Senior Level Administrators and HBCUs: The Role of Support for Black Women's Success in STEM

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Abstract: While it is important for college and university senior administrators to embrace the traditional roles of their administrative positions, senior administrators' interactions with students also shape institutional culture, students' engagement, and ultimately play a role in students' motivation to succeed. This engagement is especially evident in the Historically Black College and University (HBCU) context as senior administrators' engagement with students can directly or indirectly affect how students perceive themselves and their ability to succeed. This article aims to illuminate the role that HBCU senior level administrators play in students' motivation toward success. We also highlight the notion that senior level administrators' role in organizational culture ultimately led historically-disempowered Black women students toward success in even the most historically inaccessible pathways in the science, technology, engineering, and math (STEM) fields. The study used semi-structured interviews with 71 Black women STEM students across 10 HBCUs and asked questions to better understand how events in their lives and on their campuses shaped their choice to pursue and persist through a STEM degree program. The study found that the women were highly motivated by their HBCUs' family-like community of support. Integral to this article, this support was not confined to professors and peers, but extended to senior administrators. We conclude that Black women STEM students' perception of their ability to succeed and their motivation is influenced by the institutions' senior administration.

Keywords: HBCU; administrators; engagement

1. Introduction

The job descriptions of senior level college or university administrators such as deans, provosts, vice-presidents, and presidents include providing leadership and guidance to senior staff and faculty throughout the university [1]. Rarely discussed is the impact that these administrators have on the success of students. These senior administrators, even if from behind the scenes or in passing, can be champions of student success. This role is especially evident within the historically Black college and university (HBCU) context. Within these institutions, there is often a family atmosphere and environment [2] in which all faculty, staff, and students associated with the college or university help to empower and motivate one another. Many senior administrators at HBCUs wear multiple hats and, along with the day-to-day functions of their job, HBCU senior level administrators are also responsible for the implementation of institutionalized student support systems. Such responsibility brings these administrative leaders closer to students than at many other non-HBCU schools [3]. At some HBCUs, institutional support can be found in the way of tutoring, mentoring, remediation programs, or even school-sponsored celebrations for students' academic accomplishments.

As this study finds, senior level administrators' roles in the conceptualization and implementation of institutionalized support systems bring many HBCU deans, provosts, vice-presidents and presidents closer to student life and academic engagement. As a result, these administrators' reach and influence often extend beyond managerial tasks and the staff and faculty that their roles traditionally require them to supervise or professionally coach.

This article specifically examines senior administrators' support of Black women in HBCU STEM programs. Mentorship of this population is especially important as research highlights that Black women's attainment in STEM is constrained by historic systemic, systematic, and institutionalized sexism and racism [4]. Despite this, data show that effective and intentional mentoring and support is directly linked to student success [2]. With these data in mind, this study examines whether senior administrator's intentional support of Black women STEM students shapes these women's motivations to succeed. Within many colleges and universities, and especially within HBCUs, the presence of senior administrators as mentors, coaches, or even friendly and encouraging leadership figures, provides crucial academic guidance and social support [5]. This article takes the position that, despite the underrepresentation and historical disempowerment of Black women HBCU STEM students, the support of senior administrators can serve as affirmation and motivation for Black women STEM students at HBCUs.

Current research regarding student engagement, support and mentorship often center on the relationships between students and faculty or students and their academic peers. Although there is a paucity of literature regarding the impact that senior administration has on Black women HBCU STEM student success, these individuals play an integral role in these students' successful matriculations. The article aims to narrate the importance and impact that senior-level administrators have on the experiences of historically disempowered Black women STEM students at HBCUs, as well. It will do so by answering two questions: (1) What is the influence of senior administrators in the creation of a motivational culture? (2) What is the impact that these leaders' interactions have on the motivation of Black women STEM students?

2. Literature Review

This literature review seeks to examine the roles of Black women in the STEM fields, the traditional roles of senior administrators, and higher education staffs' student support practices. There is little existing research that examines how senior administrators' support contributes to Black women in STEM's success. We examine each group, Black women in STEM and senior administrators, separately. We also highlight Black women in STEM's presence, or lack thereof, in the field and examine their motivating factors toward success. Following this, we explore senior administrators' traditional institutional roles and highlight these administrators' student support practices through institutional support systems, indirect messaging, advising, or simple words of encouragement. While this review uses existing literature to narrate Black women in STEM and senior administrators, it ultimately exhibits the disparity in knowledge regarding interaction between these groups. With this in mind, we hope to advance the current research and concepts that speak to the importance and necessity of senior HBCU administrators' roles as motivating factors for Black women's success in STEM.

2.1. Gender and Racial Minorities in Collegiate STEM Fields

Women are undoubtedly underrepresented among all students earning post-secondary STEM degrees. In 2013, The National Science Foundation [6] reported that although women receive at least 57% of post-secondary degrees, they only earn 30% of undergraduate degrees in STEM fields, such as engineering and computer science [7]. When comparing the attainment of STEM degrees among women and men, data show that gender is an institutionalized hindrance [8]. Gender creates boundaries—both internalized and externally felt—for those pursuing STEM degrees. Research also shows that though many women feel the impact of gender-STEM stereotypes, women across varying ethnic groups might feel stereotypes in different ways and to differing extents [9]. Recent evidence

suggests that gender-STEM stereotypes vary in strength across settings [9,10]. African Americans trail behind other racial groups in the attainment of undergraduate degrees in science, technology, engineering, and mathematics (STEM). According to the NSF [6], a mere 10% of minorities constitute the science and engineering workforce [11]. This comes as little surprise considering that, in 2006, 16.7% of underrepresented minorities compared to 64.7% of Whites were awarded bachelor's degrees in science and engineering [11]. In 2010, the National Science Foundation reported that African Americans received 7% of all bachelor's degrees awarded in the biological sciences, 6% in the physical sciences, 5% in mathematics and statistics, and only 4% of the bachelor's degrees awarded in engineering [6,12].

Minority women, unlike White women and racial minority men, face a double-bind as they are underrepresented in both gender and racial categories [13]. Latina, African American, and American Indian women collectively received 6.4% of STEM bachelor's degrees earned in 2008 [10,12]. Comparatively, this number has increased over the last thirty-five years with the incorporation of education policies, such as 1972's Title IX, which prohibits gender discrimination within educational institutions.

A demographic most important to this research—and arguably the most oppressed of all American minority women groups—are African American women. With their identities contextualized in the shame that African American women were brought to this country "to work, to produce, and to reproduce" [14,15], the mental and emotional shackles of historical racism and sexism, as well as structural barriers, continue to shape the success and present identities of African American women. Black women students do not just experience or contend with the challenges associated with being Black. They "respond to the black legacy of struggle in varying ways" that also reflect their age, social class, faith, or sexuality [4] (p. 328). These constraints and barriers have many implications in the attainment of STEM degrees, such as isolation, lack of self-efficacy, self-esteem, and the aforementioned double-bind [4].

As posited by Monica Moore, "Black women are judged for not being strong and able and simultaneously Black women are judged for being "too" strong and able" [4] (p. 355). A growing body of work in psychology examines ethnic variation in the social constructions of gender and suggests that gendered conceptions of independence and agency as "masculine" are stronger among Whites than African Americans [16–22]. Given this research, it is interesting that African American women do not preclude themselves from STEM fields for a lack of independence or sense of intrinsic motivation. Their hindrances are generally more external and they are discouraged from getting into the sciences for a lack of support structures.

The mental and emotional shackles of historical racism, sexism, and structural barriers continue to impede the success and present identities of Black women. Black women students do not just experience or contend with the challenges associated with being Black. They "respond to the Black legacy of struggle in varying ways" that also reflects their age, social class, faith and/or sexuality [16] (p. 328). Data show these constraints and barriers can have many implications in the ways that Black women perceive themselves and their ability to succeed in the STEM fields [4]. The literature review examines the relationship between Black women, their perception of self in STEM fields, and the role that higher level administrators' have on Black women's perceptions of themselves and their success in STEM fields.

2.2. African American Women in STEM Fields

The socialization and "under-education" of African American women students engenders ideas of inferiority, while the presence of an inferior race, sex and class, in one body, may produce an ideology of mediocrity [8]. The psychological navigation of persistence to and through STEM education for African American women is quite different than that for women of other ethnic backgrounds. Seldom are these two features and their simultaneous effects thoroughly explored through empirical research so that certain truths may be revealed about African American women's experiences [8]. While much of the research accurately indicates that there are many structural and internal barriers to African American

women's success in the attainment of STEM degrees, there is a body of research that explores the internal and external motivations that assist in the success of African American women to, and through, STEM degree attainment.

The data indicate that many African American women who attend HBCUs persist to and through undergraduate STEM degree programs. Many of these women are high-achieving students and, although not a monolithic group, much of their success is directly attributed to the best practices of their undergraduate institutions.

2.3. Motivating Factors for Black Women HBCU Students' Success in STEM

Researchers have found that motivating factors, such as mentorship, advising, and faculty support, play integral roles in the success of students in the STEM fields [23]. Data also show that students report HBCUs as family-like environments in which students, staff, faculty, and administration support one another. For example, a study [24] conducted at the all women's HBCU, Spelman College, found that the Black women who participated in the STEM programs felt that their shared interest in STEM yielded more of a supportive and uplifting environment. There was not an overwhelming sense of competition among the women because they felt their priority was to earn a degree and help their peers earn a degree to better inform the narrative of Black women's ability to achieve and persist in the STEM field [24]. In addition to support from peers, the study also found that institutional structures, policies, and practices contribute to the attainment of women and minorities in STEM fields [24].

This sense of community is not uncommon to the HBCU organizational culture. This support yields success in student motivation as research shows that of the top 20 leading producers of African American bachelor's degrees in STEM fields, all but three are HBCUs [25]. In addition to the academic success of these institutions, mentorship and support play a vital role in helping students persist to and through their STEM programs and, as Eby notes, mentoring and support "are an intense developmental relationship whereby advice, counseling, and developmental opportunities are provided to a protégé by a mentor, which, in turn, shapes the protégé's . . . experiences in both career support and psychological support" [26] (p. 126). As the research shows that HBCUs foster an extremely supportive environment for students who might traditionally lack academic support systems, we contend that senior-level administration at HBCUs also plays a role as mentor and motivator to students in the family-like structure of HBCUs.

2.4. Higher Level Administrators' Traditional Institutional Roles and Student Support Best Practices

Traditionally, senior administrators are thought to be institutional leaders that " . . . serve on local boards, speak at public and private events, host parties or provide a forum for addressing particular issues, and comment for the media about current events" [27]. Others define senior college and university administrators as strategists and managers [28]. Senior-level administrators' daily tasks are traditionally more focused on managerial and strategic affairs such as enrollment management and the institution's financial affairs [29]. To realize student success, and thereby institutional success, the roles of HBCU senior administrators must extend far beyond their traditionally defined tasks.

In addition to senior administrators' managerial efforts, high quality engagement in students leads to student and institutional success, as well [28,30]. Positions ranging from department chairs to presidents of institutions can play significant roles in student success. As Neumann and Bensimon note, as a result of their differing beliefs about the organizational world and the leadership role, presidents are likely to differ in their agendas and in how they carry out the presidential job [31]. Although Neumann and Bensimon focus specifically on the role of the president, this study posits that the leadership strategy and approaches of all higher education administrators play a crucial role in the organizational culture of the institution. Their actions, in turn, trickle to the students. In this study, the students are Black women in STEM. As HBCUs often cater to a smaller student population and pride themselves on their familial cultures, the significance of interactions between administrators and these students is even more magnified.

Even if students do not come into direct contact with their institution's leadership team, the leadership team of the university lends a strong hand in maintaining and shaping the student support structures that are intentionally put in place to empower historically disenfranchised students. Additionally, because training and supervising the faculty and staff is a large part of the job of the administrative team, the senior administrators—the deans, provosts, vice-presidents, and presidents—support for students can also set the organizational culture of the entire institution.

3. Theoretical Framework

3.1. Organization Culture

Organizational culture theorists believe that organizational leaders shape organizational cultures. Michael Pacanowsky and Nick O'Donnell-Trujillo conceptualized Organizational Culture theory in 1982. Their theory, for the first time, critiqued organizations and communication within organizations with the notion that "more things are going on in organizations than getting the job done" [32]. Theorist and researchers believe that university and college cultures are shaped by histories, missions, rituals, demographics, and daily activities [33] and that it is the responsibility of the college or university leaders to integrate into, and maintain, the organizational culture. From the students to the president, we recognize that those within the HBCU community understand the culture upon which the college or university was formed. Our article posits that senior administrators' attitudes toward students and their staffs' student engagement sets the tone for the college or university culture. Students often can feel a college or university's culture. For this reason, we believe that the mindsets and actions of senior administrators directly influence organizational culture, which shape students' impressions of their support system. Ultimately, this relationship influences how supported students feel, their perception of their academic self, and their motivations to succeed.

This culture and the mentalities of those within the HBCU community are predicated on the fact that HBCUs were established in response to extreme inequality during a period of grave disenfranchisement toward African Americans. As a result, HBCUs are the only institutions in the United States that were created with the express purpose of educating Black citizens [34]. The history of HBCUs makes their organizational culture one that has been shaped by a communal effort to persevere and to motivate students to succeed despite unequal social and economic opportunities. Today, the 105 HBCUs enroll 8% of Black students and graduate 20% of all Black students in the United States [6]. These institutions are public and private, religious and non-sectarian, two-year and four-year, selective and open, urban and rural [6].

3.2. Student Engagement

Trowler defines student engagement as "concern with the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimize the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution" [35] (p. 3). In this study, attention is paid to the ways by which senior administrators invest in, and thereby motivate, Black women HBCU STEM students. Since senior administrators are often expected to maintain the organizational culture of the institution, provosts, presidents, and vice-presidents might motivate students by providing direct or indirect resources of institutional support, mentoring, or words of encouragement. In addition to organizational culture theory, the study's theoretical framework is centered on Vygotsky's (1978) notion of the "more knowledgeable other," in social development theory [36]. The "more knowledgeable other" emphasizes how the faculty and staff within a learning environment influence students' learning and their perceived abilities [36]. Senior administrators, or "more knowledgeable others," often shape students' self-perceptions and academic motivation. Senior administrators are important to student development as students mention their senior administrators' mentorship and encouragement contribute to their sense of accomplishment, as well as to the organizational culture and institutional

support structure. Senior administrators' varying forms of student support structures contributes to the organizational culture of colleges and universities and, as we find, are components of student motivation. According to Bozeman and Feeney, mentorship and support serve as crucial resources in student motivation as they include the transmittal of social capital—networks and ties—from the mentor to the protégé [37]. This type of support, especially prevalent in this study's context of Black women in STEM at HBCUs, is shown to help students succeed in the STEM fields [23].

4. Methods

For this study, we conducted semi-structured interviews with 71 Black women STEM students and six HBCU presidents across 10 HBCUs and asked questions to better understand the role that their institutions have in shaping these women's motivations to pursue STEM degrees. We interviewed 5 to 17 Black women students at each HBCU. A multi-site case-study approach was used in order to document and make sense of this bounded phenomenon [38]. The 10 HBCUs that were selected were intentionally chosen because they are considered high producers of Black STEM degree holders, according to the National Science Foundation (2012). Since this study looks across 10 HBCUs, purposeful sampling is applied to determine interview participants. The students interviewed came from a wide range of STEM studies that included: biochemistry (8), biology (31), biology/chemistry (1), chemistry (17), marine biology (1), mathematics (6), physics (6), and pre-engineering (1).

The investigation was initially a part of a larger study in which we examined (1) the force that shaped student choice prior to college, (2) and the affirming nature of HBCUs to help maintain that choice along students' pathway to their degree. As we organized these data and the narrative of how these women came to choose STEM, we found many students who were motivated outside of the classroom and, specifically, ways in which senior level administrators served as motivators. These data inform this article and take the position that the leadership strategy and approaches of all higher education administrators play a crucial role in the organizational culture of the institution, which trickles to the students. This study draws research from a larger study and specifically seeks to answer a two-part question: (1) What is the influence of senior administrators in the creation of motivational culture? (2) What is the impact that these leaders' interactions have on the motivation of Black women STEM students?

Data collection came in the form of single (20) semi-structured interviews and focus groups (30) with a range of one president, or two to five students each time. Focus groups, as opposed to individual student interviews, were used when students were running late for their individual interview. Since the study includes multiple sites, the semi-structured approach allowed us to show different perspectives, while drawing out major themes that uniformly cut across the 10 HBCUs. Interviews were 45–65 min and took place at each institution in a pre-designated space. Interview protocols included questions related to moments in which they perceived STEM as a possibility, to experiences that cultivated those perceptions, and to their STEM learning at HBCUs. All interviews were audio recorded using a digital recorder. The data was uploaded to a secure cloud storage file, in which access was given to a third party for transcription. We solicited consent from each participant before each interview through an Institutional Review Board (IRB) approved consent form. We informed participants of their anonymity in any published work by using pseudonyms to protect their identity.

Yin's [38] multi-case study approach guided the analysis of data as this study is driven by our theoretical framework. Upon receiving the transcribed data, data files were uploaded to NVivo, which is software used to organize and assemble qualitative data. First, we reviewed and coded the data in respect to the research questions [39]. We then conducted a second wave of coding that distinguished codes that were more descriptive in providing an overall sense of the different factors that influence and maintain choice from codes that spoke to more interpretative concepts related to relationships and interdependence. In this stage, we constructed "more abstract codes to reflect overarching ideas or higher order concepts" [40] (p. 100) that ran across data from the 10 institutions. In our third and final wave, we organized the codes under two primary categories that present (1) senior level

administrators' direct and indirect interactions with students and (2) student narratives that spoke to the affirming nature of these interactions.

5. Limitations

Although extremely relevant to higher education, organizational culture is widely discussed in relation to corporate systems, but rarely discussed as a pillar of higher education operations. In fact, as noted in the theoretical framework, the organizational culture of higher education presents a unique nuance as the mission and history of colleges and universities have such a strong influence over the present culture [33]. As many researchers do not specifically relate organizational culture to higher education, there were minimal literature sources on the current context of organizational culture in higher education.

Additionally, our study primarily focused on African American women in the STEM fields and at HBCUs. We believe that our study is valuable because it highlights the voices and perspectives of a population that is often silenced and overlooked. Even still, we acknowledge that this population is not the sole population influenced by the direct or indirect actions of senior level administrators. Because of this fact, our sample population is limited and we look forward to conducting a future study that will allow us to interview both women and men students, as well as to expand the interview pool to students in majors outside of the STEM fields.

A final limitation is that this article's main question was not the crux of the research performed but was an observation as we coded the data. The interviews uncovered that students were moved and motivated by the actions of senior level leadership who stepped out of their traditional managerial roles to encourage students' academic progress. This was not an initial question asked to the interviewed participants. In the future, a study that solely focuses on senior level leadership and student academic engagement will be valuable to the higher education field.

6. Findings and Discussion

6.1. The Engagement between Senior-Level Administrators and Students Matters

Although senior level administrators' daily tasks may be more directly focused on managerial and strategic affairs such as enrollment management and the institution's financial affairs [28,29], the students in our study noticed when senior administrators supported them. In fact, in our study, such interactions encouraged and contributed to these women's feelings of motivation and success. Higher education administrators' involvement in students' everyday lives and as motivating members of students' academic experiences influenced students' and were integral to their feelings of motivation, especially within the STEM fields and in their supportive HBCU communities. Several interviews specifically mentioned interactions between senior level administrators and students. A student commented that, "as far as the whole institution, the President, he'll be like 'oh we're very proud of you, we want you to succeed,' (and) you know they want us to succeed . . . ". Similarly, while referring to her faculty support system, a student specifically noted the involvement of her dean. Her comment is important because she mentions the unique nature of her dean's involvement in her student experience:

> *I like that (my university) is so small because . . . If you have a problem with like some work you're doing, (they say) 'just text me' or something like that. Then just like your dean knows you. I just feel like it's a very individualistic approach, and that at bigger schools you don't get that one-on-one contact . . . .*

In their interviews, students acknowledged the importance of senior level administrators' words of affirmation as motivational and encouraging. Students also named the specific senior level administrators responsible for putting institutional supports in place that helped them as they matriculated through their STEM programs. For example, one student recalled that:

> *(the doctor) . . . in charge of urology over the University of State Research . . . partnered with Dr. James who's currently the dean over here of the sciences, and then they pretty much established a program*

with 8 students, and a grant-based program where 8 students from The City University go over and study with researchers, scientists . . . .

Delineation between the specific day-to-day tasks of staff, faculty, and administration is important to maintain a well-run college or university. Within each of these job descriptions, however, is the need for all levels of college and university employees to interact and engage with students. Our study's results show that students value and draw encouragement from engaging with professors, staff, and senior administration.

6.2. The Importance of Senior Level Administration Understanding and Cultivating a Supportive Organizational Culture

Additional findings suggest the importance of senior level administrators to understand and cultivate an organizational culture around support and community. Many HBCU senior administrators boast their ability to sustain a unique supportive and family-like culture [2] within their institution. One student spoke directly to such a culture below:

I feel like the only way we can all be successful is just kind of helping each other out. I'm not really a competitive person in general, but I just don't really see as like my fellow peers as, oh, that's my competition. A lot of us are going for the same goals, a lot of us want to go off to medical school, a lot of us want to be PTs, PAs, teachers. It's just like why not help each other out because I might know something that she doesn't know or she might know something that I don't. So it's just like I do care about their well-being. With that being said, I do care about myself as well, and I will try to do whatever I can to reach my goals, but if I can help somebody along the way then that's great because I would want somebody to do the same for me.

A second interviewee responded:

The president (of the university) even brought us together one day. We had a dorm meeting, and he was like . . . He will tell you guys you're running to the finish line together is what he said. So if somebody is lagging behind, you go back and you pull them with you. That's what family (does). If your little brother was falling behind in school, you would go help him with his homework and bring him back to where he's supposed to be. So it's just like a feeling like we're all going to make it. We need to make it. First of all because we are a minority and there's not that many of us with jobs and professions, and so we all know that we need to do better. So, yes, we try to help each other.

The organizational culture of HBCUs is one that is steeped in a mission of community uplift and progress. Many students enrolled in the HBCUs that we studied fully embraced the culture of community. As such, these students admired their staff, faculty, and administrative teams' desire to maintain and foster a culture of care and family.

6.3. HBCU Presidents Understand that Their Student Support is Valuable

Many of the HBCU presidents interviewed in this study understood that their position required them to support and engage students in addition to their day-to-day administrative tasks. When asked about their administrative roles, many of the presidents spoke about the importance of senior administration listening to students to get an understanding their academic needs. The presidents also spoke to specific activities aimed to engage and help their students feel more successful and motivated. As discussed, these administrators represent Vygotsky's (1978) "more knowledgeable other" [36]. The value that they placed in students was evident and, in fact, helped many students to see their potential, as well.

One president spoke to the benefit of senior administrators, such as presidents and deans, listening to students. He said:

We have town hall meetings, and with the town hall meetings you're going to get unscripted kinds of things because people are frustrated. They've got to realize that you can take some of those things,

you go back, you implement them, and you make them happen, and then you communicate back to the university community . . . I have all of my deans there, so I have all the vice presidents there. The whole notion is we've got to sit here for these two hours, and we have to listen to . . . the good, the bad, and the ugly.

For many presidents, it was not enough to merely listen to students. Senior administrators also implemented organizational change based on how students felt about the institution and the ways in which they were being treated. A president recalled:

. . . as we collect information, we will be moving July into a university-wide retreat where a huge number of people just come together and . . . talk about what we've collected here in terms of student opinions, how do students feel about this place, how do they feel about the way they're being treated.

Senior administrators' support comes in the form of checking in with student opinions and is also found in their creating and sustaining extracurricular opportunities for STEM success. One president mentioned his involvement, as both a provost and now as a president, in the institution's annual student science program. In the interview, the president mentioned that he was very involved in starting the program and continues to go to support students. He noted,

One of the things that we do every single summer since I've been here, I started this when I was in the provost office, and we've continued it . . . we send 15 students to China every summer, to work with a scientist at a university in China, for six weeks, so our students go there and they partner with a professor in China that is connected directly to their research here . . . We have them in the STEM disciplines, and that funding is supported through a grant. They wrote that into the grant to provide the students with an international experience, so we linked that. That's pretty cool, to be able to have that. We go every summer, and they do a big presentation, before their entire faculty at this particular institution. I go there to show my support for it, and they have a big festival and things of that nature.

Such attention to students from senior administrators or the "more knowledgeable other," helps students to feel that they can attain academic success and that their experiences are important to the institution. For many Black women in STEM at HBCUs, such a personal level of engagement and concern from senior administration serves to affirm that their opinions and their successes are important to the institution's mission and advancement.

Our findings suggest that when students believe that their opinions are valued by senior administrators and woven into an institutional culture of community, they feel more successful. As one Black woman HBCU STEM student mentioned that her institution believes that "the only way [they] can all be successful [in their STEM pursuits] is just kind of helping each other out." This help is not just peer-to-peer, but is also top-down, as HBCU senior administration supports and helps Black women in STEM, as well.

7. Recommendations

7.1. Student Engagement Training for Senior-Level Administrators

The students in our study noticed when their institution's deans, provosts, vice-presidents, and presidents stepped outside of their administrative roles to encourage and support their success. The majority of current positions in higher education senior administration do not require intentional student engagement. As such, the engagement that many of the students' experienced from their senior-level administrators was voluntarily initiated. Although not mandated in the daily tasks of many of the senior-level administrators, their words of encouragement and installments of student support structures, such as study groups and motivational gatherings, were integral to students' sense of motivation, community, and purpose.

Student engagement is an integral component in building a cohesive organizational culture at all colleges and universities, and especially at HBCUs. For this reason, we recommend that HBCUs begin and/or continue to implement student engagement training for all levels of administrative staff.

7.2. Continuing to Expand Conversations around Organizational Culture and Higher Education

"Evidence is a familiar and revered term to researchers, yet there is precious little evidence collected and disseminated by researchers to demonstrate that they are making a difference in educational practice" [41,42] (p. 73). Such is the same in higher education administration. The goal of higher education administrators is to push the needle on the progress of the institution. Such progress generally falls under tasks that relate to strategic operations, institutional finances, and organizational development. There exists very little research on the impact that senior-level administrators' student engagement has on student success and motivation. We recommend that student engagement research expand beyond the lines of faculty and student engagement and begin to incorporate quantitative and qualitative research that seek to measure the impact of presidents', vice-presidents', deans', and provosts' student engagement, as well.

8. Conclusions

A great deal of the research that focuses on collegiate influences of student engagement and motivation to, and through, college approaches this question through the lens of student interactions with professors [24], academic advisors, and academic peers. While researchers do acknowledge the family-like culture of many HBCUs [2], not often do researchers look at the impact and influence of the senior-level administration on students' engagement and motivation. Although not in daily contact with most students, the senior level administration at HBCUs is a highly visible and integral component to the culture and function of the institution. As such, it is vital to interrogate the effect that their presence and interactions with students have on the students' perceptions of themselves and the organizational culture as a whole. As observed in our study, Black women in the STEM fields have acknowledged that they are positively shaped by their interactions with senior level administrators. Senior level administrators' influence is felt whether through words of encouragement or intentional academic supports implemented by senior administrators. HBCUs, and even non-HBCU institutions, that pride themselves on supporting and uplifting historically disenfranchised and/or first-generation students must continue to realize and use all aspects of their organization to empower and motivate students.

References

1. Pierce, S.R. *Producing Academic Leaders*; Inside Higher Education: Washington, DC, USA, 2011.
2. Hale, F.W. *How Black Colleges Empower Black Students: Lessons for Higher Education*; Stylus Publishing, LLC.: Serling, VA, USA, 2006.
3. Strothers, A. White Faces in Black Places: HBCUs and the White Faculty Experience. In *Opportunities and Challenges at Historically Black Colleges and Universities*; Marybeth, G., Commodore, F., Eds.; Palgrave Macmillan US: New York, NY, USA, 2014; pp. 75–88.
4. Moore, M. Black female contortionists: Learning from fiction, examining the psychological mindsets, and aiming to untwist and stand up straight, in fact, in STEM. In *NAAAS Conference Proceedings*; National Association of African American Studies: Westbrook, ME, USA, 2014; p. 1780.
5. Booker, K.; Brevard, E., Jr. Why Mentoring Matters: African-American Students and the Transition to College. *Mentor Acad. Advis. J.* **2017**. Available online: https://dus.psu.edu/mentor/2017/01/why-mentoring-matters-african-american-students-and-the-transition-to-college/ (accessed on 9 April 2018).
6. Macmillan, D. *National Center for Science and Engineering Statistics (NCSES) 2011282 National Center for Science and Engineering Statistics (NCSES)*; National Science Foundation: Arlington, VA, USA, 2004.

7.　MacPhee, D.; Farro, S.; Canetto, S.S. Academic self-efficacy and performance of underrepresented STEM majors: Gender, ethnic, and social class patterns. *Anal. Soc. Issues Public Policy* **2013**, *13*, 347–369. [CrossRef]

8.　Farinde, A.A.; Lewis, C.W. The underrepresentation of African American female students in STEM fields: Implications for classroom teachers. *Online Submiss.* **2012**. Available online: https://files.eric.ed.gov/fulltext/ED533550.pdf (accessed on 9 April 2018).

9.　O'Brien, L.T.; Blodorn, A.; Adams, G.; Garcia, D.M.; Hammer, E. Ethnic variation in gender-STEM stereotypes and STEM participation: An intersectional approach. *Cult. Divers. Ethn. Minor. Psychol.* **2015**, *21*, 169–180. [CrossRef] [PubMed]

10.　Nosek, B.A.; Ranganath, K.A.; Smith, C.T.; Chugh, D.; Olson, K.R.; Lindner, N.M.; Greenwald, A.G.; Devos, T.; Banaji, M.; Smyth, F.L.; et al. Pervasiveness and correlates of implicit attitudes and stereotypes. *Eur. Rev. Soc. Psychol.* **2007**, *18*, 36–88. [CrossRef]

11.　Flower, A.M., III. Building an academic community: Minority serving institutions and how they influence students pursuing undergraduate degrees in STEM. *Multicult. Learn. Teach.* **2014**, *9*, 187–201. [CrossRef]

12.　Upton, R.; Tanenbaum, C. *The Role of Historically Black Colleges and Universities as Pathway Providers: Institutional Pathways to the STEM PhD*; American Institutes for Research: Washington, DC, USA, 2014.

13.　Malcom, L.; Malcom, S. The double bind: The next generation. *Harv. Educ. Rev.* **2011**, *81*, 162–172. [CrossRef]

14.　Almquist, E.M. The Experiences of minority women in the United States: Intersections of race, gender, and class. *Women Fem. Perspect.* **1989**, *4*, 414–445.

15.　Shorter-Gooden, K.; Washington, N.C. Young, Black, and female: The challenge of weaving an identity. *J. Adolesc.* **1996**, *19*, 465–475. [CrossRef] [PubMed]

16.　Dillon, M. *Introduction to Sociological Theory: Theorists, Concepts, and Their Applicability to the Twenty-First Century*; John Wiley & Sons: Somerset, NJ, USA, 2009.

17.　Giddings, P.J. *When and Where I Enter: The Impact of Black Women on Race and Sex in America*; Morrow & Co.: New York, NY, USA, 1985.

18.　Binion, V.J. Psychological androgyny: A Black female perspective. *Sex Roles* **1990**, *22*, 487–507. [CrossRef]

19.　Black, A.R.; Peacock, N. Pleasing the masses: Messages for daily life management in African American women's popular media sources. *Am. J. Public Health* **2011**, *101*, 144–150. [CrossRef] [PubMed]

20.　Goff, P.A.; Thomas, M.A.; Jackson, M.C. Ain't I a woman?: Towards an intersectional approach to person perception and group-based harms. *Sex Roles* **2008**, *59*, 392–403. [CrossRef]

21.　Kane, E.W. Racial and ethnic variations in gender-related attitudes. *Ann. Rev. Sociol.* **2000**, *26*, 419–439. [CrossRef]

22.　Livingston, R.W.; Rosette, A.S.; Washington, E.F. Can an agentic Black woman get ahead? The impact of race and interpersonal dominance on perceptions of female leaders. *Psychol. Sci.* **2012**, *23*, 354–358. [CrossRef] [PubMed]

23.　Palmer, R.T.; Maramba, D.C.; Dancy, T.E. A qualitative investigation of factors promoting the retention and persistence of students of color in STEM. *J. Negro Educ.* **2011**, *80*, 491–504.

24.　Perna, L.; Lundy-Wagner, V.; Drezner, N.D.; Gasman, M.; Yoon, S.; Bose, E.; Gary, S. The contribution of HBCUs to the preparation of African American women for STEM careers: A case study. *Res. High. Educ.* **2009**, *50*, 1–23. [CrossRef]

25.　Borden, V.M.H.; Brown, P.C. The top 100: Interpreting the data. *Diverse Issues High. Educ.* **2004**, *21*, 37–39.

26.　Kaplan, L.S.; Owings, W.A. Teacher quality and student achievement: Recommendations for principals. *NASSP Bull.* **2001**, *85*, 64–73. [CrossRef]

27.　Eby, L.T. Alternative forms of mentoring in changing organizational environments: A conceptual extension of the mentoring literature. *J. Vocat. Behav.* **1997**, *51*, 125–144. [CrossRef]

28.　Ehrlich, T. *Civic Responsibility and Higher Education*; Greenwood Publishing Group: Westport, CT, USA, 2000.

29.　Keller, G. *Academic Strategy: The Management Revolution in American Higher Education*; JHU Press: Baltimore, MD, USA, 1983.

30.　Ornelas, A.; Solorzano, D.G. Transfer conditions of Latina/o community college students: A single institution case study. *Community Coll. J. Res. Pract.* **2004**, *28*, 233–248. [CrossRef]

31.　Neumann, A.; Bensimon, E.M. Constructing the presidency: College presidents' images of their leadership roles, a comparative study. *J. High. Educ.* **1990**, *61*, 678–701. [CrossRef]

32.　Pacanowsky, M.E.; O'Donnell-Trujillo, N. Communication and organizational cultures. *West. J. Commun.* **1982**, *46*, 115–130. [CrossRef]

33. Manning, K. *Organizational Theory in Higher Education*; Routledge: Abingdon, UK, 2017.
34. Penn Center for Minority Serving Institutions. Available online: http://www.gse.upenn.edu/pdf/cmsi/Changing_Face_HBCUs.pdf (accessed on 8 April 2018).
35. Trowler, V. Student engagement literature review. In *Student Engagement Evidence Summary*; Trowler, V., Trowler, P., Eds.; Higher Education Academy: York, UK, 2010.
36. Vygotsky, L.S. *Mind in Society: The Development of Higher Mental Process*; Harvard University Press: Cambridge, MA, USA, 1978.
37. Bozeman, B.; Feeney, M.K. Toward a useful theory of mentoring: A conceptual analysis and critique. *Adm. Soc.* **2007**, *39*, 719–739. [CrossRef]
38. Yin, R. *Qualitative Research from Start to Finish*; Guilford Press: New York, NY, USA; London, UK, 2011.
39. Creswell, J.W.; Poth, C.N. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*; SAGE Publications: Thousand Oaks, CA, USA, 2017.
40. Bazeley, P.; Jackson, K. *Qualitative Data Analysis with NVivo*; SAGE Publications: Thousand Oaks, CA, USA, 2013; p. 100.
41. Cleverley-Thompson, S. The role of academic deans as entrepreneurial leaders in higher education institutions. *Innov. High. Educ.* **2016**, *41*, 75–85. [CrossRef]
42. Cross, K.P. The educational role of researchers. *New Dir. High. Educ.* **2000**, *2000*, 63–74. [CrossRef]