

Preparing Future Minority Faculty for the Professoriate (Experience)

Ms. A. Ayanna Boyd-Williams, North Carolina A&T State University

A. Ayanna Boyd-Williams currently serves as the Assistant Dean of the Graduate College at North Carolina A&T State University and has over twenty-eight years experience in graduate education. Prior to coming to NC A&T, she was Assistant Dean of Graduate Studies and Director of Minority Programs at Duke University, Director of Minority Affairs and Special Projects and Assistant Dean for Student Affairs at the Graduate School of Arts and Sciences, Columbia University. She also served as the Director of Educational Opportunity Program at Ithaca College.

Boyd-Williams has been an active leader in the recruitment, retention and graduation of underrepresented minorities and women; the development and assessment of co-curricular activities related to professional development core competencies; and preparing future faculty. She serves on the Board of the National Consortium For Graduate Degrees For Minorities in Engineering and Science, Inc. (GEM) as a university representative.

Boyd-Williams received her BS degree in Psychology from Rutgers University and MS Degree in Educational Administration from Cornell University. She is currently completing her Ph.D. degree in leadership studies at North Carolina A&T State University. Her research interests include multi-criteria decision making, intellectual sustainability in higher education, corporate social responsibility and ethics, and East Asian higher education systems. She has presented numerous workshops on issues related to minority affairs, graduate admissions and funding opportunities, intellectual capital management and investment, core professional development competencies, and graduate research and teaching assistant training and assessment.

Dr. Shea Bigsby, North Carolina A&T State University

Dr. Shea Bigsby is the Coordinator of Graduate Writing Services in the Graduate College at North Carolina A&T State University. In this position, he develops resources and conducts workshops to help graduate students improve their writing skills and complete thesis/dissertation formatting and submission requirements. He also develops programming, presentations, and web materials to support numerous initiatives related to graduate student professional development, graduate assistant training, and other enrolled student services.

Dr. Clay Gloster Jr, North Carolina A&T State University

Dr. Clay Gloster, Jr. currently serves as the Interim Vice Provost for Research, Graduate Programs and Extended Learning, and Dean of the Graduate College at North Carolina A&T State University. He received the B.S. and M.S. degrees in Electrical Engineering from North Carolina A&T State University ('85,'88) and the Ph.D. degree in Computer Engineering from North Carolina State University ('93). He has also been employed by IBM, the Department of Defense, the Microelectronics Center of North Carolina, North Carolina State University, and Howard University.

Dr. Gloster has served on the program committee for several international conferences and received best paper and presentation awards. He has received numerous fellowships and distinguished awards, including his selection to the Becoming a Provost Academy sponsored by the American Association of State Colleges and Universities. Under his leadership, two new programs (BS in Computer Engineering and BS in Information Technology) were started as strategic initiatives to increase enrollment and national ranking. Dr. Gloster holds two US patents.

Dr. Evelyn Sowells-Boone, North Carolina A&T State University

Dr. Evelyn R. Sowells is an assistant professor in the Computer Systems Technology department at North Carolina A&T State University's School of Technology. Prior to joining the School of Technology faculty, she held position at U.S. Department of Energy, N.C. A&T's Division of Research and College of Engineering. Dr. Sowells earned a Ph.D. in Electrical Engineering from North Carolina A&T State



University's College of Engineering. She also holds a M.S. and B.S in Computer Science with a concentration in software engineering from the same university. Her primary research interests are in the areas of efficient digital systems design and STEM education. As a result of her work, she has numerous peer reviewed journal and conference publications. She recently authored a book entitled "Low Power Self-Timed Size Optimization for an Input Data Distribution," which explores innovative techniques to reduce power consumption for portable electronic devices. She was recently awarded the 2016 Chair's award for Rookie Researcher of the year in the Computer System Technology department. Dr. Sowells is the lead investigator of the Females in Technology (FiT) summer boot camp grant project for academically gifted low income rising senior and junior high girls for recruitment into the technology degree areas. She is also the co-PI of the Aggie STEM Minority Male Maker grant project focused on early exposure to technology to stimulate interest in technology of middle school minority males. Evelyn is not only outstanding in teaching and research, but also in service. She recently received the 2013 Chair's Award for Outstanding Service in the Department of Computer System Technology and is a member of Upsilon Phi Epsilon, Computer Science Honor Society, American Society of Engineering Education's Electronic Technology and Women in Engineering Divisions, and American Association of University Women.

Dr. Mark A. Melton, Saint Augustine's University

Dr. Mark A. Melton is a professor of biology and currently serves as dean for the School of Sciences, Mathematics and Public Health at Saint Augustine's University in Raleigh, North Carolina. In that role, he has gained valuable insights regarding the landscape, culture and demands of management at the college and university level. He has served in a number of administrative capacities including Department Chair of Biological & Physical Sciences, Honors Program Director, and as Program Director for the NIH-MARC U*STAR Program, a federally funded student research training program. His leadership includes advancing the educational and research capacity at the school. He strives to be a positive 'Change Agent' as the university continues to forge ahead in its efforts to produce some of the best and brightest scholars. He was recently promoted from associate professor to professor.

Dr. Melton has served as principal investigator and/or director of a number of grants secured from the National Institutes of Health (NIH), the National Aeronautics & Space Administration (NASA), the Department of Education (DOE) and the National Science Foundation (NSF) totaling more than \$10 million. Dr. Melton has served on many NIH and NSF grant proposal review panels for a variety of programs within each agency. In that capacity, he has gained experience and expertise in the management, assessment and evaluation of documentation required for major grants, annual reports, etc. These experiences and qualifications in the areas of proposal writing, proposal writing workshop presentations, service on panel review panels, successful grant writing, and grant implementation and evaluation led Dr. Melton to establish the Melton Consultants & Investments, L.L.C.

Since its establishment in mid-2014, Melton Consultants & Investments, L.L.C. has served as External Evaluator on numerous funded projects for federal agencies including the National Science Foundation and the Department of Education. The evaluation team includes professors in STEM disciplines and in the social sciences that have extensive evaluation experience. Additionally, Dr. Melton has conducted workshops on competitive grant writing and the importance of external evaluation at academic institutions in the US and Antigua.

Dr. Melton has authored papers in the areas of developmental biology, neurobiology (Alzheimer's) and molecular developmental genetics. He is particularly fond of the book chapter he co-authored titled "Closing the Gap: An NSF-Funded Multi-Faceted Mentoring Approach to Reducing the Barriers to Academic Success for Underrepresented STEM Majors." He recently secured a research grant from the NSF to conduct research in the field of gene regulation during development in Drosophila melanogaster in his newly established Laboratory of Molecular Genetics at SAU.

Dr. Melton received his B.A. degree in biology from the University of North Carolina at Chapel Hill, the M.S. degree in developmental biology from North Carolina A&T State University and the Ph.D. in developmental neurophysiology from the University of Maryland at College Park. He also conducted



postdoctoral research in molecular genetics at the University of North Carolina at Chapel Hill's School of Medicine.

Dr. Melton is a member of the American Evaluators Association, Society for Neuroscience, Genetics Society of America, the American Association for the Advancement of Science, Sigma Xi and Beta Kappa Chi.

Preparing Future Minority Faculty for the Professoriate: A Competency-Based Model

Introduction

The Preparing Future Minority Faculty (PFMF) program seeks to train underrepresented minority (URM) Ph.D. students and postdocs for successful careers in academia by providing mentorship, extensive training in best practices, and actual experiences in teaching, research, and service. In developing the program, the following research questions were considered:

- What are the central challenges and obstacles that inhibit minorities from pursuing a faculty career path?
- What training and experiences are needed to help students prepare deliberately for a faculty career path? And
- What kinds of support, including mentoring, are needed to increase minority students' chances of success in pursuing careers in academia?

The NSF-funded PFMF program invited applications from Ph.D. students and postdocs at North Carolina A&T State University. Twenty fellows were selected to participate in the inaugural cohort of the Preparing Future Minority Faculty (PFMF) Program as follows: 18 Ph.D. students, 1 postdoc, and 1 MS student. This cohort included 14 males and 6 females. Degree programs included engineering disciplines (13), Applied Science & Technology (4), Rehabilitation Counseling & Rehabilitation Counselor Education (1), and Leadership Studies (1), as well as one engineering post-doc. Of the program participants, nine were Black or African American, eight were non-resident aliens, one was Hispanic, one was Asian, and one did not indicate. Ten program participants were U.S. citizens, eight were non-resident aliens, and two were resident aliens. During the inaugural year of the program, fellows participated in monthly workshops, selected mentors, submitted monthly professional development reports, and attended an annual symposium. In addition, fellows completed a pre-program assessment survey, pre and post symposium surveys, and workshop evaluations. This paper discusses the outcomes of the first year of the three-year funded PFMF program, including survey results and lessons learned.

Background and Structure of the PFMF Program

Poor enrollment of African Americans and other underrepresented minorities in STEM disciplines is a critical, established problem. Though estimates demand great increases in college completion in STEM areas to drive the U. S. economy, less than a quarter of minorities have college degrees [1]. This makes minorities a critical focal point as the nation works to address gaps in STEM degree production. Science leaders agree overwhelmingly that increased diversity in the sciences is critical [2]. Increased diversity in STEM thought-leaders will strengthen scientific and engineering output and discovery [3]. Yet less than 7% of doctorates are earned by African Americans, and only a fifth of entering STEM minorities at the most advanced level in STEM fields is a self-perpetuating problem. Lack of visibility of minorities at advanced levels of science and technology leads to lack of role-models and inspiration in the field, re-enforcing the lack of student aspirations in STEM areas [5], [6].

To address these critical issues, we have implemented a model consisting of regular training and structured mentoring to help minority STEM graduate students better understand the underlying skills and preparation needed to successfully pursue tenure-track faculty positions. A central component of the PFMF program consisted of an integrated view of the roles of a professional academic career through three key areas: 1) hands-on mentoring, 2) structured teaching experiences and 3) evidenced-based professional development. Figure 1 provides a conceptual framework for linking the program activity inputs with the intended outcomes. The following section details the components of this integrated model.



Preparing Future Minority Faculty in STEM (PFMF)



1) Hands-On Mentoring

During the first months of the program, fellows are required to designate a faculty mentor. The fellows must then meet with their mentor to develop a professional development plan (PDP) that focuses on areas of teaching, research, and/or outreach that have been identified as needing improvement. As a part of their plan, fellows can interview faculty, shadow administrators, participate in faculty meetings, present a paper at a conference, or participate in predefined activities designed to teach them about the professoriate. Fellows submit a monthly report of activities completed as a part of the program. At the conclusion of the program, each fellow will have completed an electronic portfolio detailing his or her work, developed separate teaching and research philosophies, written a grant proposal, and published articles in peer-reviewed journals and conference proceedings.

In addition to aiding in the development of the PDP, the mentor has several other responsibilities. Fellows submit a one-to-two-page report of their activities in the program monthly. They also meet with their mentor regularly. In these meetings, the mentor and mentee focus on a particular aspect of teaching, research or service. During these sessions, fellows can ask questions about any aspect of being a faculty member and get candid responses from an experienced professional. Mentors provide feedback to PFMF fellows and advise them on how to benefit the most from participating in the program.

2) Teaching Experience

In conjunction with faculty mentoring, fellows are required to include a teaching activity as a part of their PDP. In their second year in the program, PFMF fellows engage in a teaching experience that will expose them to the excitement and unique challenges of teaching at the college level. To this end, we offer workshops on such topics as assessment and working with undergraduates, designing courses, teaching techniques, using new technology for teaching, conflict resolution, grading homework, authoring effective assignments and examinations, and student advising.

This teaching activity covers two semesters (minimum): an observation semester and a teaching/co-teaching semester. During the observation semester, the fellow observes an undergraduate course taught by the teaching mentor. Over the course of this semester, the fellow will participate in activities that prepare him or her for teaching the following semester, such as meeting regularly with the teaching mentor, completing structured reflections on the observations, developing course materials (homework assignments or exams), grading, or holding office hours, etc. In the second semester, the fellow teaches or co-teaches an undergraduate course, taking on significant instructional responsibility for the course. A formal observation and critique of the fellow's teaching by the teaching mentor and a PFMF peer is required.

3) Evidence-Based Professional Development

3A. Core Competency Model

The PFMF program incorporates a professional development model built on core competencies [7]. Our model leverages the nine broad "Core Competency" areas for professional development established by the Graduate College at N.C. A&T. The nine Core Competencies are as follows: 1) Career Development, 2) Communication, 3) Disciplinary Expertise & Interdisciplinary Connections, 4) Entrepreneurship, 5) Global Awareness & Cultural Sensitivity, 6) Leadership & Management, 7) Personal Development, 8) Research, and 9) Teaching. For each of these Core Competency areas, students develop skills that build cumulatively in the course of their graduate education and their subsequent faculty career.

For participants in the Preparing Future Minority Faculty for the Professoriate Program, the core competencies model discussed above forms a framework for training, but with a much stronger emphasis on preparation for faculty roles and responsibilities. In particular, our program emphasizes the key elements of tenure-track faculty experience: teaching, research, and service. Our program thus builds on the successes of the Preparing Future Faculty (PFF) model [8] and the Preparing Future Leaders program (a partnership between N.C. A&T and the University of

North Carolina at Greensboro (UNCG). Our program trains URM Ph.D. students in the roles, responsibilities and practices associated with success in the professoriate to ensure well-rounded, measurable training. We also ensure that students are positioned to document their training in a cumulative portfolio. A key capstone component of the program is the development of an ePortfolio of accomplishments, in which each student will build a record of their training and include relevant physical and digital artifacts. Among the artifacts of teaching are formal observation reports of the fellow's teaching by a teaching mentor as well as a formal report on the fellow's teaching completed by a PFMF peer. The artifacts of teaching may also include such items as student evaluations of instruction, evidence of course planning and preparation, videotapes of teaching, course materials developed, and samples of student work. As a result of their participation in the Preparing Future Minority Faculty for the Professoriate program, participants develop leadership and mentorship skills, develop their teaching skills and teaching philosophy, improve their communication skills, and engage in interdisciplinary research and development opportunities.

As a result of the training practices and core competency model incorporated into the PFMF program, participants who complete the program have a wealth of experience and expertise that can be useful when applying for tenure track positions in the future. Through their participation in the PFMF program, participants develop leadership and mentorship skills, develop their teaching skills and teaching philosophy, improve their communication skills, and engage in interdisciplinary research and collaboration opportunities.

The PFMF year 1 activities and workshops connected to many of the Core Competency areas. In seminars on research and teaching and in the PFMF Symposium, students explored critical issues in the areas of Career Development, Disciplinary Expertise & Interdisciplinary Connections, Global Awareness & Cultural Sensitivity, Research, and Teaching. At these events, PFMF students learned from established faculty members about the specific topics shown below in Table 1.

As students in the PFMF program develop their e-portfolios in year 2 of the program, they will categorize their activities and artifacts in the associated Core Competency areas. Beyond the PFMF activities, students are able to participate in workshops and other activities offered throughout the academic year by the Graduate College and various other units on campus, all of which can provide materials for developing the ePortfolio.

Core Competency Area Related Topics Addressed in PFMF Workshops Career Development Planning ahead for a successful career in academia Understanding the tenure and promotion process in academia Learning about the balance of faculty responsibilities Disciplinary Expertise & Establishing an interdisciplinary research project • Interdisciplinary Connections The importance of publishing in academia and the • process for getting published Global Awareness & Cultural Challenges faced by minority graduate students • Sensitivity and faculty members and strategies for handling these challenges Research Developing a meaningful research project/lab • Understanding how academic research is funded. • Teaching Assessment and the importance of clear • standards/learning outcomes

Table 1Topics Covered in PFMF Workshops, Arranged by Core Competency

3B. Annual Symposium- Preparing Future Minority Faculty: Tips and Strategies to Successfully Navigate the Academic Career Process

The Year 1 PFMF Symposium was held in May 2018 at N.C. A&T. This event provided a full day of impactful content for PFMF students in alignment with our goals and objectives. The event was also livestreamed to allow for participation of remote students. We had 21 students and one post-doctoral fellow in attendance, along with 3 students participating online. The event consisted of presentations and panels with N.C. A&T faculty members, an invited keynote speaker, and a panel of recent N.C. A&T Ph.D. graduates. Students who participated in the symposium received a formal certificate of attendance as an artifact to upload in their portfolios.

The Symposium consisted of the following sessions: The Scarcity of Minority Faculty in STEM Disciple; Keynote Address: Being Successful as a Faculty Member in STEM; Panel Discussion: Prioritizing Research, Teaching, and Service Activities; Perspective on Being a Minority PhD. Student at a Research I Institution; Special Presentation: Successfully Navigating the Tenure Process; Panel Discussion: The Ph.D. Process: The Good, the Bad, and the Ugly/Lessons Learned; and Panel Discussion: Establishing a Research Program. Our panelists and speakers were largely drawn from the faculty at N.C. A&T (included Endowed Professors). The keynote speaker was from North Carolina State University. Our speakers included many

underrepresented minorities with highly-successful careers in academia. They graciously shared their experiences and lessons learned very candidly with the PFMF fellows.

Assessments and Surveys

A key focus of the PFMF program is to present an integrated view of the roles of a professional academic career through a variety of structured activities. In order to assess the level of academic career professional development engagement by our fellows, pre-program, pre- & post-symposium surveys were administered to students participating in the PFMF program

Summary of PFMF Pre-Program Survey

A Pre-Program survey was implemented to assess the fellows' perceptions of their career readiness in pursuing a tenure-track academic career. Fellows were asked a series of questions regarding their confidence in various areas of teaching. Fifteen students completed the presurvey in year one. Of the fifteen students completing the PFMF Pre-Program survey in year one, two students indicated that they had been enrolled in their degree program less than one year, two students reported at least one year, three students reported two years, three students reported three years and five students reported four or more years.

When asked about various professional development activities completed while at N.C. A&T to date, the activities that reported the fewest responses were: developed a portfolio of scholarly products (0% of participants); participated in a structured teaching observation (7%); developed a professional development plan (21%); attended seminars/workshops focused on teaching techniques (21%); received formal teaching observation from a department faculty or peer (21%) and authored a grant proposal (29%). The professional development activities reporting the largest number of responses were: developed a curriculum vitae (64%); met regularly (e.g. every six weeks or more often) with an academic advisor of mentor to focus on professional development (64%); presented research findings as part of a conference proceeding (64%); attended seminars/workshops focused on the skills to succeed in an academic career (57%); received formal teaching evaluations from students (50%); and developed a teaching philosophy (50%).

Figures 2 and 3 show responses to a self-assessment of confidence in skills and knowledge relating to teaching and research (where 0 = very unconfident and 4 = very confident). These results show that students need training across these skill areas to be ready for a tenure-track faculty career.



Figure 2. Confidence in Teaching Skills/Knowledge.



Figure 3. Confidence in Research Skills/Knowledge

The Pre-Program survey and initial feedback from the program participants support the need for the PFMF program in that it aims to fill the gap in the preparedness of underrepresented minorities to succeed in academic positions, For instance, while the majority of the fellows indicated they already had some experience in developing a teaching philosophy and presenting research findings at conferences, the pre-survey showed an especially marked lack of experience with developing a professional portfolio of scholarly artifacts, participating in structured teaching observation, and receiving feedback on their teaching skills.

Summary of Pre-Symposium Survey Results

A Pre-Symposium Survey was administered to obtain information regarding student's perception of barriers for minorities pursuing careers in academia. Additionally, data was collected on

topics students would like covered in future workshops. A total of nineteen students completed the Pre-Symposium Survey (eighteen doctoral students and one postdoc fellow). Students completing the Pre-Symposium Survey were in the following disciplines: applied science and technology, bioscience, electrical engineering, industrial and systems engineering, mechanical engineering and nano-engineering. Table 2 shows responses to perceived barriers for underrepresented minorities in academia, while Table 3 shows responses to recommended future workshops.

Table 2

Perceived Barriers for Underrepresented Minorities in Acade	mia
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Communication	• Lack of knowledge and training
• Lack of support and available role	Lack of educational access
models	Access to leading research
• Navigating through the system and	laboratories
understanding available options	• Understanding all of the opportunities
Cultural barriers	available and routes to reach such
• Language barrier can affect access	opportunities
• Help for "Missing in Action" (MIA)	• Language and culture related barriers
Candidates	• Racism
• Lack of access to the field	• Need for stronger
	connections/networks and mentors

Table 3

Recommended topics for Future Workshops

• Teaching demonstrations with actual	Teaching certificate program		
examples	• Tips for journal publications		
• Writing grants, securing funding	• Teaching methods		
• Teaching statements, research	• Sourcing and developing lecture		
statements	materials		
• Women in leadership	• Tips to writing successful research		
Grant writing	proposals		
Publishing and research	• Choosing the right position		
• Teaching strategy	• Developing effective written		
• Code of conducts in teaching	communication skills		
• Grading appeal, curving the grades	• Career management and planning		
and real class teaching experience is	• Research paper publishing		
very important	• How to address attending relevant		
• Teaching and learning	conferences for the organizations in		
	our field		

Summary of Post-Symposium Program Survey Results

A Post-Symposium Survey was administered to collect data on individual and collective components of the symposium. A total of fifteen students completed the Post-Symposium Survey (thirteen doctoral students, one master's student, and one postdoc fellow). The degree

program to which the survey respondents were affiliated included: applied science and technology (count of 2), biology (1), bioscience (1), electrical engineering (2), industrial and systems engineering (2), leadership studies (1), mechanical engineering (1), nano-engineering (3), rehabilitation counseling (1) and did not indicate (1). Table 4 below shows the highly positive responses regarding level of satisfaction with the Symposium presentations.

Question: What was your level of satisfaction with ?	Very Satisfied	Satisfied
The variety of presentation topics	79%	21%
The opportunity to meet and interact with	71%	21% (with 8%
students from other programs		Neutral)
The opportunity to meet and interact with	64%	36%
university faculty from other programs.		

Table 4Survey Responses

While the overall ratings for the Symposium sessions was very good to Outstanding, the highest rated sessions were the Keynote Address, the Special Presentation, Panel Discussion on Prioritizing Research, Teaching and Service, and Perspective: Being on Being a Minority PhD. Student at a Research I Institution.

Our post-event survey results indicate that the symposium was very successful in providing PFMF participants with information and insights that will help them move toward a career in academia. 100% of respondents indicated that the symposium was a valuable use of their time, that it fulfilled their reason for attending, that they learned something new by attending, and that the symposium sessions were well matched to their needs (as shown in Table 5 below). Averaging the attendee ratings of each of the symposium sessions (on a 5-point scale from Poor to Outstanding), 90% of respondents indicated that the symposium sessions were either outstanding (61% average across all sessions) or very good (29% average across all sessions).

Question	Yes	No
Was this symposium a valuable use of your time?	100%	0%
Did this symposium fulfill your reason for attending?	100%	0%
Did you learn anything new from attending this symposium?	100%	0%
Were the symposium sessions well matched with your needs?	100%	0%

Table 5 Symposium Survey Responses

Lessons Learned, Next Steps, and Conclusion

The PFMF Administrative Team meets regularly on a bi-weekly basis to discuss, plan and valuate program activities. For a program of this type to be effective, it is essential to have continual communication among team members regarding goals and tasks. At the end of the first year, we realized the importance of connecting with the student's mentors and keeping them abreast of program activities and expectations. In addition, it was determined that there was a need to follow-up with students to assess and ensure that they implement ideas learned during professional development training sessions. As we continue to refine our approach and work to expand this project from a pilot study to a sustainable training model, we are interested in learning from other similar training programs as well as receiving feedback on our project from our ASEE colleagues.

The Preparing Future Minority Faculty for the Professoriate Program is a comprehensive approach to providing training and mentoring for future faculty. The long-term goal of the PFMF effort is to enhance and synergize existing resources for graduate student success with the aim of increasing the number of our students that move successfully into the professoriate. As this program gains traction, we hope to increase the number of PFMF fellows and continue the program beyond the initial funding period. It is only through structured programs like PFMF that we can truly expect to move the needle in terms of increasing the number of URMs who are prepared for and who actually enter faculty positions in STEM fields at HBCUs or other colleges and universities.

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