Academic Job Preparation for Underrepresented STEM Dissertators, Postdoctoral Researchers, and Early Career Faculty: Contributions to an Institutional Partnership Model for Promoting Diversification of the Professoriate

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Abstract

This paper presents the development of personalized job preparation and job search training and services for underrepresented STEM scholars as part of an institutional partnership model created to assist dissertators, postdoctoral researchers, and early career faculty along their path to joining and persisting in the professoriate. This work is part of a National Science Foundation (NSF) Alliances for Graduate Education and the Professoriate (AGEP) grant awarded to four university partners. The alliance's goal is to develop, implement and study a model of STEM doctoral degree completion and the transition to successful postdoctoral fellowships and faculty careers for historically underrepresented minorities. Underrepresented Ph.D. candidates in STEM fields have long lacked role-models from similar demographic representations due to the small number of underrepresented faculty in STEM fields who can serve as role models and mentors. This has created systemic challenges in recruiting underrepresented students for PhD programs and retaining them into the professoriate. Institutions have been providing job preparation and job search support for their students through general career and related services, such as resume/CV writing, oral presentation skills, mock interviews, and access to employer databases. This type or support may not be the most valuable for Ph.D. dissertators and postdocs whose needs are unique and whose schedules are packed with multiple commitments.

In this paper, we discuss the approach to identifying and implementing multi-year job search and preparation activities to match the needs of underserved STEM scholars who started as Ph.D. candidates and moved towards academic positions at different rates. Sources of data informing the personalized training and services include perspectives of the project leadership, and feedback from the participating scholars collected as part of program evaluation. This feedback helped fine-tune the partnership model to provide participating scholars with the most meaningful support possible.

Findings suggest three design features of successful support:
1. While general training and support such as those offered by career service centers are useful, specific support by STEM faculty with real-time efforts in applying for academic positions was more timely and valuable for URM scholars.
2. Transition support is critical as scholars' needs shift from dissertator to postdoctoral researcher to early career faculty. For example, requests to review job applications early on were joined by interest in grant writing once scholars moved into their first post-dissertation academic positions.
3. Real time writing groups focused on proposal development and application portfolio development represent one of the most promising practices. Participants reported multiple academic, social, and motivational benefits resulting from the weekly meetings.

Particular attention to job search and preparation will provide value to underrepresented scholars and assist them to successfully secure and persist in academic positions.

Introduction

The intent of graduate programs is typically to produce scholars who conduct research, teaching, and service as tenured faculty in institutions of higher education (IHEs). Despite these intentions, there are curious gaps in the preparation and retention of such scholars across most IHEs. This is particularly true in the case of scholars who identify as members of groups typically underrepresented in higher education. This paper presents the development and evolution of best practices in the preparation and retention of diverse scholars seeking a career in the professoriate. The context is an AGEP alliance, specifically Texas A&M System Research Model – AGEP Alliance, or TxARM AGEP, sponsored by NSF, with the overarching goal of diversifying the professoriate [1]. Results suggest that success depends on support delivered at the right time, in collaborative contexts, with a focus on products specific to the knowledge and skills required of scholars for their particular position in the pathway to the professoriate.

The most successful professional development models provide training that immediately precedes implementation in authentic contexts (such as the classroom). The recency of training matters in the ability to successfully retain and use knowledge and skills acquired in training. The perceived value of and commitment to training is also related to expectations of use. For under-represented minority (URM) students, the value proposition is very important as initiatives like the current AGEP alliance often requests considerable time from participants, and this cannot come at the expense of maintaining acceptable academic progress in a degree program or tenure track pathway.

Job search and preparation training offered by career centers in many IHEs focus on knowledge and skills in a general way in order to serve many disciplines and students. This is inefficient and unlikely to meet the needs of diverse scholars or focus on advanced skills development needed by scholars at the Ph.D. level. There is a lack of customized support designed to help scholars secure particular academic positions or fund development opportunities. Strategies that allow for participants to advance their personal agenda on an ongoing basis are far more likely to be effective in promoting URM scholars along their pathway to the professoriate.

Participation in the academy is grounded in collaborative practice, including students and faculty in classes and degree programs, in departments and disciplines, in research and laboratory groups, in mentoring and advising relationships, in campus and community organizations. Contemporary STEM educational frameworks characterize collaboration as a fundamental transdisciplinary skill in education and society [2]. Collaboration is part of a transdisciplinary skill set that supports academic and workforce performance over the lifespan along with communication, critical thinking, and creativity [2]. Many complex technological and scientific advances require interdisciplinary collaboration and sharing knowledge across diverse disciplines. Research suggests that measurable positive attitudes and behaviors toward cross-disciplinary and interdisciplinary work are related to engagement in collaborative workgroups [3].

Collaborative contexts provide a range of benefits to participants in terms of project implementation and performance, academic success and scholarly productivity, psychosocial

adjustment, and physical and psychological well-being. Transitions like applying for jobs, becoming a mentor and advisor, and scholarly productivity are reliant on informal mechanisms, referred to as the hidden curriculum [4]. This is particularly relevant for URM scholars, who typically lack role models from similar demographic representations due to the small number of underrepresented faculty in STEM fields who can serve as role models and mentors [5], [6]. Collaborative practice structures such as mentoring, short-term embedded practice experiences, writing workgroups, and job coaching can provide support that makes this implicit learning explicit. For example, specifically supporting transitions from doctoral to postdoctoral to early career faculty positions through collaborative practice and mentoring addresses this hidden curriculum, as these transitions often lack formal guidance from the academy [7].

Aside from academic domains, collaborative practice supports the psychosocial and sociocultural adjustment of scholars. Ongoing opportunities to collaborate and connect across diverse communities can promote feelings of belonging and inclusion, as time spent together provides the time and space necessary for trust, group identification, and mutual regard to develop [8], [9]. Membership in multiple communities of practice provides URM scholars a safety net of support and can encourage the development of peer groups with scholars like themselves.

Job Search and Preparation Activities Embedded in an Interdisciplinary AGEP Alliance

The goal of the TxARM interdisciplinary AGEP alliance is to develop, implement and study a model of STEM doctoral degree completion and the transition to successful postdoctoral fellowships and faculty careers for groups historically underrepresented in STEM. Figure 1 represents the TxARM AGEP alliance research model developed, revised, and used throughout the project that reflects the collaborations and activities undertaken under the alliance at Texas A&M University, Prairie View A&M University, Texas A&M University-Kingsville, and Texas A&M University-Corpus Christi. The role of Oak Ridge Associate Universities (ORAU) includes the external assessment and evaluation of the project and its activities. This research model shows the path of URM dissertators to professoriate, and the collaborative efforts and activities among the alliance institutional members to achieve the project goals.

Figure 2 depicts the overall AGEP alliance logic model, which engages local teams from each of four participating IHEs in the development, implementation, and study of outcomes of an interconnected set of activities and supports for URM scholars who are transitioning from being doctoral students to being postdoctoral scholars and early career faculty in higher education. The dashed lines represent the evolution of activities related to Job Search and Preparation (Career Planning and Pursuit in the Model) from the typical to advanced needs of the cohort members.
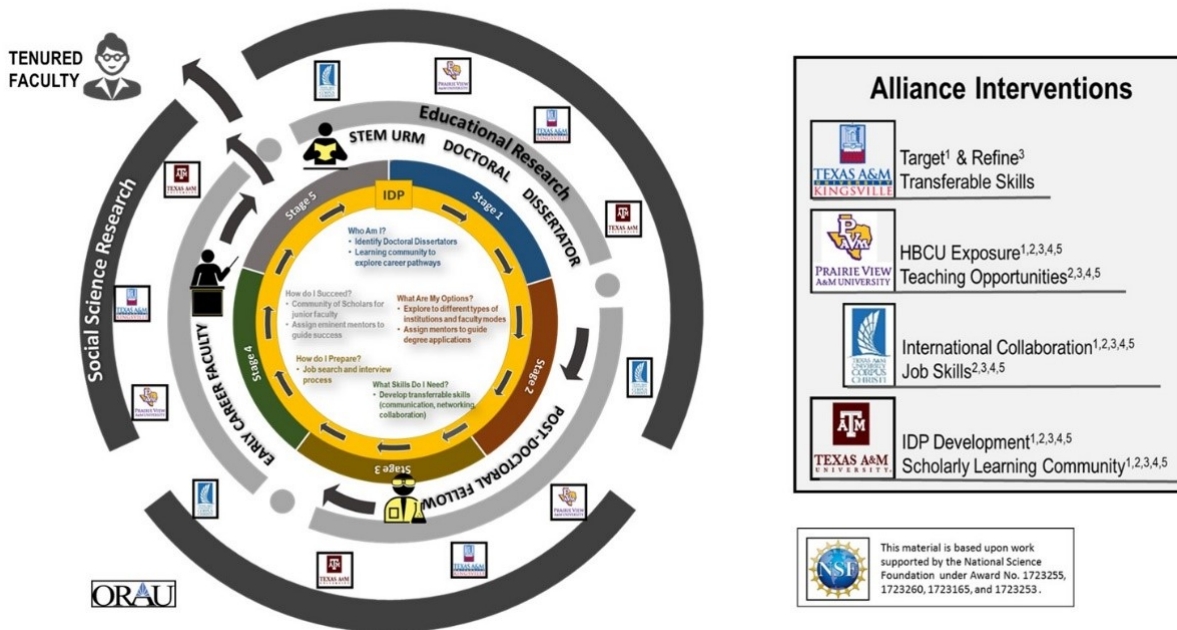
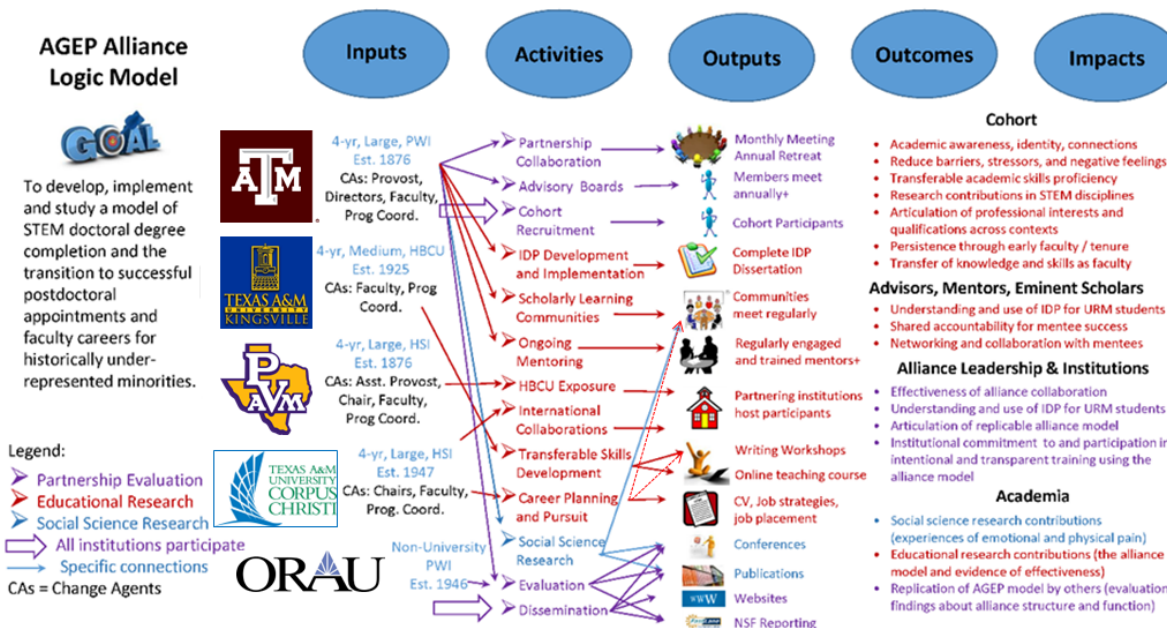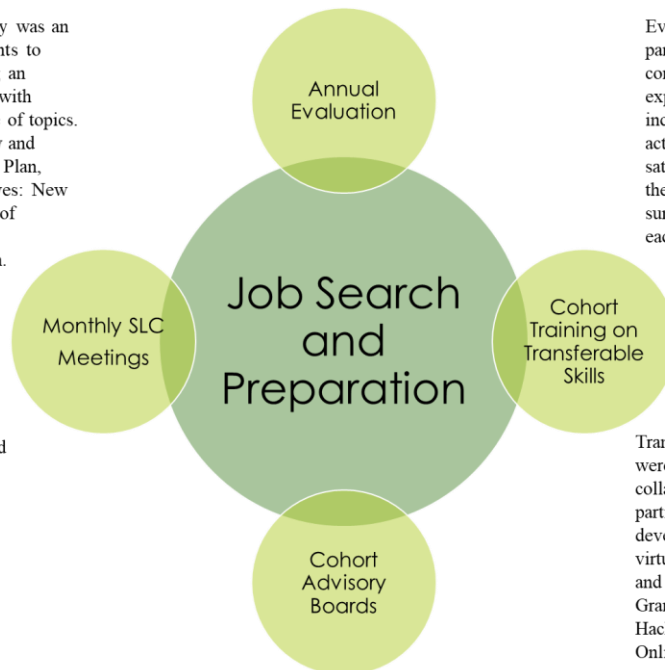**Figure 1.** TxARM Research Model – AGEP Alliance [10]

Figure 2. AGEP Alliance Logic Model

Job preparation within the AGEP alliance model is a broad term referring to developing the knowledge and skills necessary for participants (dissertators, postdoctoral researchers, early-career faculty) to successfully enter and persist in the professoriate. This paper is concerned with the job search and job preparation activity of the model, which evolved over the course of the five-year project, moving from an early focus on securing academic positions to a later focus on successfully engaging in the research, teaching, and service requirements of early career faculty to remain competitive in their discipline. Initial focus prepared dissertators for job applications through CV writing/building, writing application portfolios, preparing for mock interviews, as well as searching for the right job. As the dissertators progressed through their careers, however, their needs changed and became more differentiated, and the support provided evolved into custom-made and personalized writing sessions and just-in-time services to meet the specific needs of the cohort members.

While the focus in this paper is primarily on skills and services provided over five years that prepared scholars to secure academic positions and successfully engage in the research, teaching, and service requirements of early career faculty positions (activity labeled "Career Planning and Pursuit" in Figure 2 in the Activities column), this activity is vitally interconnected with other complementary activities of the model. Figure 3 illustrates these complementary activities along with examples of connected events.

Figure 3. Alliance model activities complementary to job search and preparation support

Recruitment and Needs Assessment

The AGEP alliance originally recruited twelve dissertators across the four participating campuses from different engineering and science disciplines who were Ph.D. students. These students became the cohort members who experienced the model first hand, and were instrumental in its development, fine tuning, and its final form as it stands today for an adaptable model to guide Ph.D. students and beyond, through the path towards academic positions. Students were recruited via the leadership team based on preset criteria – under-served populations in STEM disciplines and Ph.D. students who had reached the level of candidacy. Three of these students selected alternate career options after completing their studies (industry or government positions), and are not included in this study.

Needs assessment for job search and preparation activity started during the first year when the activity lead met with each cohort member individually to identify their plans after receiving the Ph.D. degree, including a postdoctoral position, or faculty position, including teaching or research related positions. The one-on-one interviews were conducted to understand the cohort members' career plans and goals, their graduation timeline, their perceived strengths and weaknesses, and where they sought assistance, within and beyond what the activities of the model were already targeting. This initial interview was also significant in establishing credibility with the cohort members, through sharing similar experiences as an academic and as a former Ph.D. student who experienced similar questions, challenges, and decisions. It was also significant to clarify the job search and job preparation efforts targeted by the project were different from job search and job preparation training they may have received or been exposed to from their undergraduate years on.

Even with similarities among the cohort members in terms of their career path, the individual meetings revealed the differences among each individual in terms of their career goals, timeline, perceived strengths and weaknesses, and the areas in which they sought assistance. It became clear early on that "one-size fits all" approach would not work for the Ph.D. cohort.

Beginning the second year of the project, the project leadership discussed the importance of respecting cohort members' time as they established their Individual Development Plan (IDP) and participated in different activities of the AGEP Alliance Model, and interviews and surveys asked of the cohort members moved to centralized model-based form that would capture questions from various activity leads.

Job Search and Job Preparation Activities and Their Evolution

The job preparation activities started beginning the second year with CV writing exercises which involved revamping each student's CV. Through IDP, learning communities and other activities, such as online course development workshops that were part of the AGEP Alliance Model, parts of the CV that would benefit from strengthening over the next few years were identified in preparation for jobs beyond the Ph.D. These activities were enhanced by developing application portfolios and their content during the second and third year of the project, continuing to assess the cohort members' individual needs and transforming activities to meet these needs. Finally in the fourth year of the project, based on cohort feedback, the job preparation activities were

moved to joint writing sessions with cohort members where one week was spent in reviewing and practicing proposal writing skills, and one week was spent working on job applications and job portfolios, such as job-specific cover letters, diversity statement, research statement, teaching statement, and curriculum vitae, as well as other specified documentation. During the fourth year the cohort members met weekly in formal hourly writing sessions. During the fifth year, cohort members continued to meet weekly in hourly writing sessions, but these sessions became less structured, and each member worked on their own identified writing piece, including journal manuscripts, response to the editor, job application, proposal, patent application, and other.

It is important to note that at the beginning of the project, some hesitancy was observed among the cohort members who clearly needed to 'buy into' the activities related to job preparation and job search. After all, most of the cohort members had already been engaged in the typical job preparation activities through more traditional venues, such as institutional career services, during their earlier degree programs. At the beginning, some skepticism was obvious as to what the new activities would offer the participants beyond what they already knew, and whether or not their participation was worth their time. This led to the understanding that job preparation activities, if generalized, will not serve each individual in building up their portfolio in preparation for the academic job search, since each had different plans and goals, and hence personalized sessions and services were targeted.

During the first CV building presentation, information was added from faculty perspectives as to what a faculty search committee would be looking for in a curriculum vitae based on a job posting. Such information is not usually covered in typical CV-writing exercises. Faculty perspectives from those who were involved in faculty search committees provided valuable perspectives for the participants that were deemed valuable. Other presentations were organized during the annual alliance meetings. Guest speakers who were experts in their fields were invited to offer seminars, such as negotiation skills.

Besides formal presentations as part of the cohort members' professional development, job preparation/search activity lead as well as other project leaders supported the cohort members in reviewing their curriculum vitae, cover letters, teaching and research statements, and other documents as they began applying for positions. As the cohort members moved forward in the Ph.D. studies, some chose to target postdoctoral research positions, while others considered academic teaching and research positions. As each cohort member moved at a different pace, this led to just-in-time services, where the activity leads made themselves available for reviews and suggestions on job application documents as needed.

Cohort Feedback

Based on feedback provided from the cohort in multiple contexts associated with the alliance, the following strategies and activities were identified as most helpful in the cohort members' career development.

The Right Time: Just-in-time services
- Support provided in real time, such as job applications due the next day
- Manageable ongoing activities that fit their schedule (weekly or monthly meeting models)
- Online course development only valued after COVID-19 pandemic, and IDP as mentors, not mentees (value not always recognized right away but only at the right time)

The Right Place: Support on specific job-related needs related to their transitions
- Individual job applications, mock interviews, as they were applying
- Writing groups for own funding and publication development

The Right Space: Cohort-based delivery of many activities allowing for peer support
- Transferable skills retreats
- Weekly writing groups
- Scholarly Learning Communities (SLCs)

Where are They Now?

The following table indicates the discipline, current institution, and position of each cohort participant who completed the study. The success of the project outcomes is truly measured by the success of the cohort members who have undergone the activities listed in the AGEP Model, as listed in Table 1.

Table 1. Current Placement of Cohort Participants in the Professoriate

Discipline	Institution	Current Position
Electrical Engineering	Texas Southern University	Instructor and Lab Manager
Electrical Engineering	Rice University	Post-doc
Marine Ecology	University of North Carolina at Chapel Hill	Post-doc
Biomedical Engineering	Texas A&M - College Station	Research Assistant Professor
Chemistry	University of Pennsylvania	Post-doc
Biomedical Engineering	Vanderbilt University	Assistant Professor of Practice
Mechanical Engineering	The Ohio State University	Post-doc
Biological and Agricultural Engineering	The Ohio State University	Assistant Professor
Wildlife Science	California State Polytechnic University, Pomona	Assistant Professor

Conclusions

From the results, the key findings reflect a need for support at the right time, in the right place, and in the right space.

Time: While general training and support such as offered by career service centers is useful, specific support by STEM faculty with real-time efforts during the application for academic positions was more timely and valuable for URM scholars.

Place: Transition support is critical as scholars' needs shift from dissertator to postdoctoral researcher to early career faculty. For example, requests to review job applications early on were joined by interest in grant writing once scholars moved into their first post-dissertation academic positions.

Space: Real-time writing groups focused on proposal development and application portfolio development represent one of the most promising practices. Participants reported multiple academic, social, and motivational benefits resulting from the weekly meetings.

The TxARM AGEP model presented here has been developed and fine-tuned over the course of the five-year project through the implementation of the activities identified in the model. This model is adaptable at multiple institutions to prepare underrepresented STEM dissertators, postdocs and early career faculty for the competitive academic world, and to reach diversification of the professoriate.

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