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Strategies for increasing African Americans in STEM: A descriptive study of Morgan State University's STEM programs.

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MODELS for Success

THIRD EDITION

Successful Academic Models for Increasing the Pipeline of *Black and Hispanic* Students in *STEM* Areas

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TABLE OF CONTENTS

The first chapter is a lucid, comprehensive exploration of why minority students are faced with many challenges and obstacles in STEM majors. This theoretical chapter offers a more sound perspective on what resources a minority student must have to increase their opportunities to succeed. Each subsequent, practical chapter is listed in alphabetical order by the last name of the first author.

CHAPTER

7

STRATEGIES FOR INCREASING AFRICAN AMERICANS IN STEM:

A Descriptive Study of Morgan State University's STEM Programs

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Abstract

This chapter uses documents and interviews to describe the ways in which Morgan State University (MSU), a historically Black institution, promotes academic preparedness and college persistence for African American students in STEM fields of study. This chapter concludes by offering recommendations for increasing the participation and success of African Americans in STEM fields. Strategies for Increasing African Americans in STEM: A Descriptive Study of Morgan State University's STEM Programs

This purpose of this chapter is to highlight exemplary science, technology, engineering, and mathematics (STEM) programs at a Historically Black College and University (HBCU) in the state of Maryland. Specifically,

this chapter will focus on the STEM initiatives at Morgan State University (MSU). Founded in 1867, MSU was originally known as Centenary Biblical Institute. Similar to most HBCUs, the school was founded with support of the Black church and was designed to train young men in the ministry (Brown, Bertrando, & Donahoo, 2001; Fleming, Gill, & Swinton, 1978; Williams & Ashley, 2004). In 1890, the school was named Morgan College, and broadened its emphasis to educate both men and women. Morgan remained a private institution until 1939, when the state of Maryland purchased the school to provide more opportunities for African Americans.

Morgan was a comprehensive institution until 1975 when it was converted to a university and granted the authority to offer doctorates. In 1988, when many colleges in Maryland came under the control of the University of Maryland system, MSU remained one of two schools authorized to have their own governing boards. In spite of its status as a historically Black university, the university strives to educate all students regardless of race or ethnicity. However, 90-percent of the 6,705 students are Black.

Presently, MSU is a public, urban, doctoral-research-intensive HBCU. It offers undergraduate and graduate programs in a com-prehensive range of disciplines including science, technology, engineering, and mathematics. As is the case with many HBCUs, MSU admits students with a wide array of academic backgrounds and skill levels. The university has a national reputation for being a top producer of African Americans with doctorates. In fact, in 2007, MSU produced the third-most African American doctorate degrees of all HBCUs in the nation (Richardson, 2008). Among all public four-year colleges and universities in Maryland, MSU awards the largest number of bachelor's degrees to African Americans (MHEC, 2006), and has produced more Fulbright Scholars than any other HBCU in the nation (Cooper, 2008).

MSU has a reputation for graduating a large percentage of African Americans in STEM fields in Maryland. MSU has had STEM programs since the 1980s, though primarily at the undergraduate level. Recently, however, the university has placed a concerted effort to develop and implement STEM programs at the doctoral level. MSU has been proactive in its effort to create and promulgate new STEM programs, partly because of the changing demographics of the workforce in the United States. According to U.S. Census Bureau (2004) projections, African American, Hispanic, and Asian

populations are expected to comprise 50-percent of the U.S. population, with some groups even doubling their percentage of the population as a whole. White percentages, in contrast, are projected to decline. This shift in demographics has been particularly apparent in Maryland. Similar to other HBCUs in Maryland, MSU has worked hard to accommodate the changing nature of Maryland's demographics and has correlated the growing African American population to an increased opportunity for Blacks to access higher education. Consequently, during the last few years, MSU has focused on implementing academic programs to train leaders in critical subjects, such as the STEM disciplines, that are essential to Maryland's economic growth and development.

MSU's foresight has helped it become a leading producer of African Americans STEM degrees in Maryland. Table 7.1 displays the STEM degrees awarded to African Americans by the four doctoral-research-intensive universities in Maryland for 2005-2006. MSU awarded 159 degrees at various levels (e.g., bachelor's, master's, and doctorates) to African Americans, placing it as the second leading producer of African Americans STEM degrees in Maryland.

TABLE 7.1: STEM DEGREES AWARDED TO AFRICAN AMERICANS BY THE PUBLIC RESEARCH INTENSIVE INSTITUTIONS IN MARYLAND

Institutional School	School	Bachelors	Masters	Doctorates	Total Type
PWI	University of Maryland College Park	156	8	19	183
HBCU	Morgan State University	145	6	8	159
PWI	University of Maryland-Baltimore County	94	14	2	110
PWI	University of Maryland at Balti-more	NA	NA	3	3

Source: National Center for Educational Statistics (2006). The acronym HBCU stands for Historically Black College and University and PWI stands for Predominantly White Institution

While the University of Maryland at College Park produced slightly more African American graduates in engineering than MSU in 2005-2006, Morgan has historically produced more Black engineers than any other public institution in Maryland. In 2005-2006, MSU graduated 57 African Americans in engineering compared to the University of Maryland at College Park graduating 63. Interestingly, while MSU ranks second in STEM graduates among African Americans in the state of Maryland, it has managed to accomplish this feat with a persisting funding disparity between the institution and its predominantly White counterparts.

Not only can MSU's foresight be credited for helping to produce a large number of African Americans in STEM fields of study, but credit can also be given to MSU's STEM initiatives. The subsequent sections of this chapter will discuss those initiatives and the theoretical foundations that undergird them. The next section first discusses the theoretical structure of these initiatives and is followed by a section that describes the STEM programs at MSU. The Retention Theories Undergirding MSU's STEM Initiatives.

Undergirding MSU's STEM initiatives are the theoretical frameworks of Tinto's (1993) Theory of Student Departure, Astin's (1999) Theory of Student Involvement, and Kuh's (1995) Theory of Student Engagement. These theorists and theories are widely cited in higher education retention literature to address factors associated with student attrition and retention. Tinto's (1993) Theory of Student Departure draws from the work of Dutch anthropologist Van Gennep. Tinto explained that Gennap used three stages or rites of passage–separatism, transition, and incorporation–to explain how individuals socially adapt to new environments as they progress from birth to death. Tinto applied these three concepts to understand the process students go through as they complete their undergraduate education.

The first stage of Tinto's Theory of Student Departure is the separation stage. During this stage, a student creates the potential for college success when they are able to physically and socially separate themselves from their previous communities and integrate themselves into the college community. Tinto explained that during this stage, students adopt the norms and behaviors of the college culture and reject the norms of their past communities.

The next stage of Tinto's Theory of Student Departure is the transition stage. Tinto characterized this stage as a passage "between associations of the past and hope for associations with the communities of the present" (Tinto, 1988, p. 444). Tinto characterized that this period is very stressful and posited that students may employ different coping mechanisms to surmount this ordeal. He explained that this process is facilitated by the degree to which the students began the transition process prior to formal entry into the university. Tinto explained that without assistance, many students limit the amount of time they spend on campus, which in turn restricts interaction with members of the college community and lessens opportunities for learning college norms. Consequently, students are more prone to drop out of school.

The last stage of Tinto's model of student departure is the incorporation stage. During this stage, Tinto explained that students seek to become integrated within the university by establishing contact with faculty and students. He posited that fraternities, sororities, residence halls, student unions, contact with professors, extracurricular activities, and intramural sports all foster incorporation into the university. Tinto explained, "failure to do so may lead to the absence of integration and isolation. These in turn may lead to departure from the institution" (Tinto, 1988, p. 446).

Another element of Tinto's theory is students' integration into the formal and informal aspects of the college campus. He explained that classrooms and laboratories are examples of formal aspects and contact with faculty and peers are examples of informal aspects. Though the study did not include four-year institutions, incorporation in the formal and informal subcultures stimulates academic and social integration. Tinto argued that full integration in both systems is not important for persistence. Of importance, however, is "that some degree of social and intellectual integration must exist as a condition for continued persistence" (Tinto, 1987, p. 119). Research (e.g., Hrabowski, Maton, & Grief, 1998; Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994) has shown a relationship between academic and social integration and persistence.

In summary, Tinto's Theory of Student Departure is rooted in the scholarship of Van Gennep. Tinto emphasized the importance of student integration into the college community. To fully assimilate, a student must separate himself or herself from their past communities. Tinto suggested that academic and social integration would engender and sustain persistence.

Tinto pointed out that either academic or social integration would suffice; they need not coexist.A number of scholars have criticized Tinto's theory regarding its applicability to minority students (Guiffrida, 2005; Kuh & Love, 2000; Tierney, 1992, 1999). Specifically, researchers have indicated that there is a cultural incongruence between the theory's assertion that students must fully separate themselves from their previous communities to fully integrate into the college milieu. Many researchers have found that for minority students, their support base may lie outside the institutional environment, and dismantling these home-based social systems and will poise harm to their ability to progress through college. However, scholars (e.g., Harper, 2006; Flowers, 2004) have supported Tinto's emphasis on academic and social integration as it relates to African Americans attending PWIs. In many respects, Astin's Theory of Student Involvement is similar to Tinto's Theory of Student Departure. Astin (1999) expressed the impact of student involvement on the college experience, as did other scholars (e.g., Kuh, Schuh, Whitt, & Associates, 1991). Astin explained that student involvement is the amount of "physical" and "psychological" energy that a student devotes to the academic experience. Astin (1985) mentioned that the more students engaged in their studies, participated in organizations, and interacted with faculty, the more successful and satisfied they would be with their experience. Studies conducted by researchers such as Kuh et al. (1994) and Kuh and Hu (2001) adds credence to Astin's theory of student involvement by asserting that student engagement in educationally purposeful activities results in higher educational attainment. Although student involvement is important, it is important for students to be cognizant of the extent of their engagement on campus. Too much involvement on campus might have a negative impact on student success. Specifically, Harper (2005) and De Sousa and King (1992) explain that student involvement is related to retention and persistence in college for African American students.

Finally, MSU's STEM programs have also been devised and implemented to support the students' success in STEM fields through the incorporation of Kuh's (1995) Theory of Student Engagement. There are some common elements between Astin's Theory of Student Involvement and Kuh's Theory of Student Engagement. Kuh asserts that the more students engage in educationally purposeful activities, the more successful that they will be in

college. Specifically, he emphasized that "what students do during college counts more in terms of what they learn and whether they will persist than who they areor even where they go" (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 8).

STEM Initiatives at Morgan State University

Similar to the role of many HBCUs, MSU provides a supportive and nurturing environment that promotes student success (Brown & Davis, 2001; Palmer & Gasman, 2008; Palmer, 2008). This sense of encouragement and support is embedded in the array of initiatives designed to support African American students pursuing STEM fields of study at MSU. One such initiative is the Pre-Accelerated Curriculum in Engineering (PACE) Program. PACE is a six-week intensive pre-college summer program for admitted freshmen yet to formally take college-level courses in the engineering program. One of the primary purposes of PACE is to help students test out of developmental mathematics when they take the placement test at the end of the summer program. Research has shown that programs structured in this way help to enhance students' collegiate academic preparedness (Pascarella & Terenzini, 2005).

PACE exposes engineering students to critical thinking skills, advanced mathematics courses, English courses, mandatory tutorial support, and research/training. PACE also introduces students to the engineering curriculum and facilitates interaction with undergraduate engineering students and faculty. The engineering program also provides students with peer tutoring/mentoring support. To this end, upper-class students assist faculty in providing freshmen and sophomores with academic support to help them develop the self-efficacy and academic skills required to successfully complete the engineering courses.

Undergirding the PACE program is Tinto's theoretical framework of Student Departure, which correlates a student's academic and social integration to their success in college. The basic premise of Tinto's theory is that the more students are academically and socially integrated, the more academically successful they will be. PACE promotes academic integration by helping students adapt to the rigors of the STEM curricula, developing the mentality for college-level work, and setting high expectations for

collegiate success in STEM fields of study. Consequently, when STEM students start college in the fall, they have keen insight about what is needed to succeed at the collegiate level. Conversely, PACE helps students become socially integrated into the university by helping students establish support networks prior to officially entering college. One of the ways that PACE helps students become socially integrated into the university is through peer tutors and mentors. PACE also helps facilitate students' social integration by exposing them to key resources, institutional support agents (e.g., faculty, staff, and administrators), and academic support services (e.g., tutorial support and academic advising). Students participating in PACE have an 80-percent probability of testing into calculus, a gatekeeper course, at the end of the program instead of enrolling in developmental mathematics. Participation in the PACE program significantly increases students' rate of persistence to graduation.

The Foundations of Mathematics (FOE) is another STEM initiative that is similar to PACE in that it helps students enhance their academic preparedness for studying engineering. With FOE, students have the option of participating in an online course that assists them in enhancing their knowledge and skills in mathematic concepts and skills. The central goal of this initiative is to help recently admitted freshmen pass the university's placement examination with the highest possible score, thereby eliminating the need to take develop-mental mathematics. The consequence of participating in a develop-mental mathematics course has the propensity to delay a student's time of graduation.

The tenets of FOE are not unique to engineering majors. In fact, faculty and staff of the sciences have established an initiative that is analogous to the FOE. According to faculty and staff, a major impediment to retention and graduation in the sciences is inadequate preparation in mathematics. To gain insight and understanding regarding how they might better assist students to succeed in mathematic courses, they conducted a survey. One major finding was that students lacked an effective way to access instructors or tutors when students needed to verify mathematics procedures when studying for an examination or completing homework. These issues were major impediments to students' ability to pass the course. Aside from integrating varied learning strategies in science courses (e.g., active learning, cooperative small-group

work, and peer facilitation), the faculty also decided to integrate technology into mathematics courses. Specifically, they introduced WebWork, which is an online-based teaching and assessment system for difficult mathematics courses such as precalculus, calculus, and differential equations. This system provides students with immediate feedback regarding their math problems. The primary goal of these modifications and implementations is to increase the number of students successfully completing mathematics courses, which, in turn, will have a positive influence of retention and graduation in the STEM disciplines.

Similar to the PACE program, FOE is predicated on helping students become academically integrated into the university community by helping them develop and strengthen the mindset, expectations, and skills to be successful in college. For example, by participating in the FOE program, students are making the choice to enhance their skill-set in mathematics and expose themselves to the demands and expectations of engineering and other college-level work. FOE predisposes students to the faculty coordinators of this program, which increases their likelihood of fostering relationships with these faculty coordinators once they arrive on campus. Furthermore, by participating in WebWork, students are able to hone their math skills by having access to an alternative form of academic support. Tinto used the importance of academic integration in his Theory of Student Departure to explain why some students persist and others fail out of college. Tinto posited that students who are more academically integrated are more likely to be successful. According to the coordinators of these programs, FOE and WebWork's online mathematic courses have helped STEM students increase their academic performance and passage rates of math by at least 15%.

The third STEM initiative in the domain of engineering is the Student Work Experience Program (SWEP). The primary goal of SWEP is to facilitate the development of engineering students' educational experience at MSU. This is carried out with practical work experience such as internships, cooperative education (co-op), summer jobs, and sponsored part-time research opportunities. Most students participate in internships, which are short-term and usually during the summer months; however, some students occasionally participate in internships during the academic year. These

internships, for the most part, are practical and related to students' interest in engineering and help to foster students' research skills. Cooperative education experiences enable students to work part of the year and engage in their academic studies for the other part of the year. Typically, students spend eight months on the job followed by eight months in school. Students are not limited to one work site for eight months. They participate in a variety of different positions, which helps students focus on their area of expertise upon graduation. Students also participate in paid research with faculty. This opportunity is designed to help students entertain the feasibility of attending graduate school and to pursue a career in academia. The STEM programs in science provide similar research initiatives for their students. For example, upper-class STEM students participate in programs, such as the Minority Biomedical Research Support (MBRS), Research Initiative for Scientific Enhancement (RISE), and Minority Access to Research Careers Program (MARC). Moreover, faculty allows a select number of upper-class students to work with them on a variety of research projects.

The SWEP initiative is undergirded by Kuh's Theory of Engagement in Educationally Purposeful Activities and Astin's Theory of Student Involvement. These theories emphasize the importance of student involvement and its impact on academic success. While Astin's Theory places more emphasis on involvement in the campus community, Kuh's Theory speaks more broadly about engagement in educational activities. In the context of SWEP, students engage in a variety of purposeful activities including internships, co-ops, and summer jobs). These activities support and enhance students' educational experience. STEM students and particularly engineering students also become involved in paid research opportunities with faculty through their participation in SWEP. This, of course, facilitates their involvement in on-campus activities and help fosters critical relationships with faculty. Other STEM students participate in similar research opportunities with faculty through initiatives such as MBRS, RISE, and MARC. Astin (1985) noted that the more students became involved in on-campus activities, the more successful and satisfied they would be with their experience.

Another STEM program designed to support African American student success at MSU is Fast Track. Fast Track—another initiative in

engineering—involves upper-class students working closely with freshmen students. In this context, upper-class students engage groups of freshmen in a variety of workshops centered on three themes: "Mastering Mathematics," "Making it in Engineering," and "Planning to Graduate." The workshop gives successful upper-class students an opportunity to speak to freshmen about their collegiate journey, focusing specifically on how they adjusted to the engineering curriculum, how they performed academically, and how they used their freshmen year to craft a strong foundation of academic achievement in engineering. Fast Track upper-class students include males and females from the various engineering disciplines. STEM programs also promote the importance of students mentoring other students. Specifically, the School of Engineering has promulgated The Tau Beta Pi Freshmen Mentoring program, which provides additional support for students by linking them to upper-class student mentors. STEM majors are encouraged to interact with their mentees frequently throughout the semester so the mentors can keep a pulse on how their mentees are faring at MSU.

The theoretical basis of this initiative is Tinto's Theory of Student Departure, which, as noted, states that students that are academically and socially integrated will be more inclined to persist. Fast Track promotes students' academic and social integration in that it helps students connect with faculty and other academic support services such as tutorial support and academic advising. For example, by upper-class students sharing the experiences of their journey to become academically successful, they may expose students to key academic support services resources as well as help them develop critical relationships with institutional support agents (e.g. faculty, staff, and administrators). Similarly, the Tau Beta Pi Freshmen Mentoring program helps to socially integrate students by increasing their peer interaction and support, thus expanding their social network. As such, instead of having a paucity of peers to access for support, students have a range of colleagues to turn to for support with academic issues. Furthermore, the program may also help students become involved in the campus, which increases their exposure to support systems inside and outside of the classroom, facilitates the development of relationships with role models and mentors, and enhances their commitment to the university. Research from Thomas (2000) supports the efficacy of mentoring programs by focusing

specifically on the outcomes. He notes, "those students with a proportion of ties outside of their peer group perform better academically and are more likely to persist" (p. 609). As noted previously, mentoring programs helps students to expand their support networks, which improves persistence by providing access to key resources on campus.

The STEM disciplines at MSU also use mandatory orientation courses to support students' success in STEM. Typically, students attend orientation once a week for an hour. According to a recent assessment conducted by a psychology professor at MSU, students that participate in orientation during their freshmen year are more likely to be successfulthan students that do not participate in orientation during their freshmen year (personal communication, Perrino, 2008). While there are some commonalities among the orientation courses at MSU, the curriculum is major-specific. For example, the engineering orientation is designed to provide a broad overview of engineering as a discipline and help students realize the key academic skills needed to be successful in engineering. In this course, students are introduced to a range of academic, financial, and social support services on campus. They also have guest speakers, such as upper-class students, which not only allows students to increase their support network on campus, but also allows them to hear about the skills and mindset needed to be a successful engineering student first-hand. Moreover, the science STEM students take a similar orientation course. Much like the engineering orientation, the orientation for science (i.e. biology, chemistry, and physics) is structured around the major, but the aforementioned elements are included in the science orientation course. All STEM majors, much like other majors at the university, have departmental tutorial units where students can receive peer tutorial support and assistance to help them achieve academic success.

The STEM orientation courses are undergirded by Tinto's Theory of Student Departure. The orientation course facilitates academic integration by connecting students with STEM faculty and other key academic support services. In addition, this course helps STEM students become oriented to the skills and mindset needed to be successful in college. The orientation course promotes students' social integration into the college milieu by exposing students to non-academic support services on campus and helps

them establish relationships with upper-class STEM students. Furthermore, the peer tutorial component is primarily guided by the social integration component of Tinto's theory. The tutorial process helps students, particularly first- and second-year students, expand and strengthen their social networks on campus. While students are not mandated to meet with the tutors, at least 45- or 50-percent of STEM students take advantage of this service.

Finally, each STEM major has retention counselors, who serve as the students' primary academic advisor until students become juniors. The number of students in the major determines the number of retention counselors in each academic unit. These student-centered retention advisors play a vital role in students' retention and persistence at MSU. The theoretical anchor of this initiative is Tinto's Theory of Student Departure and Astin's Theory of Student Involvement. The retention counselors forge relationships with students, and help direct them to key resources (e.g. academic, financial, and personal) on campus to academically and socially help students at MSU. These counselors also expose students to key resources including institutional support agents (e.g. faculty, staff, and administrators) and academic support services (e.g. tutorial support and academic advising). Retention counselors also promote the importance of student involvement in activities on campus, particularly STEM-related activities and organizations (e.g. the Biology Club, Women of Color in Science and Technology, and The Pre-Medical Chapter of the American Medical Student Association [AMSA]), Fast Track, SWEP, and the scientific research programs (e.g. MBRS, RISE, and MARC). STEM students are encouraged to meet with their retention counselors at least four times throughout the semester. This gives students and counselors ample time to establish a relationship and work jointly to promote the students' success in STEM.

The Efficacy of STEM Initiatives

According to interviews with STEM coordinators, there is no doubt that these initiatives and their theoretical anchors have helped to promote success in STEM fields of study. Since the development and implementation of these initiatives, student retention and overall success in STEM have increased by at least 18-percent. Graduation rates in STEM fields of study have increased by at least 15-percent. The STEM coordinators feel that

these STEM initiatives have made a positive contribution to the success of these students at MSU.

Conclusion and Recommendations

Increasing the participation of African Americans in STEM fields of study has important implications for America's global competitiveness. As such, many colleges and universities are focusing more on the recruitment and retention of African Americans in these programs. HBCUs, such as MSU, can play a significant role in increasing the amount of African Americans in these fields of study with the implementation of MSU's unique STEM initiatives, undergirded by the retention theories discussed herein. These programs have a common goal of increasing the participation rate of African Americans in STEM majors and careers.

While MSU, similar to other HBCUs, has been chronically under-funded, this descriptive investigation illustrates how the STEM initiatives at MSU promote African American success. Grounded in theory, these practices are unique and context-laden to its urban setting. However, elements of these initiatives can serve as working models for other HBCU's seeking to increase the preparedness and persistence of African Americans in STEM programs.

MSU, like other HBCUs, provide a supportive and nurturingenvironment and retain STEM students through mentoring, tutorial support, integrated technology, and student research collaboration with faculty. As a result of examining STEM initiatives at MSU, several recommendations are suggested that will support an increase in the persistence of students and, thereby, increase the pool of African American students in these fields:

a. Provide early STEM recruitment efforts beginning at the K-12 levels;
b. ncrease professional development of STEM teachers at the K-12 levels;
c. Increase funding of pre-college STEM initiatives such as after-school and summer programs (similar to NSF);

d. Develop special STEM initiatives that are guided by retention theories, such as the ones discussed in this chapter, to support persistence of African American students;
e. Incorporate meaningful STEM programs and course orientation utilizing upperclassmen and faculty as role models and mentors;
f. Provide administrative support at the university level for long-term persistence programs that support STEM recruitment and retention of African Americans; and
g. Once STEM programs are developed and implemented, maintain effective data collection systems to gauge the efficacy of these initiatives.

The STEM initiatives presented in this chapter were implemented to promote the academic success of African American STEM students at MSU. The primary objectives of these programs are to ameliorate students' deficiencies in key STEM subjects. The services of these programs as outlined in this chapter are integral to the academic support that African American students need to be successful in STEM. They aim to build the competency and the self-efficacy that students lack when first entering their freshman year as STEM majors. We can find numerous reasons why students may not be successful in STEM; however, the real challenge is to develop programs that will encourage and support students with a wide range of abilities. The STEM Initiatives at Morgan State University are a step in the right direction toward meeting this great challenge.

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CHAPTER

8

AFRICAN AMERICAN WOMEN IN CHEMISTRY

Spelman College as a National Model for Baccalaureate Degree Production

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Introduction

The past several decades have given rise to increased attention to the topic of women in science, particularly during the post-WWII period and later. With the release of Margaret Rossiter's (1995) *Women Scientists in America*[1], we now know that the Cold War-inspired campaign for "women power" resulted in a record number of women earning doctorates in science and engineering disciplines. Further studies have shown that despite an increase in degrees awarded, systemic inequalities and structural limitations significantly hampered the quality of women's access to and advancement in the profession[2]. Feminists, scholars of women's studies, and historians and sociologists of science and technology argue that this increased attention has helped to construct a better sense of the experiences of women scientists in America, especially when placed within the larger context of the growth of U.S. science and the role of higher education as a nexus for that growth.

Most of these offerings focus on a particular group of women and make implicit, if not explicit, assumptions about undergraduate degree origins. By contrast, the history, experiences, contributions, contemporary status, and undergraduate degree origins of African American women scientists remain largely under-explored. James M. Jay's *Negroes in Science* was the first comprehensive study to trace the undergraduate and graduate origins of African Americans that had earned doctorates in the natural sciences through the late 1960's[3]. The Jay study documented that African American scientists did exist, provided crucial baseline data, and was especially unique in that