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# **Outcomes of Advancing Women Faculty in Engineering and Technology at Historically Black Colleges and Universities: A Retrospective Analysis of ADVANCE-PAID Participants**

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## **Abstract**

Keeping up with their historic missions, historically black colleges and universities (HBCUs) have selected and granted progressively more number of degrees to women over the past few decades. From 1993 to 2006, the number of black women undergrads receiving degrees at HBCUs increased by 24%. For example, in 2002, 75% of black women awarded doctorates in Biology had baccalaureate origins from HBCUs. In 2006, data revealed that there were 900 black women faculty in STEM disciplines at HBCUs and 2,810 black women faculty at non-HBCUs. They accounted for 22% and 2% of the faculty at HBCUs and non-HBCUs.

The ADVANCE-PAID project, Advancing Women Faculty in Engineering and Technology at HBCUs, was a collaboration between Prairie View A&M University and Texas A&M University that received National Science Foundation funding from September 2009 through August 2014. The project implemented four key activities: (1) annual workshops; (2) seed grants to support research efforts; (3) professional career coaching; and (4) weekly writing groups. Forty-seven women faculty from 14 HBCUs attended at least one annual workshop, 13 from 9 HBCUs received seed grants,

11 from 9 HBCUs participated in career coaching, and between 4 and 6 women attended weekly writing groups.

A retrospective analysis was conducted to determine the long-term impacts of the four activities. One-on-one, semi-structured interviews were conducted with past participants to determine the impact activities had on their careers. Current faculty rank and position of each participant were compared to the rank and position held when they initially participated in ADVANCE-PAID activities. Surveys were sent to participants to assess how this project impacted their success, informed their decision or interest in pursuing administration, and how the various activities helped them overall. Group averages were compared by activity or combination of activities.

**Keywords and phrases:** NSF ADVANCE-PAID, career coaching, seed grants, writing groups, women faculty in engineering and technology, women of color in STEM

## Introduction

During the 1800s, many Historically Black Colleges and Universities (HBCUs) were established during a time when practically all colleges and universities only granted admission to men. However, due to their unique missions, HBCUs were open and available to black women (Martinez Aleman, A. and Renn, K., 2002). Between 1975 and 1991, HBCUs were exceedingly high in serving as the baccalaureate origin of black women PhDs, and today, HBCUs account for nearly 30% of all black students who are science and engineering doctorate recipients (National Science Foundation (NSF), 2017).

Reports, such as the 1976 Double Bind Report, provided critical information and, in many cases, layouts for increasing representation of black women especially in the science, technology, engineering and math (STEM) disciplines (Mack, K., Rankins, C. & Winston, C., 2009). Black women continue to remain underrepresented in the STEM (science, technology, engineering, and mathematics) disciplines. They comprise less than 2% of the tenured/tenure-track

faculty positions in STEM at U.S institutions of higher education, and a recent study reports that they are disproportionately concentrated at HBCUs (Mack, K., Rankins, C. & Winston, C., 2009). HBCUs have also been shown to serve as the undergraduate institution of choice for black women who attain doctoral degrees in STEM at a higher rate than black students who attended predominately white institutions (PWI). Thus, black HBCU students are more likely to pursue a postgraduate education in STEM than their counter parts at PWIs.

### ***Why there's a Need for more Black Women Faculty at HBCUs***

HBCUs have selected and granted progressively more degrees to women over late decades. From 1993 to 2006, the number of black women undergrads receiving degrees at HBCUs increased by 24% (NSF, 2009). For example, in 2002, 75% of black women awarded doctorates in Biology had bachelor's origins from HBCUs. In 2006, data revealed that there were 900 black women faculty in STEM disciplines at HBCUs and 2,810 black women faculty at non-HBCUs. They accounted for 22% and 2% of the faculties at HBCUs and non-HBCUs. This suggests that, on average, there are 10 black women STEM faculty per HBCU and 1 black woman STEM faculty per non-HBCU (NSF, 2009).

Black women faculty play an important role in educating, mentoring, and serving as role models for female undergraduates. Studies suggest that one of the greatest influences of academic success in STEM disciplines is access to same-gender role models, especially for women of color (Bettinger, E. & Long, B., 2005; Perna, L. W., 2009). It has also been shown that same-gender and same-race mentoring yields better career outcomes for minority students (O'Neill, R., 2002). Because of HBCUs like Spelman College and Howard University, black women were able to work in academic leadership roles before the congressional approval of Title VII. Title VII, The Civil Rights Act of 1964, prohibited discrimination based on sex and race in employment. Although, the number of women in institutional leadership roles at HBCUs did not outnumber men at that time, their presence was still significant. As a result of their success, they attracted young African American girls and college

students to academic careers by motivating them toward the opportunities to become leaders within their institution. This plays a powerful role in educating and training the next generation.

According to the National Science Foundation's 2017 report on Women, Minorities, Persons with Disabilities, women represent 25.7% of all tenured positions in STEM at 4-year degrees and universities, while women faculty of color in STEM represent only 2.3% (NSF, 2017). To increase these numbers, NSF has focused on several programs. One effort, the ADVANCE program, concentrates on increasing the participation and advancement of women in academic science and engineering careers. In order to increase the number of tenured women faculty of color in STEM, Prairie View A&M and Texas A&M University collaborated on a project that helped women faculty in engineering and technology at HBCUs advance through the faculty ranks and into administrative positions.

#### ***About the ADVANCE-PAID Project***

The ADVANCE-PAID Project, *Advancing Women Faculty in Engineering and Technology at Historically Black Colleges and Universities*, received National Science Foundation funding from September 2009 through August 2014. The overall goal of the project was to generate a blue-print regarding effective strategies and promising practices for women faculty to use to successfully advance through their careers in colleges or schools of engineering and technology at HBCUs. Achievements of this goal was to be supported through implementation of four specific objectives:

- Develop a continuum of activities that will assist women faculty in their professional development and growth while retaining them within the academic and administrative ranks at HBCUs in Colleges or Schools of Engineering and Technology.
- Explore the perspectives of stakeholders (Deans, Department Chairs/Heads, etc.).
- Establish communication and networking method and systems for life-long engagement.

- Publicize best practices to HBCU engineering administrators.

This project implemented four key activities, mainly targeting women of color faculty in HBCU Colleges or Schools of Engineering and Technology: (1) Annual Workshops, which were held in Houston, Texas; (2) Seed Grants to support research efforts; (3) Career Coaching; and (4) Weekly Writing Groups.

### *Annual Workshop*

The project activity that involved the greatest number of women faculty from HBCU Colleges or Schools of Engineering and Technology was the annual workshop. This project had a total of 47 women to attend from 14 different HBCUs. The annual workshop had six learning objectives that they implemented: (1) Negotiating and Assertive Skills; (2) Making the Right Connections; (3) Defining Research Agenda & Writing and Securing Grants, Building Collaborations; (4) Promotions and Advancement & Time Management; (5) Writing Research Articles & Strategies for Getting Articles Published; (6) Establishing an Engineering Research Institute, Building Collaborations. Participants were able to:

- Acquire the skills needed to become more assertive
- Identify and establish academic and professional growth needs
- Develop skills to approach individuals and small groups with confidence
- Identify characteristics of potential collaborators
- Deliver a concise message about themselves, their line of research, and organizations
- Identify potential funding agencies
- Discuss and identify budgets, administrative procedures, partnerships, and collaborators
- Identify the principles of good time management
- Identify and learn strategies to overcome isolation in their work environment
- Identify their research agenda

- Understand the expectations/requirements related to tenure/promotion for their department/college
- Identify mentors
- Improve research and develop skills to foster collaborations with various institutions

#### *Weekly Writing Groups*

For 15 weeks, the writing group assisted ADVANCE-PAID participants in their endeavors to write grant proposal narratives and produce published papers. In the midst of those 15 weeks, the weekly writing groups provided motivation as well as inspiration, while being able to network amongst other individuals from other institution. Participating in the writing groups gave participants the opportunity to read what others had wrote, ask questions, and engage in conversations while sharing ideas. During the groups, participants were also provided constructive criticism. They had the opportunity to share their writings and receive feedback. By having a group of other writers look at their pieces, participants received honest opinions and advice, in result participants were able to see where each other's strengths and weaknesses lay. Weekly writing groups also offered guidance when having writers' block and support. The meetings began in July 2012 and continued through the end of October 2012. Each week, participation ranged from 4 to 6 women faculty with an average of 5 women in attendance. By the end of the semester, participation decreased until there were no participants.

#### *Seed Grants*

In addition to the writing groups, the ADVANCE-PAID project provided women engineering and technology faculty at HBCUs opportunities to apply for seed Grant funding. The seed grant was an opportunity designed to promote research activities and provide grant-writing mentoring. From 2011 to 2013, thirteen individual grants and one collaborative grant, totaling \$150,000 (individual=\$10,000; collaborative=\$20,000) were awarded to women faculty from nine HBCUs. The goals of the grants were to advance innovative research projects, which were essential to getting external funding, making presentations, and/or submitting paper for publication.

### *Career Coaching*

This project also provided the opportunity for eleven women engineering and technology faculty at HBCUs to receive career coaching. The career coaching activity was focused on career planning and career mapping. A professional coach worked closely with the participants in order to help the participant determine where they would like their careers to go. The coaches constructed solutions and strategies that would be most beneficial in their journey to success. Career coaches also helped participants of the ADVANCE-PAID with their time-management skills, by teaching them how to balance being a mom and/or partner, while still trying to reach that goal of tenured positions and advancement into administration. They also gave participants the confidence that they need, as well as assurance to know that they are not alone in their endeavors to become a full professor.

## **Methods**

This research project was two-fold. First, an internet search was done to determine the current faculty rank of past ADVANCE-PAID participants. This was used to compare their advancement in rank since participating in ADVANCE-PAID activities. Then, semi-structured, one-on-one interviews were conducted with three past ADVANCE-PAID participants. Interviews were held via WebEx. Interviews were recorded for accuracy in transcribing and were conducted over a one-week time period.

### *Interview Questions*

1. What activities did you participate in during the ADVANCE-PAID PROJECT?
2. What impact, if any, has participating in “\_\_\_” had on your career?
3. Have you been promoted or changed job titles since participating in ADVANCE-PAID? Do you believe the activities in the ADVANCE-PAID project aided you in your promotion?
4. How have you used the information (or skills) gained in your day-to-day life?

5. What other types of program activities do you think we should incorporate to be implement to build on this one?

## Results and Discussion

### *Where are they now?*

During the research phase, an online search utilized websites such as LinkedIn, and their college/department webpages to determine where past ADVANCE-PAID participants are currently working. Researchers discovered that the initial two participants who were Adjuncts are now Assistant Professors and the woman who was the Visiting Assistant Professor is now an Assistant Professor. Additionally, of the original 14 Assistant Professors, nine advanced to Associate Professor, five remained in the same position. Upon further review, this is likely due to the fact there has not been enough time for them to advance. Similarly, 9 of the 19 Associate Professors stayed at same faculty rank, while 10 participants advanced to Full Professor. Of the four who were initially Full Professors, one was promoted to a position in upper administration.

**Table 1.** The number of participants and their initial faculty ranks during and after ADVANCE-PAID activities.

Faculty Rank	<b>During</b>	<b>After ADVANCE-PAID Activities</b>					
	No. of Faculty	Adj	Assist.	Assoc.	Full	Ad*	Outside Academia
Adj.	2		2				
Visiting Assist.	1		1				
Assistant	15		5	9		1	
Associate	19			9	10	4	
Full	8				8	4	
Administration	3					2	1

\*Ad= Administration position in addition to faculty rank

### *What do they have to say?*

#### *Annual Workshop*

The project conducted three workshops, where all participants attended at least one of the three workshops. As a result, some of the women felt that the workshops impacted them with respect to

promotion and/or tenure, while others felt that their professional lives were not affected by attendance.

Participants of the annual workshops shared the following statements on how the annual workshop impacted their success:

*“I also benefited greatly from the ADVANCE-PAID conference. I recall attending a session working in administrative positions, the role models really helped me to make a decision to move into an administrative position of which I am now serving as a department head of electrical engineering.”*

*“The workshops were also beneficial to be me, because, for us female who entered the professional workforce as assistant, our colleagues are males. It’s very good for us to get together to exchange ideas, and we can learn what our next step is. It’s a very good opportunity, it happens annually, so I participated in all three. I made several friends and we still have connection. All of us are working towards full professorship.”*

#### *Weekly Writing Groups*

*“I wanted to continue to write beyond the writing group that way we can hold each other accountable”*

Due to busy lives, the weekly writing groups had specific times and dates that the participants had to meet to ensure that they successfully worked on their projects and met their writing goals. However, creating schedules that work for multiple participants created huge barriers resulting in decreased participation.

*“I participated, but I only went 2 or 3. I wasn’t able to finish the last program I signed up for, because it had specific times and I didn’t have time to finish.”*

Overall, the writing groups had very little impact compared to the other activities. Although, the writing group has the potential to positively promote successful writing because of an emphasis on accountability and increased implementation of successful writing strategies, the barriers of creating schedules that work for multiple

participants must be overcome before this kind of group can have a widespread impact.

### *Seed Grants*

Recipients of the ADVANCE-PAID seed grant shared the following information during the semi-structured interview on how the seed grant impacted her success:

*“I was an assistant at that time, the seed was a really great help me. I was able to strengthen my research and then I was able advance through and get my tenured.”– Recipient of individual and collaborating seed grant*

*“I benefit extensively the grant allowed me to build my research and by building my research I was to get promoted to an associate professor.” “In addition the grant allowed me to publish my research.”*

During the interviews, participants made statements how there were limited opportunities for funding for women at HBCUs and how the heavy teaching loads they have limits the time they have for working on proposals for external funding. They also shared examples of how receiving the seed grants had given them credibility with other faculty, especially male faculty members, and opened up opportunities for collaborations, resulting in another impactful success.

### *Career Coaching*

Based on the grant’s final external report by an independent evaluator, the career-coaching participants all agreed that their coaching sessions had been very important and beneficial, and they indicated that having these opportunities would be very important to women faculty who are trying to advance through faculty ranks at HBCUs.

## Conclusion

In conclusion, the ADVANCE-PAID project played a role in advancing women faculty in engineering and technology at HBCUs through the faculty ranks and in administrative positions. Based on the interviews and the final external report, the overall project had a positive impact, both professionally and personally, on the women faculty who participated in project activities.

*“Absolutely, absolutely,” said a recipient of the seed grant and participant of the annual workshop, when asked if she would participate in the activities again.*

*“I think it serves a good purpose. If it could last longer that would be wonderful, 5 years?”* said another participant, who also agreed that they would participate again.

From interviews conducted, it was found that participants still use the knowledge and skills that they’ve gained in their everyday life.

*“Day to day I improve my writing. I know the importance of publishing. I try to reach milestones on a day to day basis,”* said a participant of the writing group when asked how she used the information or skills gained in her everyday life.

Overall, project participants were more knowledgeable and more skilled. Participants were also better equipped to navigate the academic ranks and move into administrative positions and other positions of leadership. They have become more productive with their research efforts, conference presentations, and publications. Participants also have been successful in getting external funding to support their research. They now have a better understanding of the importance of networking and have expanded their own professional networks. In addition, ADVANCE-PAID participants have more confidence in their skills in communicating with other faculty in their departments and with their department heads or supervisors. More importantly, they have created a better work-life balance for themselves. As a whole, the ADVANCE-PAID project played a major role in helping advance women faculty of color in STEM

disciplines. Assessing the long-term impacts will allow the ADVANCE-PAID project to share with others institution of higher education, especially those who desire to increase the number of tenured faculty amongst women of color.

### **Further Studies**

When asked “*What other types of program activities do you think the ADVANCE-PAID should incorporate be implemented to build on this one?*” interviewees had positive comments about the program activities. However, the interviewees shared common responses that more seed grants are needed and more programs that teach aspiring young women of color how to build a career as a STEM female professor and why it is so important for women succeed in these fields. One interviewee suggested that the ADVANCE-PAID should implement more information on how to obtain career coaching outside of the ADVANCE-PAID activities. The interviewee then went on to state how there should have been more information on who to contact or how to obtain career coaching outside of the writing program and if there is any more opportunities to get career coaching through her department.

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