often do not persist due to a variety of factors such as stereotype threat (Hall-Greene, 2000; Harper, 2013), isolation, and hostile encounters with faculty and students (Harper, 2013; Palmer, Maramba, & Dancy II, 2011).

Increasing the numbers of all individuals in the STEM workforce will include motivational tactics to keep them engaged in the STEM fields and retaining them in these areas once they enter (Drew, 2011). African American females must withstand major obstacles while trying to navigate STEM fields where they are vastly underrepresented. African American female students can often feel devalued and uncertain about their abilities to do well because not many women serve as support mechanisms (Leslie, 2005). For African Americans to do well in the STEM fields, another layer of development will be increasing their belief to do well, or self-efficacy.

The role of community colleges in the success of African American students

The ability to increase African American females in STEM fields hinges on their academic capabilities before college. However, many gaps in the literature exist about the role community colleges play in African Americans' intellectual development who want to obtain and a four-year degree. Community colleges serve as a real opportunity gateway for African American students to further develop their skills before entering a traditional college. Close to 11 million Americans enter community colleges each year, hoping to transition into a four-year college. Because many of these students are first-generation and low-income, the community college serves as an affordable and reasonable option for them to pursue higher education. Jackson (2013b) notes that a more extensive representation of African American females at community colleges who transfer to four-year institutions is accurately tracked, mainly if they enroll at an HBCU. To explore African Americans' success at HBCUs and their transition from community colleges is essential to investigate.

Increasing the numbers of African American students in STEM fields will depend on the preparation provided at community colleges. Students graduating from high school often can strengthen their academic preparation and explore STEM career pathways. The success at a community college will allow seamless transitions to four-year colleges, particularly HBCUs enrollees, as the purpose of the study highlights. HBCUs have always provided pathways for success for African American students in STEM fields. HBCUs continue to play a significant role in producing African Americans in STEM fields.

Transition challenges among African American students

The transitions to college are very significant, particularly for first-generation, low-income, minority students. HBCUs provide a cultural sense of belonging for African American students to have stronger self-efficacy to believe in their abilities to do well. Other studies highlight that knowing there are others around with similar backgrounds helps students at HBCUs persist. Lent, Sheu, Schmidt, Brenner, Wilkins, and Brown (2005) found that undergraduates enrolled in freshman engineering courses at two HBCUs had higher self-efficacy than their counterparts attending predominantly White universities and wanted to continue as engineering majors. HBCUs have social support mechanisms that allow African American students to overcome barriers to pursue STEM fields that they may have been uncomfortable pursuing at majority institutions.

Many studies highlight the lack of academic preparation as a deterrent to choosing STEM as a career field. Often these students choose non-STEM majors in which they feel they can be successful (Parham & Austin, 1994; Wang, 2013). The non-persistence of African Americans in STEM fields still needs further inquiry relating to their personal experiences. If we rely on their academic preparation as one indicator but do not address the impact, the institutional type is problematic. The role an HBCU can play in providing the necessary support to engage and support African American students properly will be increasing these fields as welcoming for these student-types. In Non-HBCU environments, there is a pressure to conform to the dominant culture (Harper, 2013; Tatum 1997). This proves to be problematic for the learning environment for these students. Particularly for females who also face the challenge of the intersectionality of being female and African-American. Further, at majority institutions, there is a lack of full inclusion and a sense of belonging for African Americans (Strayhorn, 2009; Strayhorn & Saddler, 2009).

Further, researchers have explored how institutional environments, policies, and practices influence STEM fields' overall success for African American students (Nixon, Meikle, & Borman, 2007). Additionally, scholars indicated that psychological and stereotype threats were critical decisions that impact females' decision to pursue STEM careers (Jackson, 2013b; Perna, Lundy-Wagner, Drezner, Gasman, Yoon, Bose, & Gary, 2009).

Significance

The findings of this study are significant for several reasons. First, this study's findings will highlight the experiences of African American female community college transfer students in STEM and the role of community colleges and universities in assisting this population in successful transfer and adjustment. Understanding this population's overall experiences will first give voice to other members of this population and thus will empower this population to share their experiences. Knowing these experiences will allow for informed initiatives and programs for community colleges and universities and inform them of ways to assist this population. The students in this study will highlight their experiences as it relates to transfer and adjustment

experiences from the community college to the university and their experiences in STEM. With student success being the responsibility of the giving and receiving institution (Townsend, 1995), women and minorities constituting a lower percentage of the science and engineering workforce (NSF, 2013), and HBCUs ranking among the top 20 leading producers of African American bachelor's degrees in STEM fields (Borden & Brown 2004), understanding the experiences of this population is essential to the STEM pathway. Secondly, this study's findings will inform the discussion on the specific role of community colleges in the transfer process of all students, with a particular focus on African American female students. Community colleges serve a vital role in the experiences of African Americans. With a large population of African American females enrolled in community colleges (NSF, 2013), ensuring that community colleges are positioned to assist this population through the transfer process successfully, and adjustment to the HBCU environment is essential.

Third and lastly, this study's findings will add to the baseline for continued research on the experiences of African American female transfers students in STEM and the factors that impact their transition and adjustment experiences to the HBCU. While the assumption may be that African Americans are familiar with the HBCU environment, they too go through adjustment experiences. Through this research, a basis for designing both qualitative, quantitative, and mixed-methods studies that focus on increasing the success of this population is established. Qualitative studies that explore the intersecting experiences of culture, gender, and STEM-related occurrences will add to the knowledge base of individuals to influence the study population's transition and adjustment experiences. Additionally, this research's findings will inform quantitative studies by revealing the factors that impact and hinder student transition and adjustment experiences.

Methodology

This study seeks to understand the perspective of ten African American female transfer students in STEM at an HBCU and the meaning they give to a phenomenon of being a transfer student in STEM using basic qualitative research methodologies (Creswell, 2014). This study utilized non-traditional research methods, which are discussed in greater detail below.

Context of the study

This study was conducted at one HBCU in the Southern region of the U.S. A pseudonym was given for each participant, and the respective community college and HBCU identification were not used to protect the participants' identity, the community college, and the HBCU. Moving forward, the study institution will be referred to as STEM Prep University SPREP-U (SPREP-U, pseudonym). SPREP-U has a student population of approximately 4,000, with approximately 900 students across STEM-related degree undergraduate programs. This study includes ten African American female community college transfer students.

Participants

The experiences of ten African American female community college transfer students at SPREP-U were shared in this study. The participants were currently enrolled in and pursuing STEM bachelor degrees at SPREP-U [HBCU]. During spring 2019, e-mail invitations were sent to personal, professional contacts at SPREP-U inviting African American female community college transfer students in STEM programs at SPREP-U to participate in this study. The contacts were asked to identify prospective participants who were in at least their second year in a STEM bachelors program at SPREP-U at the time of the study, were at their respective community college for at least one year, and had taken at least three courses at the community college before transferring to SPREP-U, and did not take community college courses while in high school. However, some of the participants obtained an Associates' degree before transferring to SPREP-U. Two contacts at the HBCU were identified and were asked to send the e-mail invitation to prospective students who met the criteria mentioned above. As previously mentioned, to allow for a detailed, thick, contextual description, and in an attempt to provide a common foundation from which the student's experiences emerged, the students were from the same HBCU and transferred from the same community college.

The invitation e-mail explained the study's purpose, a brief description of the study, the study's duration, and that the comprehensive study would occur in two phases. Additional details regarding the two phases of the research study will be discussed in further detail in the data collection section. The author's contact information is included in the e-mail invitation. As the professional contacts contacted students, the snowballing effect occurred. A total

of 25 students responded to the initial e-mail invitation. Follow-up e-mails containing additional information about the study were sent to the interested individuals as well. From the 25 initial respondents, three students were no longer interested in participating in the study, 12 students participated in the first phase, and ten students followed through by participating in both phases of this study. A profile of the ten participants is included in Table 1.

Table 1: African American female community college transfer students in STEM at SPREP-U (HBCU)

Name (Pseudonym)	HBCU	Major
Deana	2 nd	Biology
Marcia	2 nd	Chemistry
Bianca	3 rd	Math
Ciara	2 nd	Engineering
Tricia	3 rd	Biology
Amy	3 rd	Biology
Ashley	2 nd	Biology
Jamie	4 th (switched majors)	Regulatory Science
Rhonda	2 nd	Chemistry
Lesley	3 rd	Math

Research Design

Digital storytelling, a qualitative method, was used in this study to explore the experiences of African American female community college transfer students in STEM at an HBCU. Photovoice is the digital avenue used for participants to share their stories. Photovoice is a form of arts-based research that incorporates the visual arts, in this case, photographs, into the methodology, and has its foundation in critical consciousness and feminist theory, critical to this study (Hergenrather, Rhodes, Cowan, Bardhoshi, & Pula, 2009). Photovoice provides an alternative avenue for the participants to express themselves and incorporates photos as props for this expression. While other traditional qualitative methods would have been appropriate for this study, the use of photovoice allowed for the “capturing [of] layers of emotion, intuitive experience and a sense of self that may not be verbalized other than in response to images” (Boyce & Hajra, 2011, p. 7).

Photovoice is appropriate for this study, given its history of being used to respond to various social issues, including diversity issues (Hergenrather et al., 2009). Aligning with the tenets of the Triple Quandary Theory and Jackson-Smith’s Model of STEM Education, Preparation and Career Exploration, the use of photovoice allow for a more social justice approach by allowing African American female community college transfer students at an HBCU the opportunity to express experiences and feelings regarding STEM and transfer and adjustment that could not be effectively expressed in words. Allowing for triangulation, photographs, semi-structured interviews, and field notes was used to further explore the female participants' experiences.

Data Collection

Using the photovoice methods, this study's data collection process consisted of two phases: 1) Photo collection phase and 2) Semi-structured interview phase. During the Photo collection phase, which occurred during Spring 2014, the participants were provided information regarding the study, the informed consent document, the photograph guidelines and release form, the disposable camera, and instructions for taking the photographs. The African American female students were to take pictures within their daily lives that illustrated their community college's role in their transition and adjustment to the HBCU. While the photos could be of images they drew, created themselves, or ones that they took of objects, they were encouraged not to take photographs that disclose the identity of their affiliated community college, HBCU, or themselves. The purpose of this was to protect the identity of the participants and the institutions. After the pictures, the students were instructed to provide the disposable cameras to the identified contacts at the HBCU, who then provided the disposable cameras to the author developing the film.

The second visit to the HBCU consisted of developing the film, and conducting individual semi-structured, face-to-face interviews surrounding the photographs. After the film was developed, the participants were asked to

select photographs that best represented their experiences. The semi-structured interview discussion questions were adapted from Wang's (1999) original Photovoice PHOTO mnemonic and included questions such as: What does this photo represent? What is happening in the photo? How does this photo speak to and represent the community college experiences that assisted in your overall transition experiences as an African American community college transfer student in STEM at an HBCU? How does this photo depict your community college experiences that assisted with your transfer and adjustment? Each interview was transcribed verbatim. Researcher memorandums were used during the interview process to make notes during the interviews and document reactions.

Data Analysis

Qualitative data analysis procedures were used to analyze the data utilizing the photovoice methodology. Creswell's (2014) steps for analyzing qualitative data were used to understand the themes that emerged across all photos, photo descriptions, narratives, and interview transcripts. Thematic analysis was also used and consisted of six phases: (a) familiarization with the data, (b) generating initial codes, (c) searching for themes among codes, (d) reviewing themes, (e) defining and naming themes, and (f) producing the final product (Creswell, 2014). Following this process, the photos, photo descriptions, narratives, and interview transcripts were sorted, characterized, and reviewed without coding to gain an overall understanding of the contents (Creswell, 2014). Each pile was reviewed a second time and coded according to the study's overall purpose and research question.

As reoccurring patterns emerged across the photos, narratives and interview transcripts, similar information was categorized. Eight preliminary categories were established. From the preliminary eight categories, parallel meanings emerged. Comparable categories were clustered, and three final themes emerged that represented the participants' experiences as African American females (Creswell, 2007).

Findings

Pursuing a STEM-related degree can be challenging for any student, particularly for African American female transfer students. This particular population of students faces many challenges included just being female and being African American. Coupled with the identities mentioned above is the added identity of being in a STEM degree program. The African American female transfer students were asked to describe the community college experiences that assisted with their transition and adjustment to STEM degree programs at the HBCU. This study's findings indicate that their community college experiences assisted in their successful transition and adjustment into a STEM program at an HBCU within three areas. The participants discussed these ways within three themes: (a) It is more than academics - it is my future; (b) So what is STEM again? Understanding STEM-related skills, credentials, majors, and careers; and (c) One foot in: Understanding the HBCU environment.

It is more than academics - it is my future.

The participants discussed how pursuing a STEM degree impacted their future significantly. They viewed going through the STEM degree program as more than obtaining a degree but more so as a pathway to a successful future. They shared the opportunity to put the idea of pursuing a STEM career-related pathway into perspective while at the community college. They were allowed time to make the connection, "try on" the major, and get a glimpse into how a particular STEM degree would impact their future. The participants shared how the thought of pursuing a STEM related degree can be overwhelming – especially for an African American female. They further shared how viewing the pursuit of a STEM-related degree as a pathway to their future helped them persist and push through even when times became rough.

Marcia, a second-year Chemistry student, provided a photo of her family. Her family included her husband and three children – all under the age of 15. According to Marcia, her photo represents her future. When asked to elaborate on her photo and what her photo represents, she shared her description of her picture:

This is my family. My family means so much to me. My husband makes a modest living by working as a truck driver. He is away from us a lot. Our three children miss their dad and they deserve a fair chance at life...meaning they deserve to have both parents at home regularly and they deserve to have their needs met and a few wants. At least that is what I envisioned for my family. That is why I decided to return to school – to make life better for them; for us. I understand what I must do to successfully complete by bachelor's degree in Chemistry. But to me it is much more than a degree. It

is my future. My family's future. The degree is our ticket to a decent life – a good life for our kids. Education in my family was viewed as a privilege and not a right. The individuals at the community college helped me to see that education is for me and it is doable and I can do a lot with a degree in Chemistry, and obtaining a degree is just a piece of the puzzle. I can be successful and obtain a good job.

Ashley, Amy, Rhonda, and Lesley all expressed situations that resulted in learning how their academic degrees connected to their life goals. When asked to discuss how the community college assisted in connecting academics to her future, Jamie, a fourth-year Regulatory Science student discussed a situation that occurred while trying to declare a major.

I decided that I wanted to major in Biology and work for the FDA and develop new protocols and standards for the quality and safety of FDA-regulated products such as some medicines. I kept hearing that I needed to major in Biology and go the premed route. While at the community college, I was talking with one of my instructors who directed me toward an academic advisor at a nearby university. The academic advisor introduced me to Regulatory Science. Without knowing anything about me, my community college instructor and the university academic advisor developed a sample academic plan and expressed that it could change based on the institution. Nonetheless, the plan provided me with an idea of how my academics in Regulatory Science could be connected to my future goals of working for the FDA. It was good to have this information prior to enrolling at [SPREP-U, HBCU].

According to Ciara, a second-year Engineering student, “no one wants to waste their time or money. We have goals to accomplish. Just tell us what to expect. Tell us how going through a masculine area of study, such as STEM, is going to benefit us. Knowing what we are reaching for will motivate us when time gets rough.”

Pursuing a degree is a huge journey that takes time, patience, financial commitments, and family sacrifices. These decisions can be even more impactful when you are pursuing a specific degree with no clear understanding of where it will lead in terms of career and financial gains. All of the African American females valued the opportunity to connect academics and career goals early on. This placed them in a position to justify the sacrifices they had to make and use their career goals as motivation to push forward when things became difficult. In addition to making academic and career connections and alignments, the African American females appreciated the opportunity to learn more about STEM and the associated skills, credentials and career opportunities in the community college environment. This understanding allowed the students to learn how to prepare for their future STEM-related careers while at the HBCU.

So, what is STEM again? Understanding STEM-related skills, credentials, majors, and careers

Learning about STEM and related skills, credentials, majors, and careers was essential for all African American female participants. They shared how it was essential to know how to be successful and how “beginning with the end in mind” helped in understanding the preparation needed to complete a degree in a STEM field and be positioned to obtain a STEM-related career after graduation. The participants also shared feeling that the skills and credentials needed for a STEM career were “foreign” compared to what they learned during their educational journey.

Ashley, a second-year Biology student, provided a photo of a big question mark with a drawing of a small person in the corner. According to Ashley, the photo represented confusion. When asked to elaborate on her photo and what her photo represents, she shared her description of her picture:

Ok, so the little person at the bottom of the page is me. The big question mark represents what I felt prior to coming to [community college]. I knew I wanted to pursue a degree in Biology because I loved science in school. I enjoyed learning about organisms and different things like that. My family visited the zoo and we traveled quite a bit so I thought I had a good handle on things. But for some reason there seemed to be a big disconnect from what I was seeing during my travels and what I was experiencing in school. This made me wonder... what is STEM? I mean like ok so there is a degree in biology and I took science courses. Ok cool. But how does this translate into a career in Biology? Those were some of the thoughts that I had after I completed high school. My advisor at [community college] assisted me in developing an academic plan. She asked what I saw myself doing as a career. I mentioned being a

Chemist and a few other options and she quickly chimed in and said there was so much more I could do. She began putting me in contact with different individuals and things just progressed from there.

When asked to discuss specifically how the community college assisted in understanding STEM related skills, credentials, majors and careers, Lesley simply stated, “the community college provide me with what every student should know to be successful.” Amy elaborated on this thought and stated,

“this is what education is all about. [Community college] provided a holistic experience for us. They provided us with knowledge on what we needed to do to make ourselves marketable as African American females. This included skills sets, different activities that we need to engage in during our education journey such as internships and about career options. What more could we ask for? They even suggested that we begin identifying mentors. Some may view this as no big deal but how do you know what you do not know? Many of us did not even know where to begin with asking questions. The instructors and advisors at [community college] jumped right in with explaining to us answers to questions we did not know we had.

Tricia, Deana, Jamie, Amy and Bianca agreed with this thought and shared how they felt more comfortable pursuing a STEM-related degree upon transferring from the community college.

Preparing to pursue a STEM-related career proved to be manageable due to the community college experiences. The STEM knowledge gained allowed African American females to feel more comfortable and prepared. In addition to gaining STEM knowledge, African American females also discussed how the community college environment prepared them for the HBCU environment.

One foot in: Understanding the HBCU environment

In addition to understanding future goals and the role of STEM in the participants' future, along with understanding more about STEM, the African American female participants also valued the role that the community college environment played in assisting them in adjusting to the HBCU environment. The participants all shared that they attended a community college by choice and not because they were academically incompetent. They were ready for the HBCU environment but felt that knowing what to expect at the HBCU would allow their transition to be smooth-especially given the other adjustments, such as adjusting to the STEM environment.

Bianca, a third-year math student, provided a picture of a body of water.

According to Bianca, the photo represented familiar yet unfamiliar territory. When asked to elaborate on her photo and what her photo represents, she shared her description of her picture:

I am afraid of water. I have never been swimming. I have never been on a boat, and I have never been on a cruise. I am simply terrified. The water looks so calm but underneath could be a current that will take you under. It is like having one foot in and one foot out. I never get totally in. This is how I felt about going to [SPREP-U, HBCU]. I am ready and everything seems cool and all, but I did not know what to expect. I am familiar with university environments and HBCUs but since I had not attended one at the time, it was unfamiliar. Do I interact with faculty differently than I had interacted with my teachers? How are the students? Where do I go for financial aid? What about if I had a problem? I mean the HBCU, in my mind, was so big and everyone appeared to have it together and know what to do and I just felt like I was going to become overwhelmed, hit by a current and get pulled under.

Many of the participants shared similar sentiments of the HBCU environment being familiar yet unfamiliar. Some of the students shared how they feared failing and appreciated the community college, preparing them for the HBCU. Deane, Lesley, Ashley, and Amy all expressed how understanding how to function and manage the HBCU environment made them feel less overwhelmed and anxious. According to Rhonda:

All educational institutions are not the same. Institutions have their own individual culture and climate. In addition to that...some small institutions have cultures and climates that are different from those of larger institutions. Unless you have spent time at a particular institution before, you do not know what you are going to get. You have an idea of what to expect, but that could be totally different from what actually happens. Having someone to basically give you insight and walk you through what actually happens and how to navigate the environment and more about different institutional holidays and traditions was helpful. It made us not feel so much like outsiders.

Marcie, Bianca, and Lesley expressed a slightly different viewpoint. They valued learning more about the academic components and the rigor and what to expect to be academically successful. They wanted to know what courses they would have to take and whether they would receive an academic plan. Tricia mentioned, “It is all about the academics. If I can know the reality of the academic situation, the course load, what is considered passing, how much homework I will have at [SPREP-U, HBCU], I am good.”

Discussion and Conclusion

This study aimed to explore the role of community colleges in preparing African American female community college transfer students for STEM degree programs at an HBCU. The community college played an essential role in preparing them for the HBCU and STEM programs from the students' perspectives. While taking into account the intersecting tenants of Jackson-Smith's Model of STEM Education, preparation, career exploration and the interplay of the three tenets of the Triple Quandary Theory (Boykin & Toms, 1985), the authors conclude that African American females desire to be an effective citizen and successfully obtain a STEM related degree leading to a career allowing them to provide for their families.

The students highlighted their experiences in three areas, including the impact that the community college had on connecting academics to their future goals, the role of community colleges in explaining the context of STEM and related skills, credentials, and career opportunities, as well as what to expect in the HBCU environment. Several of the students noted how the community college connected academics and their respective future career goals. The participants expressed transferring to the HBCU and obtaining a degree in STEM for their families' future. Given the sacrifices they would make by making this step, they discussed not wasting money and time. Knowing what to expect at the end of a STEM related degree and how the degree was going to benefit their family was motivating and provided them confidence when times became rough. According to Eagan, Hurtado, Chang, Garcia, Herrera & Garibay (2013) and Jackson (2016), connecting knowledge and practice is essential and can provide a sense of reality to the individuals experiencing it.

Understanding the nature of STEM degrees and STEM-related career options were discussed by the participants. Several participants shared how the community college helped improve their skills to learn and different activities they needed to engage in during their educational journey to succeed in STEM. Additionally, the students expressed gaining knowledge of the credentials, majors, and STEM-related career options. They shared how the community college-educated them on what they needed to do to make themselves marketable as African American females (Packard, Gagnon, & Senas, 2012). This information was essential to the participants, as many of them explained how they did not know what questions to ask and what information they needed to know. The students even shared how they were encouraged to network and identify mentors who would provide them with more specific information on STEM.

Lastly, understanding the HBCU environment was vital for the participants. The participants highlighted that they first attended a community college by choice and not because they lacked academic preparation for the university environment. While many of the students expressed being familiar with the university environment, they were still unsure of what to expect and how to manage and exist within the university environment. The participants expressed community colleges' role as assisting in their adjustment (Kasper, 2003) in two areas. Some of the participants expressed the role of community colleges in assisting with their understanding of academic expectations. Other participants valued learning about the university environment, culture, and climate. The participants expressed not knowing if their interaction with faculty and staff at the university should be the same as in the community college environment or somehow act differently. They understood that institutions have their own cultures and climates but did not know how this would look in adjustment and transition.

Implications for Practice

There are significant implications for practitioners and faculty within both the community college and HBCU environments. While the implications may benefit all students in STEM, this study's implications, as it relates to the findings, are specific to African American females in STEM. The first implication is related to the role of community colleges and African American female student experiences. Community colleges provide many educational opportunities for students, including transfer, associate degrees, certificates, and workforce development, to name a few. Among these many opportunities is transferring preparation. Understanding African

American female transfer students' experiences and why they choose to pursue a STEM-related degree at an HBCU is essential for community colleges (Kurlaender, 2006).

Further, understanding the impact that STEM degree attainment has on the families of African American females places community colleges in a position to ensure that this population's needs – rather it be academic preparation, career development, or personal and family needs, are addressed. African American female transfer students in STEM encounter many obstacles that the community college can assist. With a large portion of African American females in STEM enrolling and transferring from the community college, community college must be able to ensure their success (both at the community college and during the transfer and adjustment process), as the community college environment is the starting point for postsecondary education for many African American female students in STEM (Hagedorn, Moon, Cypers, Maxwell, Lester, 2006).

The second implication is related to the role of community colleges in educating students about STEM. According to Packard, Gagnon, LaBelle, Jeffers, and Lynn (2011), research regarding women's experiences using the community college as a pathway has not received much attention. The participants expressed valuing the opportunity to learn about STEM and being prepared to transfer into STEM degree programs at the HBCU. Community colleges must continue to take the responsibility of ensuring that students in STEM majors are aware of the skills, credentials, and expectations associated with obtaining a STEM-related career – either at the community college and after transfer to a 4-year institution. This can be accomplished by ensuring that instructors, advisors, and individuals in positions to impact African American females' experiences are knowledgeable about STEM, STEM degrees, STEM content areas, and STEM-related career options. These individuals must also be prepared to discuss course transfer options and traditional and non-traditional academic pathways. The experiences of the African American female community, college transfer students remain the responsibility of both institutions. With students entering 4-year institutions via the community college environment, these colleges have the privilege of leading the charge in the successful transition and adjustment of students in the two-year environment and ensuring that African American females in STEM are not “Lost in transition.”

The third implication focuses on the role of HBCUs in receiving African American female transfer students in STEM. HBCUs comprise a large population of African American students in STEM. While HBCUs constitute a rather small portion of colleges in the U.S (approximately 3%), they are responsible for educating a large portion of our nations' STEM talent among African Americans (Lancaster & Xu, 2017). The transfer students in this study, referred to the HBCU environment as “unknown territory” and as “unfamiliar.” Understanding the HBCU environment is essential to the success of the transfer students. HBCUs can assist transfer students by engaging them early in their transfer process. Once transfer student enter into the HBCU environment, providing opportunities for transfer students to meet and interact with other students, faculty, staff and administrators can allow for a smoother transition. Additionally, assisting transfer students in understanding how to navigate the HBCU environment will allow the transfer students to adjust to what it means to be a transfer student in STEM at an HBCU.

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