

“What is going on here?” Exploring Why HBCU Presidents are Successful in Producing STEM Graduates

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This multiple case study seeks to explore the leadership characteristics of HBCU presidents associated with success of some historically Black colleges and universities (HBCU) in producing science, technology, engineering, and mathematics (STEM) graduates. Success, in this context, is defined by the ability of institutions to recruit and retain students in undergraduate and graduate STEM programs. Using purposive sampling, data were collected through semi-structured interviews with four HBCU presidents by the Center for the Advancement of STEM Leadership (CASL). In addition, the researchers used the Integrated Postsecondary Education Data System (IPEDS) enrollment and graduation data. Implications for HBCU leadership practices in the recruitment, retention, and graduation of STEM students are considered in relation to HBCU leadership studies.

Keywords: *STEM, HBCU presidents, student success, broadening participation*

INTRODUCTION

In reviewing the academic literature on historically Black colleges and universities (HBCU) leadership there seems to be a consensus among scholars that HBCUs are experiencing a leadership crisis of high turnover in the face of increasing scrutiny around fiscal challenges compounded by insufficient emphasis on succession planning (Birnbbaum et al., 1989; Boncana, 2014; Jamal & Watson, 2013; Lomotey & Covington, 2017). Some scholars even go as far as to point to the leadership crisis as arguably one of the main reasons colleges and universities are struggling in their efforts to recruit, retain, and graduate students (Birnbbaum et al., 1989).

HBCUs contribute to the American higher education landscape the following assets:

- HBCUs are involved in Black students' intellectual growth and development by providing opportunities to access and succeed at higher education.
- HBCUs are credited for producing Blacks in science, technology, engineering, and math (STEM) fields (Williams & Palmer, 2019).
- HBCUs contribute to the improvement of the students' self-efficacy, cultural connectiveness, psychological wellness, and social uplift (Palmer & Strayhorn, 2008; Preston & Palmer, 2018).

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These HBCU assets emerge in the face of many challenges that leaders, especially presidents, confront; challenges include resistance from governing board members, high turnover (e.g., research suggests that the average tenure for a president in an HBCU is four years, below the national average of six and half years), shrinking funding and resources (e.g., limited financial resources to support the faculty and staff), and policies that are often not in alignment with the mission of their institutions (Freeman et al., 2016; Palmer et al., 2017; Preston et al., 2019; Stripling, 2017).

Notwithstanding the aforementioned challenges, the 2016-2017 IPEDS data revealed that some small HBCUs (e.g., with a population of 800 students) have been more successful than some of the medium and large institutions (e.g., with a population ranging from 2,500 students or higher) not only in promoting student participation in STEM programs, but also helping them to succeed (Jackson, 2013). Success, in this context, is defined by the ability of a college or university to recruit and retain students in programs related to science, technology, engineering, and math (STEM). Furthermore, success involves providing those students with the opportunity to graduate not only with a baccalaureate degree, but also creating for them a pathway to pursue a graduate degree (i.e., a master's or Ph.D.; Brown & Sacco-Bene, 2018). Finally, a higher education institution is said to be successful when it prepares students to become contributing members of the society by teaching them the skills to become more competitive in the STEM job market (Hatton, 2012). Therefore, the following overarching research questions will guide this study:

- What characteristics do the presidents of these small HBCU colleges and universities have that make them effective leaders?
- What individual or institutional factors do the participants perceive might have led to their success in graduating STEM students?
- What role do HBCU presidents play in maintaining a culture of excellence in their institutions?

Individual and Institutional Factors Contributing to Success

In recent decades, as the competition among universities continues to grow in attracting students, some HBCUs are exploring new ways to attract, retain, and matriculate their students to degree completion (Fakayode et al., 2014; Wilson-Kennedy et al., 2018). In this regard, scholars have identified a set of individual leadership characteristics and institutional practices they believe can contribute to the STEM student's persistence and learning (Brown & Sacco-Bene, 2018; Gasman et al., 2017; Kim & Hargrove, 2013). It is important to mention that for the purpose of this article, the attention is exclusively geared toward the individual characteristics that the HBCU presidents may possess to assist with fostering students' success in STEM programs. Research suggests that successful presidents possess proven competence—alongside visionary, innovative, entrepreneurial, fundraising, fiscal management, and social networking skills—that help them lead their organizations to success or productivity (Ezzell Jr & Schexnider, 2010; Hatton, 2012). Finally, as Hatton (2012) stated, successful presidents “understand and appreciate the HBCU culture, tradition, customs, and racial dynamics of the institutions they are asked to lead” (p. 22).

Specifically, the institutional practices involve developing or acquiring student-centered programs or curricula that put emphasis on students' motivation, behaviors, and experiences (Brown & Sacco-Bene, 2018); creating a supportive campus environment where teaching and learning can take place (Kim & Hargrove, 2013; Nixon, et al., 2007); developing policies and practices that influence success in STEM fields (Jackson, D. L, 2013; Jackson, S., 2007; Toldson, 2013); encouraging meaningful faculty–student interactions that can help create trusting relationships between students and faculty; in turn, resulting in positive student learning outcomes (Brown & Sacco-Bene, 2018). Additionally, institutional best practices include establishing good relationships with community members and businesses to facilitate external fundraising and hiring politically savvy administrators who are committed to the institution's mission and vision (Freeman & Gasman, 2014; Hatton, 2012).

President's Role in Creating and Maintaining a Culture of Excellence

The debate over the role of academic leaders has continued for nearly five decades (Bolman & Deal, 2017; Bolman & Gallos, 2011; Jackson & Harris, 2007; McCaffery, 2019). In reviewing the academic literature there seems to be a consensus among scholars that the role of college and university presidents has changed over time (Barden, 2009; Hornsby et al., 2012). As such, depending on their schools of thought, scholars seem to have different, sometimes conflicting, views as it relates to the expectations for how a president should function and which specific roles must be emphasized (Cote, 1984). Some scholars, for example, argue that one of the most visible and demanding roles expected from a president is to be a champion fundraiser (Hodson, 2010; Thomas, 2018). In other words, they believe that an effective president must be a person who can create and maintain a culture of philanthropy and private support for their institutions. Freeman and colleagues (2016) expanded on this idea by proclaiming that the institutional function of a president should be concerned with fundraising, budgeting, community relations, organizational strategy development, strategic planning, project management, and delegation of responsibilities to constituents.

Other scholars believe that since the educational institutions are becoming the hubs of a kaleidoscope of students from different social, racial, ethnic, cultural, historical, and economic backgrounds, it is important for college and university senior administrators to embrace and engage in advancing diversity as one of their major responsibilities (Borkowski, 1988; Freeman et al., 2016; Kezar, 2008; Whittaker & Montgomery, 2012). In focusing, especially, on the STEM-affiliated HBCUs, Lockett and others (2018) believe that any effort by a president intended to create a positive institutional environment or climate on college and university campuses may serve as a catalyst for shaping the institutional culture, inspiring or engaging students of color to participate in the teaching and learning processes, and ultimately leading to student motivation and success.

Badillo-Vega and Buendía-Espinosa (2020) conducted a study on the leadership roles of university presidents in Mexico. They summarized the roles of university presidents into five main categories: (a) strategists, (b) communicators, (c) motivators, (d) politicians, and (e) legitimators. As strategists, presidents use the critical information they get to advance both the mission and the strategic planning of their institutions. As communicators, they use storytelling, symbols, and language of the communities in which their universities are embedded as means to create networks with external actors and to defend the interests of their organizations. In their role as motivators, presidents employ strategic information and a persuasive communication approach to create trust and establish relationships between the university community, potential investors (fundraising), and strategic partners. As politicians, they promote networking and organizational innovation and change. Finally, their role as legitimators is concerned with the position of the institution within the broader society.

In her study on "Presidential roles and qualifications: Views from historically Black colleges and universities," Buchanan (1980) seemed to have provided one of the most exhaustive lists on the function of an academic president. She used a 21-item instrument to survey 12 HBCU public and private senior leaders. Participants were asked to rank what they perceived to be the most important presidential roles based on their experiences. Among the 21 items presented to them, participants retained 10 as most important, which include (a) articulating a vision, (b) shaping and reshaping goals, (c) planning for future directions, (d) ensuring achievement of mission, (e) implementing board policies, (f) recommending policy changes to the board, (g) managing resources, (h) assembling an administrative team, (i) providing leadership during crises, and (j) securing financial support. Gardner (1990) echoed some of Buchanan's ideas on the tasks of effective and successful higher education leaders that include envisioning goals, motivating, affirming values, managing, and promoting unity.

METHODOLOGY

To answer the research questions of this study, researchers used a collective or multi-case study design (Creswell & Poth, 2018; Yin, 2018). Hancock and Algozzine (2016) describe case study research as a qualitative approach in which an investigator focuses on *individuals'* representative of groups, organizations, or a phenomenon. In this study, we are interested in exploring the best practices that permitted HBCU presidents to be successful in student engagement and matriculation to degree completion in STEM programs.

Furthermore, case studies are considered a holistic empirical inquiry that provides opportunity to investigate a real-world phenomenon in its natural context, bounded by space and time (Creswell & Poth, 2018; Merriam & Tisdell, 2015; Yin, 2018). In this study, we interviewed four HBCU presidents who were leading the Center for the Advancement of STEM Leadership (CASL) Affiliate Institutions during the 2016-2017 academic year.

Finally, an important characteristic of a case study is that it is richly descriptive because it enables the researcher to collect extensive data drawing from deep and multiple sources of information. To achieve the objectives of this study, we used semi-structured interviews to gain greater insights into the phenomenon.

Participants

The participants in this study consisted of four HBCU presidents who participated in CASL's broadening research project at 16 CASL Affiliate Institutions. They were the only presidents out of the 50 individuals interviewed. All of the presidents were male. The HBCUs in the study were also half public and half private. The size of the student population in those institutions varied. Based on Integrated Postsecondary Education Data System (IPEDS) institution enrollment data, recorded during the academic year in which the interview was conducted, CASL classified three institutions as small (700-2,500 students) and one as medium (2,501-5,000 students; National Center for Education Statistics, 2020).

Sampling Procedure

To address the research questions, we used the purposive criteria sampling procedure. Purposive sampling is one of the most widely used sampling strategies in qualitative research because it allows researchers to identify and select information-rich cases that yield insight and understanding of a phenomenon of interest (Palinkas et al., 2015). Purposive sampling is relevant for this study in the sense that it provided the opportunity to interview participants with expertise and deep knowledge of the issues related to student engagement, retention and graduation in STEM programs. Their perspectives allowed us to have an in-depth understanding of the phenomenon under investigation.

CASL purposely invited 17 institutions to serve as CASL Affiliate Institutions; one institution declined the invitation. Efforts were made to select a group of institutions that reflected the broadest array of criteria. The criteria for invitation included school size (more or less than 1000 student enrollment), public and private institution status, number of STEM programs, number of STEM undergraduates, and the number of students pursuing advanced STEM degrees.

Recruitment Process

Upon Institutional Review Board (IRB) approval, potential participants were contacted by the Executive Director of the CASL. Emails were sent to presidents at 17 HBCUs requesting their participation in CASL research. The emails included a recruitment letter containing the purpose, the benefits associated with the study, and the option to withdraw at any point from the study without providing justification. The institution identified individuals who were operating in a STEM or institutional leadership capacity to participate in the study. Participants who were willing to take part in the study were requested to sign a consent form.

Data Collection

To examine and analyze how presidents garnered success in their institutions, CASL researchers used semi-structured interviews. Semi-structured interviews were particularly suited for this collective case study in the sense that they provide the researcher the opportunity to pursue novel lines of inquiry within the context of flexibly worded predetermined questions (Hancock & Algozzine, 2016). Finally, using semi-structured interviews was appropriate for this study because it provided the opportunity for participants to express themselves openly and freely from their own perspectives (Creswell & Poth, 2018; Hancock & Algozzine, 2016).

Data Analytic Strategies

Immediately after the interviews, the tape recordings were transcribed. The researchers reviewed the transcripts to familiarize themselves with participants' perspectives and arrived at an overall view of the data. Next, they assigned codes to the data items with the purpose of identifying concepts and finding relations between them. The researchers used the block coding technique suggested by Saldana (2016). The coded data were then categorized into groups based on interrelated patterns. Finally, categories were obtained to generate themes.

FINDINGS AND DISCUSSIONS

The findings are organized based on the following generated themes and presented in relation to prior literature:

- presidents' leadership characteristics,
- role of presidents, and
- institutional factors leading to presidents' success.

Presidents' Leadership Characteristics

Leadership characteristics of presidents identified in the study were

- competence guided by vision,
- building of teams to advance the mission,
- experience navigating challenges,
- boldness of action, and
- vision that motivates and discerns.

The findings described next overlap with existing findings. Boldness of action, however, implies a nuanced and complimentary extension to the existing literature on HBCU leadership for broadening participation in STEM.

Competence guided by vision. All the participants in this study agreed that competence was a valuable characteristic for successful and effective leadership. However, one president argued that competence was not enough. This president believed that competence needed to be accompanied by self-assurance of the leader's actions and character. The president continued that frequently one may encounter many folks who are bright, smart, and capable individuals with world-class ability, but may be lacking a value system. In the end, such individuals would end up floundering.

Building of teams to advance the mission. As for building strong teams, three out of the four presidents discussed the importance of having a strong team. The team should be committed to fulfilling the vision. A president said,

I think the best way to measure the success of any leader is the people that they are surrounded by. I am fortunate to be surrounded by a very solid team who believes in the vision and supports the vision. The provost and I have to be on the same page about a lot of things. My provost understands the same way I understand the importance of building STEM and how that facilitates your brand as an institution, how it helps with new revenue streams.

Also, during the hiring process, the three presidents reported being deliberate in selecting faculty and staff who could advance the institution's STEM agenda. One president stated, "We hire to mission the folks that want to be here, to want to serve." Another president shared,

We are very focused on hiring younger faculty in STEM. We've been looking to hire younger proactive faculty who can step up and build these pipelines in all the multiple areas. I hire good people and let them do their jobs. I don't have time to micromanage a provost, or a dean, or a chair. If you're doing that as a president or a chancellor, something is wrong in your leadership model. [However], internally, a weak chair and weak deans really can hold back the progress of STEM. We have to make sure that the hires in those STEM areas are people who bring a track record.

Experience navigating challenges. The third leadership characteristic identified in the study was experience. All the participants in this study concluded that because of the complexity of higher education institutions emanating from the pressing and, sometimes, conflicting demands from the different constituents (board of trustees, faculty, staff, students, community members, and businesses), it was critical that a president have experience leading effectively. Participants mentioned that progressing through the ladders of the administrative and managerial hierarchy offered unique opportunities for a president to understand the organization's culture and be better prepared to confront the challenges that the job entails. The participants recognized that college and university presidents may encounter multiple forms of challenges that could put their jobs at risk, if unaddressed. Some of the challenges included administrative, financial, and social matters. For example, presidents discussed fiscal mismanagement, reduced budget, lack of appropriate personnel, and not having programs that would be considered competitive. Therefore, the participants concluded that if there is one place where experience was needed, it would certainly be in the position of the presidency. Furthermore, the participants appeared not to believe in the idea of a president learning on the job but ascending to the role with experience.

Boldness of action. Boldness was the fourth leadership characteristic revealed in the study. Two presidents spoke of the need to be bold as presidents. This characteristic was needed to achieve the institution's mission and transform the status quo at their institutions. Boldness was defined by taking a stand in doing something that a president believed was beneficial for the well-being of the organization even if others in the institution were reluctant to do so. One president believed that the reason some HBCUs have excelled in STEM enrollment, retention, and graduation rates was because their presidents had been able to take bold actions no matter the cost. Another president spoke of being bold and fearless when he spent two weeks during the summer visiting every program director at a STEM governmental agency. The visits resulted in two grants and his institution named a national center, the only in his state. This president reported that the program director commented, "You're the only president who's ever come to visit us. Not only HBCU president you're the only president that's ever come to visit us."

Vision that motivates and discerns. The last characteristic identified in the study was vision. Possessing vision allowed presidents to be relentless until goals were accomplished. Presidents shared how the lack of vision could be detrimental to the institution. One president stated, "A vision that's not tied to a concrete plan over time will demoralize the faculty." Another president shared that he was able to turn down an investment from the Navy "because it just isn't part of our vision." The same president said,

You want to talk about the shortcoming, what I see in some HBCU presidents? I already have an idea [of] what's going to happen five years from now. I already have an idea [of] what's going to happen three years from now. Since I have that idea, then I'm able to plan for it financially.

Presidents' Role in Creating and Maintaining STEM Success

The data indicated that the presidents were instrumental and strategic in ensuring the availability of resources, network building, and maintaining a competitive edge for STEM their institutions. Therefore, presidents in our study described roles like that of strategists, politicians, and legitimators (Badillo-Vega & Buendía-Espinosa, 2020).

One president spoke of his commitment to promoting STEM by providing financial resources. He fundraised a couple million dollars for STEM and reassured the faculty that although the institution might have budget cuts, the STEM funding would not be touched. The funding allowed faculty to develop competitive grant proposals to build quality programs with a research focus. The university never said to a STEM area, "We can't support you." Also, the university received \$10 million in grants to refurbish an old science building. Faculty with patents received extra laboratory space. As strategists, recognizing that there was not enough funding to build up STEM sufficiently, decisions were made for funds from summer school to be directed to support STEM.

Secondly, assuming the role of politician, networking emerged as a role of presidents. Three presidents spoke of making connections with external entities. One president discussed being invited to serve on various advisory boards that opened many doors. The president stated, "Being on [a] board led to a transformational grant. We're the only institution in all five. Not the only HBC—we're the only institution in all five [grant recipients]."

The two other presidents discussed networking in the context of opportunities for students. One president talked about the importance of forming partnerships with regional schools and international countries such as China. This president stated, "We've created partnerships. There are some amazing institutions in this region. It's not a competition. . . [These institutions] are the places here where the money flows, but their diversity is lacking." The partnership allowed his students to attend neighboring schools while paying tuition at their home institution. He also added, "I've been fortunate to be able to go over and cultivate the relationship in China. I spent time over there, and I'll send a team over. I was over in Senegal working with the universities over there."

Lastly, aligned to the roles of strategist and legitimator, the presidents recognized that they were responsible for maintaining a competitive edge for their institution. One president stated, "Broadening the participation means you have to constantly take a look at the STEM areas and make sure that they're advancing at the same pace as the national trend." The presidents knew that other HBCUs were not their only measuring stick. They needed to be able to compete with any institution, the best in the nation. Being competitive in the grant world would allow the university to attract strong faculty and contribute to students who are well-prepared to obtain good internship opportunities.

Institutional factors leading to presidents' success. In support of previous literature (Brown & Sacco-Bene, 2018; Hatton, 2012; Kim & Hargrove, 2013; Nixon et al., 2007), three institutional factors emerged in the presidents' perspectives on contributing to success in broadening participation in STEM: (a) demonstrated commitment to students, (b) quality STEM programs and research experiences, and (c) commitment to the historic mission of HBCUs.

Demonstrated commitment to students. From the perspectives of presidents, success in STEM could be seen in the commitment institutions made to students in the form of training, mentoring, and opportunities. One president expressed his determination to ensure that students succeeded at his institution regardless of how they got to the institution. The president stated,

So, I do everything in my power to create a meaningful landscape [so] that our students have the most transformational experiences [and] that they can compete in any global society. And that is the mission of HBCUs, bringing out the best of any student that we have no matter where they are. And I tell our staff

and faculty all the time. I don't care how the student comes in, it is our responsibility from the pedagogy model, from your staff development model, to get the student to where they need to be.

Another president provided similar sentiments. He shared that commitment to student success meant "the leadership, staff and faculty give them the feeling that they are in a special place." He believed that creating that networking system, where everyone felt important and valued, could be a source of motivation resulting in students' broadened participation in STEM programs. He added that it was the university's responsibility to provide students with the tools and knowledge to achieve their goals. Also, when presidents were asked directly how they defined student success in STEM, responses centered around commitments to develop students' skillsets and competencies, make students competitive for PhD programs, provide undergraduate research and internship experiences, have students be second and third authors on publications, and educate students on alternative career options in STEM.

The presidents acknowledged the importance of supporting students entering their institutions without receiving adequate preparation in high school to complete STEM degrees. They explained that it is the institutions' responsibility to provide students with proper training. The following was stated by a president, "When you bring [students aspiring to be mathematicians, engineers, and scientists] who are underprepared, then you must be able to bring them up to speed in a short period of time." Student success in STEM is all about building the foundational base that gives students the opportunity to find their natural fit. To address the STEM preparation issue, one institution received a million dollars in funding to create a program that helped students overcome gaps that existed. One such gap was understanding learning styles. The program worked with students to develop the analytical skills needed to be a scientist.

Quality STEM programs & research experiences. Evoking entrepreneurial principles, presidents in our sample reported intentionality in having STEM programs and extramural experiences that were of high quality. A major focus was on making students ready and competitive for graduate school and internships. Presidents' reflection drew connections between broadening participation in STEM, quality programs that get students internships, nationally ranked STEM programs, and internships. One president said,

We need to make [students] highly competitive. Our programs have to be accredited. Our programs have to be of such quality. [Students] have to have internships. A big gap right now is HBCUs are not giving their STEM majors enough internships to be competitive.

Presidents also reflected on STEM program reforms to facilitate students' ability to be successful in STEM. Programmatic changes were made as needed. At one institution, a change allowed students to not directly enter majors. When students started in the institution, they explored majors, developed critical thinking and analytical skills, and became exposed to multiple career pathways.

One president described removing impediments, such as deemphasizing traditional remedial developmental courses. Students took regular, credit bearing math courses. However, the students were required to do additional work with the instructor or supplemental instructors outside of the scheduled class period. To facilitate graduating within four years, this second institution required students to register for a minimum of 15 credit hours each semester. Also, the institution developed a required course for freshmen, in which students met weekly with a professional adviser (course instructor). Interactions between the students and professional advisers were documented.

Moreover, institutions restructured programs when needed. At an institution, humanities and social sciences were initially invisible because the focus was on STEM. An approach used was to have the other disciplines focus on the relevance of STEM in those disciplines. This was illustrated by having student focus on STEM Journalism and STEM Mass Communication.

Historic mission of HBCUs. Furthermore, the historic mission of HBCUs emerged as an institutional factor that contributed to success. As one president said, “HBCUs, historically, have been able to take folks who have been, really, maybe average high school students, and get them to blossom. [HBCUs’] leadership is nurturing.” All the presidents spoke about the dedication to mission to nurture students that exists at HBCUs to bring out the best in any student. The presidents shared that at HBCUs, students are not alone, everyone at the institution is committed to their success. The commitment was highlighted in the following comment, “If someone really wants to do well here . . . from the president down to the folks who cut the grass [are committed] to make sure the students succeed.”

CONCLUSIONS

The narratives of the small HBCU presidents in this study captured much of what has been previously documented as effective HBCU leader characteristics, roles, and institutional strategies. The findings from this study extend the knowledgebase by highlighting presidents’ perceptions of HBCU leader characteristics, leadership roles, and institutional factors specific to STEM success. Taken together, STEM leadership, specifically, appears to summon boldness of action and a balance of roles as strategist, politician, and legitimator, alongside the steadfast pursuit of quality in STEM education derived from entrepreneurial mindsets and innovation. Many of these practices have relevance for current and emerging HBCU leaders, as well as higher education leaders in other settings with a mandate to broaden participation of students of color in STEM. Future research can extend our understanding by examining the differential impact of characteristics, roles, and institutional factors that work together to impact STEM.

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