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Social Enterprise Model for a Multi-Institutional Mentoring Network for Women in STEM

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Social Enterprise Model for a Multi-Institutional Mentoring Network for Women in STEM

STEM-UP PA was launched through an NSF-ADVANCE (Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers) grant with the mission of supporting academic women in STEM from a consortium of teaching-focused institutions in the central Pennsylvania region. Unlike many ADVANCE grants awarded to large research institutions, STEM-UP PA brings together women from teaching-focused regional colleges and universities who face similar challenges but are isolated in their small STEM departments. This paper focuses on the establishment and growth of a multi-institutional mentoring network, as well as the model for supporting the network beyond the term of the ADVANCE funding (2012-2015).

The mentoring network is administered by a volunteer Executive Committee, which matches junior and senior faculty members and administrators according to a survey of strengths and needs, both within and across institutions. The annual program includes orientation training and goal setting, a structured mentoring relationship with monthly meetings and bi-annual phone check-ins with the executive committee, and approximately three career-focused workshops where all participants gather. These workshops include a networking component designed to support the mentoring relationship and foster additional relationships among STEM faculty across central Pennsylvania.

The mentoring network has grown to a 2017 cohort of 44 participants in seven STEM disciplines, traveling up to 100 miles from 21 colleges and universities. Core workshop topics have included Work/Life Balance, Writing Productivity, and Self-Advocacy, as well as annual Symposia on Collaborative Research Opportunities and Innovative Teaching and Improving Teaching Evaluations. Program evaluation shows almost all involved women have remained in academia and advanced through the ranks while feeling less isolated. An innovative sustainable funding model is being piloted by transitioning to a social business model that extends programming to STEM women in industry and government. Industry sponsors gain access to a pipeline of local graduating women in STEM while improving their workplace culture for diverse employees.

Introduction

The percentage of women undergraduate students continues to increase and reach parity with male students in higher education; however, women remain underrepresented amongst STEM faculty, particularly in tenured and senior ranks, and administrative positions. In academia, women in STEM account for less than 20 percent of qualified applicants [1], 31 percent of full-time faculty, and 27 percent of deans and department heads [2]. Women also comprise a disproportionately low number of full professorships in STEM, with women accounting for 42% of instructors and assistant professorships, 34% of associate professorships, and only 19% of full professorships [3]. The NSF ADVANCE program is “designed to foster gender equity through a focus on the identification and elimination of organizational barriers that impede the full

participation and advancement of all women faculty in academic institutions” [4]. Approximately 200 ADVANCE awards have been made since 2001 [5].

An NSF-ADVANCE grant funded in 2012 launched STEM-UP PA with the mission of supporting academic women in STEM from a consortium of teaching-focused institutions in the central Pennsylvania region. Unlike many ADVANCE grants awarded to large research institutions, the goal of STEM-UP PA was to bring together women from teaching-focused regional colleges and universities who face similar challenges but are often isolated in their small STEM departments. The founding institutional partners included three relatively small teaching-focused institutions of higher education (two private and one public) and a multi-institutional non-profit organization connecting businesses to institutions of higher education to commercialize innovative technologies (Elizabethtown College, Shippensburg University, Harrisburg University of Science and Technology, and the Innovation Technology Network).

The three main goals of STEM-UP PA were to (1) assess and report on the climate among central Pennsylvania institutions of higher education for the support of gender equity and diversity among faculty in STEM disciplines; (2) adapt, build upon, and develop programs and services that promote increased representation and advancement of the region’s academic women in STEM (specifically around Recruitment, Retention, and Advancement); (3) develop a web-based resource in support of a sustainable climate of gender equity and diversity for STEM faculty.

During the term of the ADVANCE grant from 2012-2016, STEM-UP PA grew into a community of over 400 individuals across the larger mid-Atlantic region from a variety of STEM disciplines. As part of the ADVANCE grant, STEM-UP PA established and administered a mentoring network, a leadership development program, individual consulting and coaching, and a policy analysis. In a recent internal impact study, over 98% of women in these programs said that participation had a positive impact on their lives and career.

Mentoring Network Background

The STEM-UP PA Mentoring Network was developed as a component of the second goal of the ADVANCE grant to adapt, build upon, and develop programs and services that promote increased representation and advancement of the region’s academic women in STEM (specifically around Recruitment, Retention, and Advancement). Resources for the Mentoring Network were based on materials produced through other successful NSF-ADVANCE initiatives and were tailored for a multi-institution consortium of teaching-focused faculty.

Mentoring was a primary focus of the STEM-UP program because the literature conclusively shows that strong mentors and peer support are key contributors to the success of female faculty members [6-8]. A 2010 study by the National Academies indicated that female assistant professors with no mentors had 68% probability of grant funding versus 93% of women with mentors [9]. Mentored individuals are more likely to have higher compensation, greater salary growth, and more promotions than non-mentored individuals [10]. However, multiple studies indicate that access to mentorship is often more difficult for women and underrepresented faculty

[8]. Particularly for faculty in STEM departments at relatively small institutions, finding mentors informally based on proximity provides an additional challenge that STEM-UP sought to ameliorate.

The Mentoring Network was modeled largely on the University of Missouri, Columbia (Mizzou ADVANCE) STRIDE (Strategies and Tactics for Retention to Improve Diversity and Excellence) Committee and mentoring programs, with additional resources adapted from New Mexico State University and the University of Michigan. The structure of the Mentoring Network was developed over a one-year period by a subcommittee consisting of two of the NSF grant co-Investigators (co-PIs), the project manager, and a consultant who worked on previous ADVANCE programs. These founders launched a Mentoring Network Executive Committee, which is the body that provides oversight and administration for the Mentoring Network.

The Mentoring Network is a paired mentoring program that is administered by a Mentoring Network Executive Committee and comprises an application and matching process for mentors and mentees, a required orientation program, a check-in system with mentors and mentees, and an annual evaluation process for the program. Now beginning its fifth year, the program has grown substantially in the size of its membership and also the number of institutions participating. The first cohort of the Mentoring Network included 14 women from five institutions in central Pennsylvania. The third cohort had 51 women from 20 participating institutions with some women traveling more than 100 miles, clearly indicating a need for the STEM-UP networking and support. In subsequent fourth and fifth cohorts, the Executive Committee decided the ideal size was approximately 40 participating women for a large enough network to support women with varying needs while allowing the Executive Committee to manage the workload. The number of distinct institutions and range of travel has continued to expand into states outside of Pennsylvania.

Mentoring Network Model

Executive Committee

The Executive Committee was formed by two co-PIs on the ADVANCE grant and one project manager, and began with two women from each of the three original ADVANCE institutions. The committee members (now representing six regional institutions) volunteer for a one-year renewable appointment, and the chair of the committee is elected by the membership. Duties of the Executive Committee include: matching mentors and mentees, facilitating the annual orientation and core workshops, and completing phone check-ins with members. Regular monthly meetings are conducted by phone and the committee meets in person once a year to pair the next cohort of mentors and mentees and to plan the year's orientation and core workshop events. The approximate time commitment to serve on the Executive Committee is 25 hours annually for members and about 50 hours annually for the Chair.

Matching Mentoring Pairs

One of the primary duties of the Executive Committee is to match the mentoring pairs. After learning from several cohorts, it has worked best to gather applications using SurveyMonkey during the month of May, as faculty have some breathing room after finishing their spring semester. The application process has evolved from a lengthy multi-page pencil and paper solicitation to a simple 20-minute online survey. Evaluation from early cohorts suggested that preference on only four dimensions are key for productive mentoring pairs: 1) being paired with someone at the same institution or another institution, 2) meeting in person or virtually, 3) being paired with someone in the same discipline or another STEM discipline, and 4) identification of specific areas for which support is needed (for example, teaching, scholarship, work-life balance, navigating politics, etc).

Over the summer, the Executive Committee meets in person to assign mentoring pairs based on the four dimensions of preference. Before the program kick-off event in August, participants are sent an email with information about their pairing so they may contact one another. On rare occasions, Executive Committee members have been contacted with concerns about the pairing; a discussion about the reasoning for the pairing has provided context and satisfactory resolution.

One challenge has been the unequal distribution of more women requesting to be mentees than mentors. Evaluation has shown that mentors often get as much from the mentoring relationship as mentees. Therefore the Executive Committee has sometimes reached out to post-tenure participants to ask if they are willing to be a mentor instead of a mentee, or if they are willing to form a peer mentoring pair. It is important to note that women do not see themselves as mentors even after being tenured and promoted. It often requires encouragement by the committee to convince women that they would be a strong mentor. If post-tenure women are specifically looking to be mentored to move into administrative positions, a suitable mentor can often be located. Pre-tenure women have always been matched with post-tenure women.

Program Requirements

When selected for the Mentoring Network and paired, participants must agree to uphold the program expectations developed from best practices at other ADVANCE institutions as well as the experience of STEM-UP. These requirements include:

- Meet at least once a month from September through July, in person, by phone, or on Skype.
- Maintain confidentiality about the content of mentoring conversations.
- Attend at least one core workshop throughout the year, ideally with the mentee/mentor.
- Have a 15-minute phone meeting with an Executive Committee member once a semester to check in and fill out an evaluation survey at the end of the year;
- Use a ‘graceful exit’ clause if at any point they wish to exit the mentoring relationship, done by notifying their partner and the Executive Committee.

During the orientation event, participants sign a memorandum of understanding (MOU) indicating they will meet these expectations.

Orientation

A mandatory orientation event kicks-off the mentoring program in August. The few instances of failed mentoring pairs shared the common feature that one or both people in the pair were unable to attend the orientation, so attendance has become mandatory to participate in the program. This has become a challenge as the Mentoring Network has grown and a variety of academic and personal schedules become harder to accommodate. This is one reason for limiting the target size of an annual cohort.

The orientation typically takes place at a location central to the original ADVANCE institutions and runs from approximately 9 am to 3 pm on a Saturday in August. The event is facilitated jointly by members of the Executive Committee and includes structured events as well as breakfast and lunch during which women are encouraged to mingle with the larger network.

The structured events include:

- 1) a brief session introducing the literature on the benefits of mentoring;
- 2) a quick review of the requirements of the program, culminating with a signing of the Memorandum of Understanding;
- 3) attendance at one of a choice of three short workshops on time management, goal setting, and effective communication;
- 4) an extended afternoon time for mentoring pairs to get to know one another, set expectations about meetings and any off-limits topics, help the mentee set professional goals, and schedule their first meeting;
- 5) a wrap-up panel with experienced mentors and mentees to answer questions.

A folder of materials is provided to each participant with a selection of goal setting and time management worksheets developed over the years by the Executive Committee and a calendar of STEM-UP events including the core workshops.

In evaluations of the orientation event, setting specific career goals and getting feedback on those goals with mentors is consistently noted as the most helpful activity from orientation, with participants saying:

“The 1-year planning sheet was extremely useful for helping me organize what goals I want to achieve this year, and set both subgoals and a timeline to make the process clear. I have a road map!”

“The most valuable part of it was being able to sit with a mentor and having her challenge me constructively on my thoughts and goals.”

Core Workshops

Core workshops are offered throughout the academic year to address issues common to women faculty in STEM. Typically the workshops are scheduled on Saturday mornings and end with

lunch and networking. Core workshops sometimes overlap with other STEM-UP programming and expand the participants to women beyond the Mentoring Network.

Previous workshop topics have included “Innovative Teaching and Improving Teaching Evaluations”, “Self Efficacy, Self Advocacy, and Negotiation”, “What Does it Mean to Teach Science?” and “Successful Strategies in Writing and Publishing.” Several of these topics have been so successful as measured through post workshop surveys that they have been repeated for multiple years. Two semi-annual STEM-UP Symposia have also been considered core workshop opportunities. These have included Symposia on Collaborative Research Opportunities and Innovative Teaching and Improving Teaching Evaluations with presentations from STEM-UP members and other faculty at regional institutions.

During the years of the ADVANCE grant, funding was available to bring in outside speakers and offer three or more core workshops each year. With the end of the grant, STEM-UP has transitioned to using exclusively speakers internal to the STEM-UP network while only offering two core workshops annually (one in the fall and one in the spring). In addition to decreasing the cost for each event, women who have benefitted from the early external speakers are able to move into the facilitator role and expand their skillset to include workshop facilitation. These internal speakers then have opportunities to facilitate workshops at other campuses for substantial fees. This has been an unexpected benefit of developing internal talent and being forced to innovate beyond the ADVANCE funding.

Check-ins and Evaluation

Once a semester, a member of the Executive Committee schedules a 15-minute phone call with each member of the Mentoring Network. In addition, an annual survey is conducted at the end of the program, soliciting much the same information for evaluation purposes. Participants are asked how and how often they are meeting with their mentees/mentors, which core workshops they have attended, how things are going, if there are any challenges or concerns with the mentoring relationship or program, and what benefits they have experienced as a result of the Mentoring Network. Notes are taken for program evaluation, following protocols set out by an IRB with the original ADVANCE grant.

Results from Mentoring Network Evaluation

One measure of the success of the Mentoring Network is the tremendous growth of the network in terms of number of participants, variety of institutions, and range of travel. Most of this growth has resulted from word-of-mouth testimonials, both from women faculty as well as the Deans and Department Chairs who have seen the benefits. Starting from a cohort of 14 women from 5 institutions in the immediate central Pennsylvania area, the second year grew to 35 participants from 13 institutions, and the third cohort had 51 women from 20 participating institutions with some women traveling more than 100 miles. After the Executive Committee determined that a cohort of around 40 women was the optimized size to target, the fourth cohort had 41 participants and the most recent fifth cohort includes 44 women in seven STEM

disciplines, traveling more than 100 miles from 21 colleges and universities, including some research-focused institutions and institutions in neighboring states.

In the most recent evaluation survey, almost 60% of women said that their participation in the Mentoring Network had a ‘strong positive effect on their career progress’ while 30% indicated a ‘moderate positive effect’ and 10% indicated ‘no effect.’ From several years of phone check-ins with the Executive Committee, 85% of participants said that ‘progress is being made on mentee’s goals’ and 85% agree or strongly agree that the ‘mentoring experience is effective.’

The multi-institutional nature of the Mentoring Network is a unique feature and part of its success. Particularly for women at small teaching-focused institutions who may be the only female faculty in their department, connecting with other women ameliorated a sense of isolation and enabled them to tap into support, empathy, and constructive practices.

“Especially at smaller organizations it is hard to have a sense of community when there are so few STEM women. The workshops and goal setting were beneficial, but the support from the community of women sharing their experiences, ideas, and challenges has been invaluable for my career.”

The ability to get advice from women outside their home institution was particularly helpful for some participants, especially when navigating politics or wanting an outside perspective.

“It’s been wonderful to have someone outside of my campus to bounce ideas/issues/problems off of.”

In addition, many women continue their participation over multiple years and have transitioned from pre-tenure mentee to post-tenure mentor.

“For me, as the mentor, this shift to giver of guidance has been profound. It has made me step up to opportunities that I might not have before. I realize that I have something to offer.”

Mentees specifically report getting advice for tenure, guidance on time management, gaining confidence, and dealing with department politics.

“Was having some problems with department chair and had mentor discuss the issue and read over a letter that I wrote. This was extremely helpful, as department chair agreed with everything and kinda close to partially apologized.”

“First year (as a faculty member) went so very well and I credit the network with assisting that success. First year review was overwhelmingly positive.”

“Mentoring has really helped me focus on scholarship by giving me the voice (and strength) to say ‘no’ to service work!”

Mentors report being energized in their own teaching and research and that they also are more confident in their ability to guide and support junior faculty in their own departments. Evaluation has shown that often mentors get as much professional benefit from the relationship as mentees, although they weren't expecting that to be the case.

"My mentee's enthusiasm is contagious! Through conversations with her I have realized that it is time I re-worked some of my classroom approach. These are things I have been thinking about, but had been putting on the back burner."

When several women participate from a single institution, the connection across departments (which wasn't occurring prior to STEM-UP) has created a safe space for mentees.

"There are 3-4 Mentoring Network members in my building. The network creates a safe space for professional support."

Another positive outcome elicited through evaluation is that women have begun using the Mentoring Network as a model for mentoring beyond STEM on their own campuses.

"I was asked by my Dean to mentor a faculty member. The structure of the STEM-UP PA program helped me with that because the college gave no clear expectations about mentoring."

Costs of Maintaining the Mentoring Network

As the NSF funding drew to a close, the Executive Committee and PIs of the original grant streamlined the Mentoring Network and obtained bridge funding from participating institutions during the transition to a social business model for sustained funding. The end of NSF funding has clarified the monetary costs and human capital to maintain the Mentoring Network. These include:

- Meals at participant events including orientation and the core workshops
 - Roughly \$3000 annually for about 40 participants
 - Bridged by a grant from a founding institution
- Speaker fees at core workshops
 - \$25,000 annually in ADVANCE years
 - Decreased to a negligible amount by using internal facilitators, reducing from three workshops to two, and partnering with events at member institutions
- Space to host events
 - Free space is available through the Pennsylvania State System of Higher Education
- Administrative support
 - Less than 5 hours a week on average, mostly to manage member registration and organize the catering and space reservations for events
 - Less than \$200 annually in photocopying

- Covered by the non-profit partner on the ADVANCE grant with a mission to connect businesses and academia for product commercialization
- Non-profit is supported primarily by state economic development grants and local chambers of commerce
- Website maintenance
 - Initially designed and built by a paid external consultant
 - Currently on a volunteer ad-hoc basis from network faculty with the skills
- Executive Committee members' time (five members)
 - Approximately 25 hours annually for each member
 - On a volunteer basis for a one-year renewable term
 - Is recognized as 'service to the community and field' for consideration of tenure and promotion at member institutions
- Chair of Executive Committee's time (one chair)
 - Approximately 50 hours annually
 - Previously supported by a founding institution as a one-course release annually out of the grant overhead
 - Is recognized as service and leadership for consideration of tenure and promotion at member institutions

Social Business Model for Sustainable Funding

The term 'social business' was coined by Muhammed Yunus to describe his model for the Grameen Bank in Bangladesh, for which he was awarded the Nobel Peace Prize in 2006. Yunus defines a social business as one that has its primary purpose to address a social problem rather than to generate profits. The social business is not a non-profit relying on grants and donations but rather must be financially self-sustainable. It is typically understood that profits are to be reinvested in the business to expand its social impact [11].

An innovative partnership with a Social Enterprise Institute housed at one of the founding institutions has resulted in a social business model for sustainable funding for the Mentoring Network along with two leadership development programs offered by STEM-UP. The social business approach includes: 1) rebranding and expanding the focus beyond academia and into new geographic regions, 2) providing consulting and coaching opportunities for revenue, and 3) creating a mutually beneficial sponsorship model.

Rebranding and Expanding

STEM-UP PA has been rebranded as STEM-UP Network with a new website. This rebranding mirrors the expanded focus beyond academia and into new geographic regions. In addition to academic women in STEM, programming is now available to women with STEM careers in industry, government, the military, and senior executives. Not only are many of the issues facing women in STEM similar, but participants can also learn from one another and create synergistic connections across academia, industry, and the government. In addition, the 'customer' has been expanded beyond women in STEM to also include companies that have identified the attrition of

talented women employees as a competitive disadvantage in the marketplace. Finally, regional networks and programming are being initiated in Philadelphia and Baltimore in addition to central Pennsylvania (Harrisburg).

Coaching and Consulting Revenue

Coaching opportunities have been expanded and consulting has been added to generate revenue for STEM-UP. The coaching aspect of STEM-UP was previously limited to academic women participating in a specific leadership development program. With the expansion, paid professional coaching has been made available to all participants in the network outside of structured offerings.

Consulting services targeted at supporting efforts in recruiting, retaining, and advancing women STEM professionals have also been added. These services are aimed at the employer/corporation and include:

- gap and needs analyses on policies and practices in support of gender equity;
- identification and amelioration of implicit bias in hiring and advancement practices;
- assistance with internal capacity building initiatives and programming for leadership and professional development; and
- research and external evaluation to measure impacts of initiatives and support for women in STEM within the organization.

Sponsorship Opportunities

Finally, sponsorship opportunities have been developed to generate revenue and also provide benefits to sponsors. Sponsorship of the network in general or of specific events is offered. These benefits include:

- Access to collegiate and post-collegiate STEM women professionals and researchers who could be potential employees or partners;
- Reduced recruitment and employee replacement costs;
- Retention of a productive, highly motivated group of employees;
- Mitigation of the loss of institutional knowledge with employee attrition;
- Improved demographics for contracting requirements;
- Diversity and implicit bias awareness to include the costs thereof;
- Methods for reducing the negative effects of gender bias and stereotypes;
- Facilitation of a supportive environment for all employees;
- Developing, managing, and promoting diversity and affirmative action policies;
- Opportunities to share best practices and best practices models.

Sponsorship of the STEM-UP Network is currently offered at three levels.

Champion Sponsor - \$15,000

- **Public Recognition.** Your organization will be on the STEM-UP Network website, marketing materials, signage and recognition at all events
- **Five Invites to STEM-UP Network Special Events.** Five, no-cost invitations to special events such as summits, workshops, and community forums
- **Featured in STEM-UP Network Summits.** Subject matter experts from our Champion Sponsors participate as designers, facilitators and panelists at STEM-UP Network programs and/or events
- **Networking & Recruiting.** Connect with women professionals and students in STEM disciplines to talk about the interesting work your organization is doing
- **Active Participation in the Network.** Professional women in your organization are invited to take part in all Network programs

Advocate Sponsor - \$10,000

- **Public Recognition.** Your organization will be on the STEM-UP Network website, marketing materials, signage and recognition at all events
- **Three Invites to STEM-UP Network Special Events.** Three, no-cost invitations to special events such as summits, workshops, and community forums
- **Networking & Recruiting.** Connect with women professionals and students in STEM disciplines to talk about the interesting work your organization is doing
- **Active Participation in the Network.** Professional women in your organization are invited to take part in all Network programs

Partner Sponsor - \$5,000

- **Public Recognition.** Your organization will be on the STEM-UP Network website, marketing materials, signage and recognition at all events
 - **An Invite to STEM-UP Network Special Events.** One, no-cost invitation to special events such as summits, workshops, and community forums
 - **Networking & Recruiting.** Connect with women professionals and students in STEM disciplines to talk about the interesting work your organization is doing
 - **Active Participation in the Network.** Professional women in your organization are invited to take part in all Network programs
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The STEM-UP Network social business model launched in Fall of 2017. We are talking with four potential founding sponsors at the time of this writing.

Conclusions

The STEM-UP Mentoring Network was launched through an NSF-ADVANCE grant with the mission of recruiting, retaining, and advancing academic women in STEM from a consortium of teaching-focused institutions in the central Pennsylvania region. Building on resources and best practices from other ADVANCE grants, a model for an effective multi-institutional Mentoring Network was formed and has grown to a 2017 cohort of 44 participants in seven STEM disciplines, traveling up to 100 miles from 21 colleges and universities. Program evaluation shows almost all involved women have remained in academia and advanced through the ranks while feeling less isolated.

An innovative sustainable funding model is being piloted by transitioning to a social business model that extends programming to STEM women in industry and government, as well as the organizations for which they work. The social business approach includes: 1) rebranding and expanding the focus beyond academia and into new geographic regions, 2) providing consulting and coaching opportunities for revenue, and 3) creating a mutually beneficial sponsorship model. The goal of the social business model is to address gender equity issues that impact the individual, the organizations for which they work and, therefore, the regional economy.

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