

# ***HBCU Presidents and their Racially Conscious Approaches to Diversifying STEM***

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*HBCUs have outpaced all other institutions of higher education in graduating Black students who are empowered to pursue graduate programs and contribute to the science, technology, engineering, and mathematics (STEM) ecosystem. These successes are due, in part, to Black presidents who are at the helm of these institutions. This study examined the practices of thirteen Black HBCU presidents or senior administrators. The authors interviewed these leaders and relied upon Gallos and Bolman's four frameworks to explore university presidents' decision-making to understand the skillsets and values that enabled them to create educational environments where Black STEM students thrived. These HBCU presidents utilize multiple leadership frames concurrently, while operating under a race-conscious approach to understand, identify, and counter the structures of systemic racism.*

**Keywords:** *university presidents, HBCUs, STEM, broadening participation, leadership, race-consciousness*

## **INTRODUCTION**

### ***Persistence against Surmountable Odds***

Historically Black colleges and universities (HBCUs) have maintained an unapologetic commitment to the education of Black students, while also attending to the education of all students that enter their institutions. HBCUs have particularly succeeded in diversifying the professoriate, the legal profession, medicine and dentistry, K–12 educators, and the science, technology, engineering, and mathematics (STEM) landscape, thus changing the face of these professions. HBCUs have outpaced all other institutions of higher education in graduating Black students who are empowered to pursue graduate programs and contribute to the STEM ecosystem (National Science Foundation, NSF, 2019a, b). The STEM ecosystem refers to higher education or industry environments focused on science, technology, engineering, and mathematics (STEM) concepts, practices, or innovations. HBCUs play an outsized role in preparing first-generation, low-income Black students for success in

These monumental achievements are due, in part, to Black presidents who are at the helm of HBCUs. In this current study, six of twelve Black HBCU presidents received a STEM degree, one HBCU leader served as dean of engineering, while the other six HBCU presidents became STEM leaders while serving at junctures where they developed and promoted approaches to diversify the STEM ecosystem, such as, higher education and the workforce, through their students and faculty (Gasman & Nguyen, 2014; Smith-Jackson & Byrd, 2019). In spite of gross funding disparities (e.g., the state of Tennessee owes Tennessee State University upwards of \$544 million dollars; Weissman

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2021), HBCUs continue to serve as the largest producers of STEM African American bachelor's graduates who continue their STEM academic graduate degrees, this article explores how Black HBCU presidents lead their STEM-centric institutions. STEM-centric refers to HBCUs which have played and continue to play a critical role in addressing underrepresentation in STEM and in studying mechanisms related to broadening participation in these disciplines (e.g., North Carolina A&T State University, Morgan State University, Norfolk State University, Jackson State University, Howard University, Florida A&M University).

HBCU presidential leadership is known to be informed by awareness of race and racism, and they actively fight against racism in STEM (Whitford, 2021). According to Selzer and colleagues (2017), race-conscious leaders know the difference between individual and systemic racism and understand that White people and their institutions of higher education benefit from a system that privileges them while distributing unequal resources (McGee, 2020). HBCUs have been on the front lines of the long struggle to gain entry to STEM education and careers for Black Americans (Toldson, 2013, 2018). HBCU presidents share in a long legacy of navigating systemic racism to negotiate opportunities for their Black students and are considered leaders in providing Black students with a safe and supportive education, offering a community of mentors, peers, and professionals that mitigate the challenges associated with “learning while Black.”

This study integrates HBCU presidents' personal histories and leadership ideologies to unpack their separate and collective strategies to racially diversify the STEM fields. We refer to the presidents in this current study as legacy leaders—leaders who have an accumulated body of work in broadening participation in STEM. We believe the practices of HBCU presidents in diversifying the national STEM workforce should serve as a prototype for all institutions serving Black and other minoritized students. Specifically, we investigate the following research questions: In what ways do HBCU presidents' leadership decisions translate into increased racial diversity in STEM fields? And how do their leadership strategies contribute to increasing STEM diversity in academia and industry?

## LITERATURE REVIEW

### *Introduction to Historically Black Colleges and Universities*

In 2018, there were 101 HBCUs located in 19 states, the District of Columbia, and the U.S. Virgin Islands, among which 51 were public institutions, and 50 were private non-profit institutions (National Center for Education Statistics, 2019). Although HBCUs make up only 3% of all colleges and universities across the country, they have contributed meaningfully to the education of Black students at the undergraduate, graduate, and professional levels (U.S. Department of Education, 2016).

HBCUs have a long history of producing Black graduates. In academic year 2017–18, some 48,300 degrees were conferred by HBCUs. Of the degrees conferred by HBCUs, associate degrees accounted for 11%, more than two-thirds were bachelor's degrees (68 percent), master's degrees accounted for 16% of degrees, and doctor's degrees accounted for 5%. Of the degrees conferred by HBCUs, the majority (74%) were earned by Black students. Black students earned 43% of HBCU's 5,500 associate degrees, 81% of the 32,600 bachelor's degrees, 71% of the 7,700 master's degrees, and 62% of the 2,500 doctoral degrees conferred by HBCUs in 2017–18. At all levels, the majority of degrees earned by Black students were conferred on Black female students (National Center for Educational Statistics, 2020).

For more than 150 years, HBCUs have demonstrated their STEM expertise. HBCUs account for 21 of the top 50 institutions that educate Black learners who earn doctorates in STEM fields, according to the National Science Foundation, the National Academy of Sciences, and the National Center for Science and Engineering Statistics. Though only 8.5% of Black undergraduate students attend HBCUs, the historically Black colleges and universities award about 18% of Black STEM bachelor's degrees as cited in Davenport and Jones (2020). In 2018, 32% of Black HBCU graduates

were awarded their bachelor's degrees in STEM (NSF 2021). This rate is 2% higher than non-HBCUs, who reported 29% of their Black graduates earned their STEM degree (National Science Foundation 2021). In the last four years, rates at HBCU and non-HBCU institutions have remained unchanged.

Further, recent research confirms that HBCUs are doing a better job than the average postsecondary institution in terms of vaulting students from the lowest quintile of income to the highest as adults. Of HBCUs studied, over 85% had a higher "mobility score" than the average across all institutions in the U.S. (Reeves & Joo, 2017). The mobility score is a product of two factors: access and success. Access is measured by the proportion of students coming from families in the bottom income quintile. The success component tracks the proportion of this group who make it to the top wage quintile as adults. HBCUs play an important role in promoting upward mobility for poor black students by helping to close one of the most persistent and important disparities between Black and White educational access and attainment (Reeves & Joo, 2017).

### ***Leadership Practices of HBCU Administrators and Presidents***

University presidents are afforded varying degrees of power within the university's structure, and culture. They set priorities, make strategic plans, and influence institutional images (Goodall, 2006, 2010; Pierce, 2014). Most presidents are responsible for the direction of the university, the strategy for achieving its goals, and the mechanisms for fulfilling its mission (Ricard & Brown, 2008; Solberg, 2009). Ricard and Brown (2008) define mission as "the explicit role, purpose, and function of the institution" (p. 69). In a recent report, researchers outlined that effective HBCU presidents often arrive with a deep knowledge of the politics that govern their institutions and the communities in which they are situated (Esters et al., 2016). HBCU presidents require particular expertise to be effective because these institutions function within a political climate wherein their legitimacy is often contested.

Brown, Williams, and Esters (2021) identified common practices that presidents use to establish external partnerships, including: learning to prioritize university operations; focusing on student needs and wants; using external experts and internal data to make informed decisions; collaborating across networks; and seeking innovative solutions to problems. HBCU leaders also create collaborative partnerships with other minority serving institutions (MSIs), as well as historically White institutions (HWIs, i.e., institutions created to serve White students, Esters et al., 2016). Such collaborations, which enhance institutional images and contribute to attracting talented faculty, staff, and students, expand the research infrastructure and increase academic opportunities across sites (Esters et al., 2016).

HBCU leadership emphasizes innovative methods to attract, recruit, and retain talented STEM faculty in an increasingly competitive environment (Palmer & Freeman, 2020). Hendrickson and Haynes (2019) demonstrated the correlation between hiring high-quality STEM faculty and broadening access to STEM careers at Morehouse College. Morehouse, over a five-year period, recruited faculty who were well prepared to assume their role, resulting in robust research agendas and rich collaborations with their students. In terms of institutional support, Morehouse provided faculty with a generous start-up package, including smaller teaching loads, senior faculty mentoring for junior faculty members, and ample opportunities for collaboration and visiting fellowships (Hendrickson & Haynes, 2019).

### ***Race-Conscious Leadership in Higher Education***

HBCUs were founded in part to eradicate racial barriers; thus, HBCU leadership epitomizes racial consciousness in higher education. Jones and Nichols (2020) define race-conscious policies as those which, "explicitly address race in the design [of the policy] and provide higher education access, opportunity, or support to students of color and their colleagues serving them" (p. 3). Scholars have shown that race-conscious leaders in education pursue the greater

goal of dismantling systemic racism, while attempting to minimize the discrimination that has historically shaped both K–12 schooling and higher education in the U.S. (Harper, 2009; Lamos, 2012). Jones and Nichols (2020) argue that since racist laws and practices led to the underrepresentation of Black students in higher education, leaders who pursue race-conscious policies are essential for eliminating the disparities. Leaders who employ race-conscious practices have a collective responsibility to recognize the impact of racism, expose the racial violence that impacts the lives of people of color, and operates from an ethic of care (Gunzenhauser, Flores & Quigley, 2021; McGee, 2020; Selzer, Evans-Phillips, & Johnson, 2017).

### ***The Role of HBCU Leadership in STEM Success***

While the literature has explored the role of HBCU presidents and what makes them successful (Albino, 2013; Anderson et al., 2019; Cole, 2020; Gallos, & Bolman, 2021; Goodall, 2006), few works have studied specifically how HBCU presidents contribute to the success of Black students in STEM. HBCU leaders' decision-making, strategic planning, and ability to transform their universities while adhering to the university's mission contribute to a culturally affirming experience for their students (Wilkins, 2017). HBCU presidents employ collaborative partnerships with other MSIs and HWIs and leverage these partnerships to form robust STEM programs where students gain from participating in multiple STEM environments (Esters et al., 2016).

### ***Theoretical Framework for Leadership***

We explore HBCU leadership via Gallos and Bolman's (2021) framework for university presidents' leadership practices across several aspects of decision making, including the structural, political, human resources, and symbolic frames. The structural frame is concerned with the institution's architecture, inherent in its rules, roles, policies, procedures, lines of authority, hierarchy, technology, and environment (Gallos & Bolman, 2021). The political frame casts presidents as advocates, political strategists, and coalition builders who manage conflict, make key decisions, and promote the interests of internal and external stakeholders (Gallos & Bolman, 2021). The human resources frame is concerned with how the president aligns and assigns individuals to the organization's tasks and responsibilities. Gallos and Bolman (2021) outline five approaches to successful human resource leadership: (a) promoting openness and transparency; (b) empowering constituents by providing the resources and space they need to use their skills and talents; (c) ensuring that coaching, support, and care are available to all constituents; (d) helping groups and committees function as a team; and (e) hiring the right people. Symbolic leadership is concerned with maintaining the traditions, rituals, and cultural contexts associated with the university. Leaders espouse symbolic leadership when they "build on the past, lead by example, and provide specific plans for moving forward that align with the culture, community and history of the university."

Gallos and Bolman (2021) present the four aspects of leadership in separate chapters but hold that using multi-frame thinking is necessary because "colleges and universities are messy and difficult organizations that require from their leader's simultaneous attention to vastly different sets of needs" (Gallos & Bolman, 2021, p. 17). The overlap between symbolic decisions, structural decisions, human resources decisions, and political decisions highlights the complexities of university leadership in general, and the work of HBCU presidents. In fact, Bradbury and colleagues (2012) demonstrated that presidents must consider the intersecting nature of these four frameworks when they make decisions. The HBCU leaders in our study made overlapping decisions about hiring Black and other faculty; designing and developing programs; creating robust and affirming student experiences; and providing resources to faculty. For this reason, we also apply these four themes to examine the multiple layers of decision-making for HBCU presidents while attending to the overlap between them.

## *The Importance of Race-Conscious Leadership*

Race consciousness counters color-blind ideologies that falsely assume fairness and equality are omnipresent, while purporting not to see race, and thus limit the opportunities to explore structural inequities (Bonilla-Silva, 2018; Perry, 2011). Race consciousness allows decisionmakers to recognize existing structures of racism, and this perspicuity enables them to acknowledge the force of race-based disparities and their impact on people of color. For example, the race-conscious policy of affirmative action, is understood by many White people as a threat to their domination and privilege. Harris (1999) asserts, “Affirmative action does not reify existing patterns of privilege, nor does it produce subordination of Whites as a group. If anything, it might fairly be said that affirmative action creates a property interest in true equal opportunity—opportunity and means are equal” (p. 289). Thus, race-conscious policies and practices that explicitly address race in design and provide higher education access, opportunity, or support to students of color and their colleges and universities serving them have the potential to rectify some forms of structural racism in higher education (Jones & Nichols, 2021). Furthermore, where a critical, race-conscious lens informs the pedagogy, Black students achieve more consistent success in schools and have a more positive outlook on their racial identity (Carter, 2008; Cokley, 2002; Zirkel & Johnson, 2016). For Black HBCU presidents, race consciousness is embedded within the leadership process, which is transformative for all parties because it sets the tone and boundaries for guiding human conduct and aspiration.

In summary, the literature we have outlined shows that HBCU race-conscious leadership has a transformative effect, increasing diversity in STEM through the following: (1) establishing the direction of the university, (2) leading strategic planning, (3) providing funding and assessing priorities of departments in hiring faculty, (4) providing resources, (5) attending to political alliances and collaborations, (6) prioritizing STEM, (7) creating learning opportunities for students, (8) building facilities, (9) creating programs, and (10) managing crises (Cole, 2020; Goodall, 2010; Solberg, 2009).

## **METHODS**

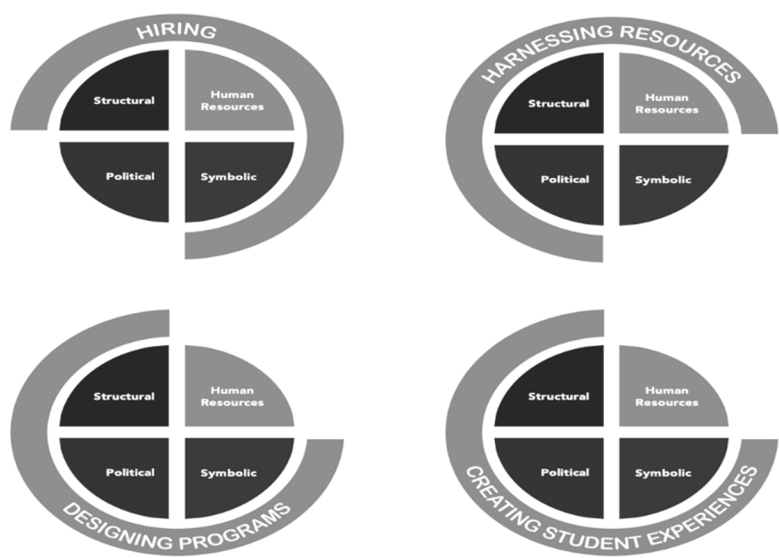
In 2020, we embarked on this research on legacy leaders, which included twelve former or current HBCU presidents and one engineering dean. The research originated in an NSF grant awarded to the Center for the Advancement of STEM Leadership (CASL). CASL seeks to examine historical and contemporary attitudes, behaviors, standards, and administrative practices of past provosts, presidents, and other key institutional stakeholders. The study was designed to capture the lessons learned and the institutional knowledge that these legacy leaders hold as they serve as a foundation for the next generation of HBCU STEM leadership. Note that we refer to the group collectively as HBCU presidents though the group includes a dean and draws on research that has similarly recognized that input from engineering college deans is essential to reshaping university cultures and engineering education (Besterfield-Sacre et al., 2014; Bystydzienski et al., 2016; Hodson, 2010). See Appendix for more details about each STEM legacy leader.

The CASL leadership team chose twenty presidents who were HBCU STEM legacy leaders and collected biographies for these potential interviewees. The first author reviewed the biographies of the HBCU leaders to develop an initial draft of the semi-structured interview protocol. Revisions of the interview protocol included comments and feedback from the CASL leadership team, and interview questions were prioritized from most to least important. Interview questions included: How was your role as a university president/dean valued within the larger STEM community? What strategies have you used to address diversity challenges in STEM?; and, What was the impact and/or legacy from your leadership in diversifying STEM within and beyond your institution? Thirteen interviews, which ranged from 44 to 94 minutes, were conducted via Zoom or phone call. All interviews were professionally transcribed, and interviews were coded via qualitative analysis through NVivo software. The interview format is particularly appropriate given that the phenomena we are studying evolves dynamically in our participants’ real-world contexts. In this context, we

examined the phenomena with intentionality, eidetic reduction, which resulted in acquiring new knowledge derived from our respondents’ experiences.

Our analysis employed phenomenology, which is the preferred strategy when asking how or why questions, and when the focus was on a historical or contemporary phenomenon in some real-life context. Initially, our analysis team included four members (the two authors, a doctoral student, and a master’s student), and employed an open coding schema to ensure that we captured the important elements of our interviewee’s legacy of leadership. Next, we coded the interviews using the Gallos and Bolman leadership framework (Gallos & Bolman, 2021). We attended to the overlapping nature of leadership by double or triple coding, using all four subframes. Our team coded separately and then came together to discuss the codes as a group and negotiated any disputes, before coming to consensus.

We narrowed the types of practices that the HBCU presidents used, then categorized the practices to derive a more nuanced understanding of emergent phenomena. Figure 1 illustrates how we categorized the HBCU presidents’ practices for broadening participation in STEM in relation to the Gallos and Bolman frameworks (2021).



*Figure 1. The Interaction of HBCU Presidents’ Practices and the Four Frames (The ring segments around the 3 of the 4 frames, indicates that these 3 segments are playing lead roles while the 4<sup>th</sup> is playing a lesser role.)*

Our analysis demonstrated the overlapping and intersecting processes that occurred as presidents made decisions about their students, faculty, and institutions. Member checking, a technique used by qualitative researchers to help improve the accuracy, credibility, validity, and transferability of a study, was done during the interview process and again at the conclusion of this publication (Birt et al., 2016). Out of the 13 STEM leaders, eight engaged in the member checking process.

**FINDINGS**

Every HBCU STEM leader took measures to secure funding, develop strategic plans for successful programming and initiatives, and set and manage expectations with an orientation toward Black STEM achievement. Four themes emerged from our analysis of our legacy leaders’ decision-making: (a) prioritizing the hiring of Black faculty, (b) being attentive to the Black student experience, (c) providing faculty resources for STEM success, and (d) designing/creating culturally affirming programming.

## ***Determining STEM Hiring Priorities with a Specific Focus on Black Faculty***

The HBCU presidents spoke frankly about the need for Black STEM faculty. They were attuned to ensuring that all STEM faculty embody the values of HBCUs. The decisions associated with the race and gender of faculty hires had numerous implications, as presidents made STEM faculty hiring priorities that intersected with the human resources, structural, and political frames.

Presidents recruited faculty to serve as mentors and role models for their Black students, in addition to the traditional roles that faculty perform (research, teaching, and service). Dr. Johnnetta Betsch Cole, President Emerita of Spelman College, discussed recruiting faculty with an eye toward social justice. She highlighted the importance of Black faculty:

In the HBCU community, [there are] folk who feel that too many positions are held by people of color who are not Black Americans. My position was always, it depends on who it is. That's because with my unmovable and persistent commitment to social justice, to being an activist, I do not hold the view that every single Black American is a perfect human being. . . . However, I do take the position that it is highly important for all Black students to be in the orbit of Black faculty.

HBCU presidents often leverage their knowledge of and rapport with Black doctoral candidates across the country to recruit Black STEM faculty, thus increasing diversity in both education and the STEM workforce. Dr. Eugene DeLoatch, former Dean of Engineering at Morgan State University, had an ingenious solution to the lack of Black faculty in STEM: hire alumni as faculty. His approach involved selling a value proposition grounded in the benefits of mentoring and teaching at Morgan State University:

[When I hire faculty] I'm trying to sell a concept. I had to sell it to people I knew. So, I put together a faculty that was non-traditional. Which means that I went after people I knew, so I met with some of my former students who had just gotten PhDs and tried to convince them that higher education might be a place that you can thrive in . . . [Instead of] "Oh no, I'm going to be a big creative engineer somewhere." I said, but, "You know, there's something about. . ." So I had to convince some people [to] take on a role in education. And many of them, several of them, well they're still in education and some of them are still at Morgan State.

Dr. DeLoatch was proficient at marketing the value of being a professor at Morgan State to alumni. Like our other HBCU presidents, Dean DeLoatch was aware of the symbolic and representational impact of Black faculty at an HBCU. This awareness allowed him to hire mostly Black STEM faculty with a mindset and vision that aligned with his altruistic and justice-oriented goals for the university.

Similarly, President Emeritus of Morehouse College, Dr. Walter Massey's approach to recruiting STEM faculty was to grow his own faculty members by implementing a postdoctoral program. President Massey's postdoctoral program introduced these Black postdoctoral candidates to the benefits of university life, creating a cadre of potential faculty. President Massey, reflected on this novel faculty development strategy:

I've put in programs to attract Black postdoc students . . . I found a way to have them come into the institution. Even pre-docs come in from HBCUs, to work in the summers as interns. They then go on and learn about STEM research. We have also tried to put together a program where we bring Black faculty along with their students. That didn't work as well. I don't know why. We've had a couple of hires, but I still think it's a good idea.

Although the effort to recruit Black faculty and students had results that were less successful than expected, President Massey's intent showcases the ways that faculty recruitment requires multiple strategies. At HWIs, the norm is to avoid hiring doctoral or even postdoctoral candidates for tenure-track jobs from within the institution. These two HBCU leaders, however, are committed to hiring Black faculty in STEM and see their own student graduates as ideal candidates for STEM faculty positions.

### ***Fostering a Supportive and Inclusive Culture for Black (and non-Black) Students***

Creating holistic and culturally affirming experiences, specifically for Black students but that are enjoyed by the full racial diversity of the college student body, is an explicit goal for many of the HBCU presidents. In some instances, presidents created opportunities for students at HBCUs to gain international experience; and in other cases, presidents encouraged mentorship and increased students' direct engagement with administration and university leadership. They envisioned HBCUs as an incubator for Black STEM achievement and a brave space for Black students and faculty to develop or enhance their own cultural identity in concert with their STEM identity.

Dr. Beverly Daniel Tatum, former president at Spelman College, wanted to ensure that students had meaningful experiences, so she provided them the opportunity to have international experiences:

The STEM program was well established when I arrived. But my biggest impact was to bring new resources to STEM departments and as a consequence of infusing more resources we offered expanded opportunities. Another and very important goal was our strategic initiative during my tenure to give every student a meaningful international experience. We wanted every student to have some kind of study abroad experience, if not a semester, maybe a summer internship or something like that.

This president's leadership practice enabled STEM students to have a global perspective, which would give them a nuanced understanding of how STEM practices are embedded within various cultural contexts. Such perspectives are likely to translate into a deeper understanding of different cultures and can lead to culturally inclusive and innovative STEM practices (McGee, 2020).

Gallos and Bolman (2021) assert that student learning and success are at the heart of university missions. HBCU presidents in our study provided numerous examples of student centeredness being intertwined with other institutional goals. For example, President Beverly Hogan created student experiences at Tougaloo College through partnerships with other universities. President Hogan recalls:

Tougaloo was part of the NIH funded Jackson Heart Study, and decided to become the undergraduate training center where we would focus on building a pipeline for students in epidemiology. We developed the Jackson Heart Study Scholars Program. Then we included a summer program for a science, language, arts, and math component designed for high school students, which builds a pipeline for Tougaloo College. And building on our legendary Summer Science Program, we expanded that program to include engineering and formed a collaborative partnership with Mississippi State University and Brown University. Students can go to Tougaloo College for three years, and then go to Brown for two years and then get their graduate degree in engineering. And we developed the same concept with Mississippi State. I think that one of the strongest positions that Tougaloo has [is] its ability to build partnerships with other institutions. What we cannot provide for our students directly on campus, we look outward and say, "Let's build this partnership." And that has exposed our students to a broader reservoir of experiences and opportunities.

Similarly, President Orville Kean of the University of the Virgin Islands engaged the local STEM and business communities. His leadership strategy required looking at the unique position of a university that served majority Black students in the Caribbean, a region that attracts tourists from around the world. President Kean spoke of the ways he leveraged these assets in service to the students and the community:

What was most profound was that I established a summer institute for future global leaders in the Caribbean. It enrolled students from Caribbean universities that participated in the Association of Caribbean Universities and Research Institutes, where I served as president. I wanted to focus on the need to excel beyond the Caribbean. We needed our students to have a global perspective. The simple and most obvious case is that most of us in the region depended on tourism, and tourism is a global industry. Caribbean businesses are competing in global markets in tourism, and have to be competitive



in those markets. Our obligation was to develop global leadership skills programs for our students. The STEM program enhanced our capacity to provide these skills.

Dr. Walter Massey, who began his presidency at Morehouse College in 1995, hired staff and worked with faculty to encourage students to pursue science and earn a Ph.D. His efforts are categorized within the human resources frame, but President Massey also operated within the symbolic frame, as an alumnus drawing upon his knowledge of the culture, rituals, and traditions of Morehouse. He explains:

I was an alumnus, since I graduated [in] '58. And I had not been involved in a small undergraduate college since I earned my PhD. So here I'm going back South to a small, 2,500 male undergraduate institution. My original goal was just to go out and learn as much as I could, so I wouldn't go in and screw up things. We [wanted to] get more students to go into sciences and one of my colleagues who was really a driving force behind it was John Hopps. John was my oldest friend. He also got a PhD in physics, at Brandeis. And at the time I was in California, John was at the Draper Lab at MIT. He said, "If you go back to Morehouse, I'll go with you in whatever capacity you want." So he quit his job at MIT and went with me. And we began working with the dean and faculty trying to come up with some ideas and programs that would really emphasize students going into science and going on to get their PhDs. That was the notion.

President Massey worked collaboratively with his faculty and the dean to identify students as early as high school and recruit them to attend Morehouse. He also encouraged rigorous science programming that would prepare the students to graduate from Morehouse with the academic knowledge required to compete as graduate school candidates. Students attended summer programs that included math and science but also included social action and leadership development curricula.

### ***Harnessing Resources & Empowering Black Students through STEM Collaborations***

Gallos and Bolman (2021) suggest that interactions with the world outside the walls of the institution are an opportunity for a university to make a political statement about their missions and about who they are. Our HBCU leaders created student opportunities that included collaborations with both internal and external stakeholders. These decisions combined the political and structural frames. Presidents reached out to external partners or drew upon existing relationships to provide opportunities for students that would benefit these organizations by improving the diverse pool of STEM graduates.

HBCU presidents often acted within the political frame when they negotiated external partnerships, received funding for them, and navigated related barriers (Brown, Williams, & Esters, 2021). These decisions, while political in one sense, were designed to maintain the quality of programming and to influence student experiences, thus falling also under the structural and human resources frames. For example, H. Patrick Swygert, President Emeritus of Howard University, partnered with General Electric so that his students would have first-hand knowledge and experience as working Black STEM professionals. In turn, there was an opportunity for students to forge relationships that could benefit them as they moved into the job market or pursued STEM graduate programs. Additionally, allowing students to interact with and learn from other minoritized STEM professionals aligns with the symbolic frame, demonstrating how Blacks and other minoritized groups are represented in the STEM ecosystem.

During her tenure as President of Jackson State University (JSU), Dr. Carolyn Meyers promoted the idea that data and technology are the drivers for advancement and progress in the 21st century across disciplinary boundaries. A new department of Electrical and Computer Engineering was formed. With an \$8 million investment from the state of Mississippi, supporting

laboratories were constructed. Additionally, as a result of the landmark Ayers Supreme Court decision, JSU was awarded the right to have a School of Public Health which would be enabled by the existing computer science and engineering disciplines not only at JSU but also by establishing partnerships with other Mississippiian universities. This STEM endeavor was financially Apple supported this endeavor by Apple.

We encouraged joint programs. Well, we had a school of public health, which was tied to the engineering program. How you can deploy computer science and engineering and software stuff to accelerate public health and impact it and all. But the thing that was good about it, [is that it] was at Jackson State.

Particularly telling is that the joint program was housed on Jackson State's campus. During the *Brown v. Board of Education* (1954) era of school desegregation, the onus of integrating schools was on Black students and their families. Black students were bused to White schools because those campuses were always considered the best campuses. Having the engineering program housed at Jackson State is a political statement that speaks to the quality of this HBCU's program and its resources.

Similarly, President Larry Robinson of Florida A&M University (FAMU) spoke of a collaboration with Florida State University's engineering program. Robinson contextualized this partnership within a 38-year experiment in which both universities were seeking to address underrepresentation. President Robinson clarified the nature of the success of the partnership between the HBCU and the HWI (The presidents of Florida A&M and Florida State formalized an agreement for managing the joint College of Engineering):

[FAMU] has made this phenomenal advance in the US News and World [Report] rankings, for example. We are now, of all the engineering programs in the state of Florida, we're ranked number two in engineering schools. The reason is because both institutions have, through the engineering school in particular, a similar vision and dedication to addressing the issue of diversity, inclusion, and equity. I think the school has really set sort of a benchmark for how to get that done. Now we always have to worry about how much attention we pay to ensuring that we live up to that mission, in particular, not only at the undergraduate level but at the graduate level. And at both institutions, we're paying very close attention to the numbers. We haven't seen the type of unrest around inequity that we're seeing now in a very, very long time. My job is to eliminate the injustices in education, and I really think the engineering school is one of those classic examples of how, if we work together, we'll do much better than anybody would've thought, and there were people talking about, at one time, the partnership was holding the engineering school back. "If it was one, in and of itself, it could do better."

The partnership with FSU is not only about creating STEM opportunities, but it also allows President Robinson to take a much broader political stance about the benefits of partnering with engineering program in Florida dispels the myth that such partnerships benefit only Black students, since it is usually Blacks who are framed as the beneficiaries of integration. Additionally, when President Robinson claims that the partnership is consistent with "living up to [FAMU's] mission," he evokes the symbolic frame, whereby he draws upon the history and strength of the university while advancing its institutional objectives (Gallos and Bolman, 2021).

Dr. Cynthia Jackson-Hammond of Central State University worked to establish her university as a land-grant institution, a status it achieved in 2015. The land-grant status had implications for the faculty and the community in which Central was situated. Land-grant status meant that there were additional funds, but there were also new expectations. The decision to become a land-grant school required Central State to serve its surrounding community, while also allowing students and faculty to benefit from this engagement. Faculty received resources allowing them to engage in more rigorous research. Dr. Hammond recognized that the "integrated process" involved resources that could reach multiple stakeholders. Finally, President Johnnetta Betsch Cole, led a science-focused expansion at Spelman by securing external funding to meet the needs of students through grants from NSF, NASA, Howard Hughes Medical Institute, and the Kellogg Foundation.

## *Strategies for Building STEM Programs and Structures*

Recruiting competitive students was a key to developing successful STEM programs and structures at HBCUs. President Dorothy Yancy sought to equip Black students at Johnson C. Smith with tools that would allow them to succeed in their studies. President Yancy recognized the racial barriers and equity issues involving computers and technology. To combat this imbalance, she provided computers to students and equipped them with the knowledge to repair them. In this way, President Yancy institutionalized STEM capital through student-centered knowledge and technological independence.

President Swygert of Howard University shaped the culture of student recruitment by competing for talent, while creating related programming and policies that were institutionalized. President Swygert described recruiting young Black students as part of an intricate process that showcased their facilities and talented Black faculty. According to President Swygert, the process of recruiting students for STEM would lead to more representation of Black students in these fields:

I've always thought that as it relates to STEM education we started at the wrong end of the proposition. And what do I mean by that? I have long thought that rather than speaking to high school students while they're in high school, why not bring them to a college graduation ceremony so they could see the end of the road in the sense that you see it. You have young people who look like you who may have backgrounds that they shared with you; they're graduating into STEM fields. You see it can be done. See, there is a school of engineering here. And there's nothing like seeing and touching. And again, I go a little deeper than that. I like to go to the middle school students. I like to go to the elementary school students. And why do I say that? Well, sometimes by the time we get to juniors and seniors in high school there are other issues that have impeded their progress. Let's talk about the elementary school kids. Let's show them Black scientists, minorities, women scientists, Black scientists, people of color who are scientists.

By exposing young people to Black and other minoritized scientists, President Swygert, sought to provide images of STEM success which he hoped would lead to future investments in these fields. HBCU presidents recognized that the legacy of their institutions could be maintained only if the new generation of students could see themselves as scientists and innovators.

President Beverly Wade Hogan maintained a flagship program that supported the success of Tougaloo alumni. Here she puts the reputation of Tougaloo in the foreground as she describes how she built programs to serve students:

The sciences were our flagship programs. Tougaloo built its reputation, formed its credibility, around that division, along with its rich history in civil rights and social justice where the college is known as the "cradle of the civil rights movement" in Mississippi. In fact, 40% of the African American physicians and dentists and healthcare professionals practicing in Mississippi, earned their undergraduate degrees from Tougaloo College. So that was a legacy... [, and] I was a part of that legacy. I didn't try to change it; I worked to strengthen it. And oftentimes, when presidents come in, they want to clear the slate and build their own. But sometimes you just have to build on what's there and make it better.

President Hogan's description encapsulates the practices of symbolic leadership, which seeks to honor and maintain the culture, traditions, and reputation of the institution, while adapting and transforming it to meet changing times. This is done while adhering to the structural frame to ensure that flagship programs, responsible for cultivating and producing successful graduates, continue to thrive.

## **DISCUSSION AND IMPLICATIONS**

Our findings demonstrate how HBCU presidents lead with intertwined and overlapping frames. They employed a race-consciousness in ways that uniquely benefited Black and other minoritized

students, faculty, and staff. Our HBCU presidents made leadership decisions that translated into increased racial diversity in STEM, by being unapologetically focused on centering the needs of their students. Since the majority of those students were Black, they provided a Black-centric approach that also focused on student inclusivity. Strategies for diversifying STEM included leveraging opportunities outside the institution; funding new and existing STEM programs; building up the STEM infrastructure particularly through prioritization; and funding the hiring of Black faculty.

Part of creating a racially conscious environment involves including HBCU students as part of a global community. Several HBCU presidents centered student experiences on exposure to international opportunities. HBCU leadership provided students with the opportunity to have experiences that would allow them to see themselves within a global context.

Three presidents and a dean-initiated programs that focused on increasing STEM faculty. They did not hesitate to hire their own doctoral or postdoctoral students contrary to the established norms of HWI's. Academic inbreeding is often accompanied with claims of a lack of objectivity in the hiring process (as if hiring faculty was an objective process to begin with). It is also associated with a perceived lack of new ideas and innovation, and with a certain conceit around only hiring one's own. There are even claims that academic inbreeding affects productivity. However, our HBCU presidents were not dissuaded from valuing their own students as STEM faculty hires.

Report after report lament that HBCUs are at a disadvantage in comparison to HWIs. Although the 12 HBCU presidents and one engineering dean were aware of the gross disparities between their institutions and HWIs, most responded by creating successful partnerships with fellow HBCUs, other educational institutions, major industries, and community partners. Our leaders' decisions illuminate the complexity of increasing STEM diversity because to do so it is necessary to draw support from systems outside of the educational ecosystem be they partners from government, industry, or other sectors. As race-conscious leaders, they understood the complex, systemic factors that drive the current underrepresentation of people of color in STEM. And they are uniquely positioned, as leaders of institutions designed to redress racial inequities in education, to consider multiple decision frames (e.g., structural, political, human resource frames), and to address the complex environment which these institutions inhabit.

Collaborations both within and outside of the walls of the institution were often borne out of necessity, but the benefits went far beyond meeting the needs of their students, the local community, and partner institutions. These HBCU presidents were cutting-edge leaders and engaged in relationships that were critical to developing innovative support for their institutions. They leveraged their strengths to graduate a large proportion of Black students who complete their degrees in STEM without the fiscal resources of large majority institutions (McGee, 2020). Leaders also used these partnerships as a mechanism to enhance STEM education and training opportunities. Our presidents put forth considerable effort to ensure that collaborative partnerships directly benefited their STEM students.

Thus, presidents also confronted complexity with respect to the numbers of stakeholders impacted by their decisions, and the effect of their decisions on the wider societal context. Although students, faculty, and staff were their primary responsibility, these leaders understood that their decisions had a wider impact on the composition of the industrial workforce, on the government's willingness and ability to function as a partner, and on the reputation and future of institutions such as theirs. The presidents' focus on students in their respective HBCUs had far-reaching implications for the STEM ecosystem, as they addressed a niche area in the STEM marketplace and contributed to the positive reputation of HBCUs as the go-to institutions for diversifying STEM.

No decision is made in a vacuum, and none of the decisions made by an HBCU president in our study had a singular effect. HBCU presidents were charged with running institutions that have many moving parts and multiple stakeholders. The institutions in themselves are complex, and the HBCU presidents in our study shed light on institutional complexity across the various campuses.

No leader inherited the same type of campus because HBCUs are not a monolith. The leaders took the helm at different times in their institution's histories. Some leaders began their tenure at institutions where there was low morale among campus faculty and students, others came to the presidency when their institutions were facing fiscal crises. Nonetheless, the presidents strategically drew upon prior relationships and networks, and formed new ones in order to move their institutions forward, and to create systems for prioritizing STEM on their campuses while managing the everchanging campus climate.

The complexity of the presidency at an HBCU was also illuminated by how HBCU presidents managed multiple institutional issues and provided solutions that required both immediate and long-term considerations. We found that the HBCU presidents operated with race-consciousness that gave them greater insight for preparing students to achieve academically and for preparing them to navigate broader society. HBCU presidents were particularly attentive to the traditions, cultures, and rich histories of their respective institutions as they moved towards broadening participation in STEM. Broadening STEM programming meant creating a continuum that exposed younger high school students to the possibilities of STEM at HBCUs while simultaneously creating pathways for HBCU graduates to go into graduate programs and enter the STEM workforce. Successful university leaders cannot create and maintain a thriving STEM culture without similarly being attentive to the past, present, and future experiences that students will face. Future studies, might explore the strategies employed by our STEM legacy leaders compared with current interventions and "evidence-based" programming and their different impacts? To what extent are the best practices from these STEM legacy leaders transferable to non-HBCUs? What success would non-Black leaders have if they pursued these strategies?

## **IMPLICATIONS**

This study implies that HBCU presidents need ways to increase their opportunities to create partnerships with other educational institutions, industry, government, and other sectors. A policy implication of the study would involve streamlining and fast-tracking any process that would enable such partnerships between HBCUs and other institutions. Further, to assist in efforts to diversify the STEM ecosystem, stakeholders should find any means available to improve and streamline any process that

- prioritizes the hiring of Black faculty,
- enhances Black student experiences,
- provides faculty resources for STEM success, and
- designs and creates culturally affirming programming.

Another implication of the findings is that race-conscious leadership and pedagogies produce results for both STEM recruitment and retention. Educational theory and teaching should emphasize the vacuity of outmoded color-blind policies and practices. The study implies that educational pedagogy and scholarship should emphasize race-consciousness as a factor in effective leadership that leads to increased diversity.

## **CONCLUSION**

HBCUs produce an astonishing number of Black STEM graduates, particularly considering their legacy of inequitable resources, even when factoring in the generous donations of wealthy benefactors. We conclude that most effective HBCU presidents embody a race-consciousness and awareness of how race and racism impact the experiences and lives of their students, faculty, and staff, both within and beyond STEM. Their leadership was informed by the mission to serve Black and other minoritized students. Race consciousness enabled these leaders to understand, identify, and counter the structures of systemic discrimination and advocate for success that celebrates and not simply tolerates authentic forms of Blackness in STEM.

## Appendix

### *Quoted HBCU Presidents' Institutions and Accomplishments*

Name	Institutions served as President	Date of the Presidency	Accomplishment
Dr. Johnnetta B. Cole	Spelman College	1987-1997	<ul style="list-style-type: none"> <li>• The first African American woman President of Spelman College</li> </ul>
	Bennett College	2000-2005	<ul style="list-style-type: none"> <li>• Reduced teaching loads to make room for research</li> </ul>
	Director of the National Museum of African Art	2009-2018	<ul style="list-style-type: none"> <li>• Pushed for STEM education and increased African American female participation in STEM</li> </ul>
Dr. Eugene M. DeLoatch	Dean Emeritus of School of Engineering at Morgan State University	1984-2016	<ul style="list-style-type: none"> <li>• Created engineering collective programs and had the highest number of African American Engineering Graduates</li> </ul>
	President of American Society of Engineering Education	2002-2003	<ul style="list-style-type: none"> <li>• The first African American president at ASEE</li> </ul>
Dr. Cynthia Jackson-Hammond	Central State University	2012-2020	<ul style="list-style-type: none"> <li>• First African American woman president at Central State University</li> </ul>
	President of the Council for Higher Education Accreditation	2020-present	<ul style="list-style-type: none"> <li>• Built the Center of Academic Research and Innovation to promote collaboration and development across disciplines</li> <li>• Pushed for research activities especially in the College of Engineering</li> </ul>
Dr. Beverly W. Hogan	Tougaloo College	2002-2019	<ul style="list-style-type: none"> <li>• First woman to lead Tougaloo College</li> <li>• Tougaloo became one of the top 25 institutions whose graduates went on to earn a PhD degree under the leadership of Dr. Hogan</li> <li>• Built the undergraduate research center in collaboration with multiple institutions and a tutorial center for students</li> </ul>
Dr. Orville E. Kean	University of the Virgin Islands	1990-2002	<ul style="list-style-type: none"> <li>• Built a research and technology park for tenants, while tenants are responsible for setting up scholarship and offering curriculum for students</li> </ul>

Dr. Walter E. Massey	Director of National Science Foundation	1991-1993	<ul style="list-style-type: none"> <li>• Focused on recruiting high performing high school students in STEM to join Morehouse</li> <li>• Led efforts to find barriers in science education and offered grants to deal with systemic issues under the Urban Systemic Initiative</li> </ul>
	Morehouse College	1995-2009	
	School of the Art Institute of Chicago	2010-2016	
Dr. Carolyn W. Meyers	North Carolina A&T State University	1997	<ul style="list-style-type: none"> <li>• First African American woman dean of an ABET accredited engineering school</li> <li>• Secured funding to upgrade academic and academic support facilities</li> <li>• The first woman president of Jackson State University</li> <li>• Added electrical engineering program, partnered with Apple and the E2F Foundation, won Apple Distinguished University (1 of 5 in the nation) twice, highest enrollment in JSU history</li> </ul>
	Norfolk State University	2006-2010	
	Jackson State University	2010-2016	
	NSF Program Director		
Dr. Henry Ponder	Benedict College	1973-1984	<ul style="list-style-type: none"> <li>• Encouraged faculty to bring in more grants and recruit more students</li> </ul>
	Fisk University	1984-1996	
	Talladega College	2002-2008	
Dr. Larry Robinson	Florida A&M University	2017-present	<ul style="list-style-type: none"> <li>• Nurtured existing collaboration in FAMU-FSU College of Engineering</li> <li>• Established partnerships with community colleges to provide access to African American students with associate degrees</li> <li>• Promoted interdisciplinary research and internship in undergraduate study</li> <li>• Established STEM experiential programs for K-12 students</li> </ul>
	Interim president of Florida A&M University	2016-2017	
		2012-2014	
		2007	
Mr. H. Patrick Swygert	University at Albany, SUNY	1990-1995	<ul style="list-style-type: none"> <li>• Recruited more African American faculty at both institutions</li> <li>• Developed student outreach programs at Howard to attract more students of color to STEM</li> </ul>
	Howard University	1995-2008	

Dr. Beverly D. Tatum	Spelman College	2002-2015	<ul style="list-style-type: none"> <li>Created programs for all Spelman students to have research experience and global opportunities for STEM students</li> </ul>
Dr. Dorothy C. Yancy	Johnson C. Smith University	1994-2008	<ul style="list-style-type: none"> <li>Set up a system to reward researchers who brought in grants</li> </ul>
	Shaw University	2009-2010 & 2011-2013	<ul style="list-style-type: none"> <li>Encouraged brightest and best students to pursue careers in higher education so that there would be more African American faculty</li> <li>Established leading technology infrastructure at Johnson C. Smith to provide internet access across campus and offered every student a laptop and software needed for their success</li> </ul>

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