Women in STEM Fellowship: An Intersectional and Interdisciplinary Approach to Advancing Inclusion in the Sciences

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"I felt that I belonged in my field when I first got together with the Women in STEM Fellowship."
Anonymous Women in STEM Fellow

At our university, women-identified individuals make up 23% of students in male-dominated STEM fields; less than 15% of them graduate with a STEM degree. Nationally, more than 40% of women who enter a STEM job leave it within fewer than ten years. Gendered issues within STEM industries have been identified, yet we are far from equal opportunities for all genders. In 2018, we—the director of Women's and Gender Studies (WGS) with colleagues in Math, Computing Sciences, and Chemistry—received a $45,000 grant to create a "Women in STEM Fellowship." The inclusion of WGS made the fellowship interdisciplinary, intersectional, and informed our decision-making process via feminist diversity, equity, and inclusion approaches. Through WGS techniques of questioning oppressive systems as well as a community-building focus, we attempted to mitigate prevalent reliance on neoliberal individualism.

This article offers insights into the fellowship's activities and programs, challenges and successes, as well as assessment. We call on diversity initiatives in STEM to collaborate with academic and student success units—such as WGS or Black Studies—that house much -needed expertise and to refrain from isolating efforts in STEM departments.

Introduction

At our comprehensive state university in the US Southeast, female-identified individuals made up less than 23% of students in fall 2019 in the fields of Math, Chemistry, Physics, Engineering, and Computing Sciences; since 2009, 14.6% of all female STEM majors (which, at our school, includes Biology and Marine Science in addition to the aforementioned programs) graduated with a STEM degree within four years. Nationally, 71% of employed scientists in 2017 were male (Shattuck & Cheney, 2020), and more than 40% of women who enter a full-time STEM job leave it after having a child (Else, 2019). Gendered issues—such as harassment, fraternity-like work cultures, and the refusal to consider the needs of parenting employees—within STEM industries have been identified for many years, yet we are still far from having established equal opportunities for all genders (Shattuck & Cheney, 2020). Considering the power STEM companies and organizations have over societies worldwide, it is essential that leadership roles in these sectors reflect the identities of the people they aim to serve.

In 2018, we—faculty in Chemistry, Computing Sciences, Mathematics, (eventually) Physics, and Women's and Gender Studies (WGS)—received a $45,000 Student Achievement Funding grant from our institution to create a "Women in STEM Fellowship." Our intention was to be interdisciplinary in setting up this project, making WGS a core component of our efforts instead of siloing support solely within the affected STEM departments. This inclusion of WGS made our focus on under-represented groups purposefully intersectional and informed our decision-making process via feminist diversity, equity, and inclusion approaches. Our fellows shared with us that many of them did not feel like they belonged in the majors they are passionate about—not because of their academic capabilities but of how they felt perceived by their peers and instructors. We, thus, set out to grow these students' self-esteem and to provide them with tools that would help them persevere in the face of bias and self-doubts.

While we recognize that our fellowship exerted limited power in bringing about structural change at our institution, we see our interdisciplinary efforts going further than most, what Myers et al. (2019) call, "STEMinism" strategies, which have "opened doors to STEM majors and recruited more young women into STEM fields, [but have] not provided them with an understanding of the subtle mechanisms that can hinder their success" (p. 657). Through the intentional inclusion of WGS approaches to questioning oppressive systems as well as a community-building focus, we attempted to mitigate "STEMinism's" neoliberal individualism. In this article, we offer insights into the activities and programs we pursued (mentorship and ambassador initiatives, visits with industry partners, guest speakers, paid student research and conference travel, etc.), into challenges and successes with different initiatives, as well as assessment data. We also call on campus diversity initiatives in STEM to collaborate with academic and student success units—such as WGS, Black Studies, and Diversity Offices—that house much-needed expertise and to refrain from isolating efforts in STEM departments and colleges. We hope that our information proves useful for developing new strategies to create change for students of all identities in STEM education.

Why a Women in STEM Fellowship?

Despite studies showing that more diverse teams create products and ideas that serve a wider range of communities better as an assemblage of diverse workers prevents groupthink and the limitations that come with it (Wachter-Boettcher, 2017), the sciences have a bad track record with bringing in and keeping a diverse workforce. Tokenism, stereotyping women as too emotional and not analytical, hostile environments, and anti-family workplaces are still the norm (Branson, 2018, p. xiv). Women make up only 25.8% of the labor force in the fields of Math and Computing Sciences and 15.7% in Engineering (U.S. Bureau of Labor Statistics, 2020). These percentages are even smaller in leadership positions; for example, only 5% of the most highly paid executives in the tech industry are women (Branson, 2018, p. ix). In the realm of science research, bias about gender and race leads to fewer women and other minoritized groups being published in reputable science journals and being awarded prestigious grants, which are both career-defining elements (Pinholster, 2016; Head et al., 2013).

But issues begin much earlier than with the start of one's career. Girls' interest in the sciences awakens later than boys' as the former is often discouraged by a patriarchal construction of femininity that trains girls to play with toys which prepare them for motherhood and household duties while typical boy toys, like building-blocks and action figures, encourage problem-solving, creativity, and spatial recognition (Weale, 2016). It is indeed an accomplishment that our students succeeded in becoming STEM majors in the first place despite gendered roadblocks, such as persistent stereotypes about who can be a scientist, a lack of female role models in the sciences, and a dearth of young girls' exposure to science activities (Bach, 2015; French & Crouse, 2018).

Female students who decide to pursue studies in a STEM field often describe being one of very few women or even the only one in their classes. Such isolation that emphasizes one's "stigmatized identity" "is likely to induce stereotype threat" (Tatum, 2017, p. 160), the "extra burden of anxiety" they must carry "because they are aware of the

negative stereotype" associated with one or multiple parts of their identity (Rivers & Barnett, 2013, p. 98). Our fellows also reported feeling patronized in courses by both peers and faculty, being able to interact with only few female professors, and having few mentoring opportunities. They further indicated that they were teased about their bodies and had their competence questioned (Branson, 2018, p. 56). They are tokenized, lack peer support, and must negotiate a very masculine culture (Branson, 2018, p. 47, 48). As a result, many young women are unaware of their potential and, worst case, feel so unwelcome in their chosen field that they decide to switch to a different major—often moving from doing STEM into teaching STEM, which is seen as a more feminine and, thus, acceptable career path. While teaching STEM is an admirable and usually readily available career path, these jobs are much less well paid than STEM research and development positions and certainly less esteemed. Indeed, switching majors is highest among women students in STEM, especially in math, despite most switchers being academically talented. While students' academic under-preparedness coming out of K12 education, especially in mathematics (Butrymowicz, 2017), negatively affects their success rates in their STEM major classes, many female students name alienation, isolation, intimidation, and lack of encouragement as their reasons to switch out of their chosen STEM major (Branson, 2018, p. 66-67). At our own institution, 41% of female students in a STEM field switched majors over the last three years compared to 30.7% of all enrolled female students. In the academic year 2018-19, Physics lost 71.4% (n=5) of its female majors, only surpassed by Engineering losing their only female major for a 100% change rate in the 2016-17 academic year. It is important to note that 38.6% of male STEM students also switched majors. But while the difference between female STEM and non-STEM switchers is 10.3%, the difference for male students is only 5.9%, so almost half (with 32.7% of all male students changing their majors).

Despite the prevalence of such experiences, most of our fellows were not aware of and certainly not prepared for the many obstacles that women face in STEM jobs. The survey, "Elephant in the Valley," for example, which focuses on women in senior positions in the technology industry, demonstrates that almost all of the more than two hundred respondents had been exposed to sexism in their careers. Specifically, the survey revealed that 84% of participating women "have been told they are too aggressive;" "66% felt excluded from key social/networking opportunities;" "88% have experienced clients/colleagues address questions to male peers that should have been addressed to them;" and 60% "reported unwanted sexual advances," which made one third of the women fear "for their personal safety" (Vasallo et al., 2018).

According to Mundy (2017), "such undermining is one reason women today hold only about a quarter of U.S. computing and mathematical jobs—a fraction that has actually fallen slightly over the past 15 years, even as women have made big strides in other fields." And a hostile workplace culture leads women to leave tech jobs "at more than twice the rate men do" (Mundy, 2017). It takes a lot to persist in jobs where women are interrupted more frequently than male colleagues, where the evaluation of women's work is influenced by judgements about their personality in ways different from men, and where it is much harder for women to receive funding for their ideas, which are perceived as more "persuasive" if presented by men (Mundy, 2017). Many of these issues are not unique to the STEM fields but are heightened in male-dominated spaces such as the hard sciences.

And the situation is even more complex for women whose experiences with discrimination due to their gender intersect with bias based in other identity markers such as their race or dis/ability. In fact, racially and ethnically diverse girls often do not "even make it to the starting line" because of persistent racialized inequities in K-12 education that make it harder for them to graduate high school (Johnson et al., 2011). Between 1995 and 2004, only 9.3% of Black women who received a college degree graduated in a science field (Johnson et al., 2011). It is not surprising then that, while white women received 25.7% of all PhDs in STEM given to US citizens in 2016, black women only received 2.2% (Shattuck & Cheney, 2020); in addition, women of color report feeling even more isolated than their white female colleagues and having their input dismissed for being perceived as angry (Williams et al., 2015). As of fall 2020, 32.3% of all women STEM students identified as non-white at our school. Closely mirroring this percentage, 35.9% of our fellows identified as students of color, with 17.6% African American students constituting the largest demographic in this group. Our fellows' testimony confirmed that women of color often feel alone, singled-out, and non-supported in our STEM disciplines.

Yet, despite studies revealing that sexism holds women back, some members of the STEM disciplines hold on to views that the dearth of representation of women and other minoritized communities is due to a lack of talent. For example, in a recent (and since retracted) article in a leading Chemistry journal, the author scolds the amount of people who "have been designated with 'preferential status'" despite the number of diverse people in the industry having "greatly increased" (Hudlicky, 2020). He laments that such "preferrential [sic] treatment of one group leads to disadvantages for another," in fact to "discrimination against the most meritorious candidates," that "[n]ew ideologies have appeared and influenced hiring practices, promotion, funding, and recognition of certain groups," and that "mandatory 'training workshops' on gender equity, inclusion, diversity, and discrimination" have appeared (Hudlicky, 2020). Such claims are devoid of any understanding of systematic, institutionalized discrimination against non-majority individuals (see, for example, Wachter-Boettcher, 2017; Hofstra et al., 2020; Ford et al., 2019).

Our Women in STEM Fellowship set out to push back against post-feminist narratives that paint an unrealistic picture of gender equity and equal opportunity in STEM fields. Myers and colleagues (2019) have found that women students are trained to "espouse gender essentialism, meritocracy, and exceptionalism" (p. 650), to rationalize sex-segregation and inequality they witness (p. 653), and to perceive gender differences as natural and permanent (p. 655). Specifically through inclusion of WGS skills sets and content regarding the critical analysis of systems of power, privilege, and oppression, we intended to make fellows aware of persistent and systematic exclusive measures and to empower them to protect themselves against a system designed to keep minoritized people out of STEM. We see these components as a useful addition to existing initiatives targeting underrepresentation in STEM from which we drew inspiration.

Existing National Initiatives

In light of persistent ignorance about bias in STEM, non-profit organizations, like the National Girls Collaborative Project (https://ngcproject.org), are committed to getting more women-identified individuals into the sciences. And professional groups, like the Women in Engineering ProActive Network (https://www.wepan.org/) and Women in Technology International (witi.org), provide support for women already in STEM careers. Our Women in STEM Fellowship intended to create similar support networks directly on our campus.

In recent years, the National Science Foundation's ADVANCE program has offered large grants to support proposals that promote diversity, equity, and inclusion in STEM. Impressive programs have come out of these grant opportunities. In addition, several initiatives on college campuses have focused on women in STEM. Cornell University's Empowering Women in Science and Engineering symposium, for example, provides networking opportunities between graduate students, faculty, and professionals. Stanford University's Women's Community Center facilitates long-term Women in STEM mentoring between undergraduate and graduate students, a symposium for current students, as well as student and faculty panels for prospective students and during first-year orientation. Meanwhile, Women in Science and Engineering brings sophomore, junior, or senior high school students to Johns Hopkins University two afternoons a week for a semester to engage them in research and have them present their findings with the goal of encouraging them to pursue a STEM degree in college. Lastly, Girls Who Code is an organization that creates networks among college women in technology via weekly meetings to help them succeed in their studies. For our Women in STEM Fellowship, we adapted elements from all these programs—events, mentoring, research opportunities, and ambassador outreach—and combined them into one year-round, on-campus initiative.

Dekhane and Napier (2017) at Georgia Gwinnett College offer deeper insights into their "short-term summer Programming Boot Camp (PBC) for female IT majors and minors . . . focused on improving technical skills, providing professional development, and building stronger networks" (p. 246). Their "data suggest that in the short-term PBC increases confidence, improves programming skills, and encourages student engagement" (p. 246). Furthermore, "the PBC participants have progressed further in their program as compared to non -participants" (p. 249); the former group's inactivity rate at the college was over 35% lower than non-participants, and all stayed in a STEM major (even if not Computing Sciences) (p. 250).

Hoping for similarly encouraging outcomes, we adopted key elements of the above-mentioned models and adjusted them to our campus' needs. We decided on a long-term program, built into the academic year to make our outreach offerings more accessible as they were offered at different times and on different days during the semester. While ADVANCE-funded initiatives clearly generate needed focus on faculty and internal university systems, we gauged that we could generate the most immediately needed results by, at least initially, channeling our attention directly onto our students. Simultaneously, we took time to connect and raise awareness with advocates and allies of all identities across campus. We implemented a faculty information session to sensitize our colleagues to systemic challenges for women-identified students in STEM and recruited supportive faculty of all genders to collaborate with our research fellows. We further ensured that—in addition to their private workshops specifically designed to empower our fellows—all our invited speakers gave talks that critically questioned oppressive STEM systems and were open to all members of our campus community.

Student Recruitment

We asked our Office of Institutional Research to identify all female-identified STEM majors for us[1]. With the data provided, we created an email list that became our main means of communication. In our first year, we only reached out to female students in Math, Physics, Computing Sciences, Chemistry, and Engineering. We purposefully left out students in Marine Science and Biology as it was our intent to target students in majority male-dominated fields, which, at our institution, does not apply to the two latter fields (in BIOL, female students make up more than 73%, while in MSCI they constitute over 67%). We wanted our limited resources to go to the students who might be most in need. Hence, our first email list consisted of 135 names. Admittedly, the attendance at our events that first year was low. In addition, over the course of our first year, we learned via conversations with colleagues and students that, within seemingly female-dominated majors, subfields—such as Physical Oceanography in Marine Science—exist in which women struggle. We, thus, decided to invite all women students in the sciences on our campus to our programs. This decision grew our email list to over 1200 recipients.

Students did not have to apply to become fellows as we feared that an official application process would intimidate and alienate many whom a patriarchal society has told their whole lives that they do not need to bother trying to enter prestigious science-focused spaces, either due to their gender, race, socioeconomic class, or another identity marker. Every invited person who attended two events sponsored by the fellowship per semester qualified for funding through the initiative. No formal training was required before becoming a member of the group or turning eligible for financial support. The faculty advisors invited students no matter their GPA or other identifiers, such as whether they were Pell grant eligible or not. We acknowledge that our outreach was limited in its inclusiveness when it comes to gender identity since our email list was created using sex markers on government documents. To offset this problem, we used language on promotional materials that invited all women-identified students. Unfortunately, we do not know if this approach was sufficient as, for example, no trans student approached us about attending an event or being added to the email list.

What the Women in STEM Fellowship Looks Like

For several years, our university has had a Women in STEM—formerly known as Women in Computing—student club. While the club provides important space for female STEM students, like any student organization, it has struggled to find enough people to stay active and has not placed much emphasis on professionalization skills. Instead of taking away from the club, we hoped to offer female STEM students an additional venue to come together to support each other. And so, four of us (one original group member eventually moved to another university and was replaced by someone else) submitted a proposal toward a new grant initiative at our institution that asked for projects targeting retention issues. Our budget included a yearly stipend for four faculty advisors to function as the main contact persons for the fellows, the organizers of most events, and primary mentors for the fellows.

During our conversations about what to name our proposed group, we critically gaged the term "fellowship's" association with religious messaging as well as its linguistic male-centeredness. As a result, we also considered terms like "advocacy group," "allyship," and "support network." When soliciting feedback from students, we found that they perceived "fellowship" as the most neutral term and connected the other terms with "political activism," which the majority of them found intimidating and even off-putting. Instead, students saw in "fellowship" a connection to community, which they were craving. While these preferences clearly demonstrate that students erroneously perceive STEM as free from politics, ideologies, and biases, we decided to follow their suggestions to not risk estranging our target audience.

Among the four involved faculty, one person took on a leading role and volunteered to be responsible for scheduling meetings between faculty advisors, managing the budget, booking event spaces, and completing assessment and reports. All faculty advisors were contact persons for all fellows and collaborated on organizing professionalization activities and disseminating information. Two advisors worked closely with our ambassadors, connecting them with schools and accompanying them to some of their events. The third advisor served as contact person for the research fellows and research mentors at the initial stages of the application process. This advisor provided guidelines for research proposals, final reports, presentations, and worked with the faculty director to organize the research symposiums.

Our programming strategy consisted of official professionalization events, networking opportunities, and skills training on the one hand, and informal events that were marketed as "low-key" and did not have an obvious career-preparation angle on the other. Knowing that women students in STEM tend to embrace passive coping mechanism, "such as avoidance or disengagement" (Myers et al., 2019, p. 657), and lack knowledge about active strategies to confront sexism and other inequalities, we incorporated critical thinking about systems of oppression into all our gatherings. In monthly meetings, we brought together our fellows via consciousness-raising and community-building sessions. These meetings ranged from informational welcome-back gatherings at the beginning of the semester and a fellowship logo design competition to hands-on workshops. One gathering, for example, focused on public and feminist approaches to science. While building simple science kits out of everyday materials, attendees learned about systemic issues with sexism, racism, classism, and ableism in science and how non-traditional approaches to science combat these instances of oppression. During an escape room simulation, students learned about puzzles, math, and ciphers. The fun training sessions made fellows practice interdisciplinary thinking, which is seen as a major career-builder (Branson, 2018, p. 168). We also intended for these types of activities to get students excited about their chosen and related STEM fields, to remind them of their passion for science, and to provide them with community and accomplishments that proved to them that they belong in their majors.

The foundation of all our programming efforts was the impression that our students are clearly aware that their inclusion in their fields depends on others who surround them. As one of our fellows explains, "I feel like I belong in my field when the other people in my field,

regardless of race or gender, treat me as if I belong." Based on such insights, our interdisciplinary, inter-collegiate project aimed at setting up support systems for female students in STEM to equip them with the tools to deal successfully with challenges, intimidation, and isolation and to make them feel like they truly belong in their areas of interest. We believe that receiving such support and encouragement makes women-identified students in the STEM fields at our institution less likely to drop their majors and, as a result, perhaps leave the university. We hoped that the community we created would make them feel more welcome and prepared in their studies, which promises to enhance their persistence and engagement rate, and might increase their self-esteem and achievement levels as well as, in the long term, their ambition to assume leadership roles (Branson, 2018, p. 58). Research suggests that, for women, such positive developments can be realized more effectively in women-only educational spaces which can increase self-confidence with regard to science and critical thinking and better prepare students with academic skills, such as study habits (Riggers-Piehl et al., 2018, p. 6).

Branson (2018) urges that women in male-dominated careers need a "diversified portfolio" of mentors (p. 71). While four of us at a time served as faculty advisors to our fellows and we introduced our Career Services counselors as a support system, we thought it was important fellows also received guidance from each other. Hence, we created a mentorship program as part of which more advanced fellows offered solidarity and advice to other women-identified STEM majors. Each semester, we worked with five mentors who were selected based on an application process that asked them to write short statements, describing what they hoped to gain from being a mentor and what they planned to contribute to the program. The first semester of the fellowship, mentors were recruited by nomination and invited by the fellowship advisors. After that, an announcement was sent to all women in STEM majors each semester with a call for mentor applications. Students who had previously participated as mentors could reapply by expounding on their accomplishments and contributions to the fellowship. We were able to pay each mentor a stipend of $100 per semester. The mentors were responsible for sharing information on our various social media sites, ranging from event reminders to informative articles about STEM careers; they helped organize and facilitate our events; and they designed and implemented community-building meetings without faculty, such as a STEM movie night, a finals destress event where attendees constructed gingerbread houses and stress balls, and a class registration information get-together. A definite advantage of a student-student mentor model was to foster engagement of the newest members through peer-to-peer interactions.

The informal socialization the mentors nurtured not only benefited the mentees but also the mentors as one "way to increase students' motivation is to provide them with meaningful experiences where they feel their efforts can impact those around them" (Dekhane & Napier, 2017, p. 246). Such experiences also train students in important leadership skills, which are vital in STEM jobs but often missing in the science curriculum (Branson, 2018, p. x). Because students juggle the competing duties of schoolwork, work to support themselves, and involvement in other co-curricular activities, it was tough for some mentor cohorts to coordinate schedules and ideas. Levels of being proactive also varied widely among mentors, which made some groups more effective than others.

To complement our two-tier mentorship approach and in hopes of creating actual sponsorship, resulting in "vigorous coaching and strategizing" down the road (Rivers & Barnett, 2013, p. 27), we brought women leaders in STEM to campus to give workshops on their experiences. Our visitors ranged from academics in Physics and Computing Sciences to women executives in a variety of nation-wide companies. Via lunches, lectures, and in-person or virtual workshops, our fellows became more comfortable with networking and with asking for business cards, and they learned skills—how to promote themselves on the job market, how to negotiate a challenging work culture still influenced by unconscious bias, how to promote one's achievements, and how to take healthy professional risks—that prepared them for life after graduation. We hope that these encounters also lowered the chances of our fellows falling into the traps of stereotype threat. Seeing successful women in their professions, we stipulated, would embolden students to ignore internalized negative bias and heighten their self-esteem. As with any other professionalization and academic events on campus, we regularly had a tough time getting students to attend our programming in the numbers we had envisioned, despite using flyers, social media, and email to spread the word. Even offering food did only mildly do the trick. We learned that word-of-mouth publicity and peer outreach were by far the most effective methods to get students to show up.

Despite the realization that an earnest focus on professionalization seemed off-putting to many students—perhaps because they felt overwhelmed by thoughts about life after college or they naively believed that a degree alone will secure them a job—we did heavily emphasize job preparation, which positively stood out to some students. One of our fellows wrote that the Fellowship has "definitely helped [her] connect with other women in STEM fields and gave [her] more insight on [sic] what jobs are out there." Perhaps our most elaborate career-training event was a road-trip with nine students and two faculty advisors to meet with the Women in STEM club at a nearby university and to tour a Boeing plant in the same town. The visits created comradery with female STEM students at a different institution that helped our fellows realize the systemic nature of some of their own experiences; and students got excited about seeing their skills applied to real jobs in industry, an experience that shows signs of positively affecting students' persistence rates (Branson, 2018, p. 71). We saw the Boeing trip as a chance for students to learn about and network with one of the biggest employers of STEM graduates in our geographic vicinity. Predictably, some of the students approached the trip more as a chance to not have to go to class than to think about their careers and, thus, did not express as much interest during our visit as we had hoped. The majority of students, however, engaged with the opportunities in meaningful ways, exchanging contact information with their peers and asking questions of our host at Boeing.

To add further professionalization opportunities, our budget specifically allocated funds to support undergraduate research, conference travel, and memberships with pertinent professional organizations, such as the Association for Women in Math and Women in Computing. Since only about 50% of recent STEM graduates make use of their training in their first jobs (Branson, 2018, p. 145), professionalization training was important to us. Over two years, we sent two students (one in Math and one in Marine Science) to regional conferences in their fields. And we had planned for five students to travel to the WeCode conference at Harvard in March 2020, which was canceled due to COVID-19.

In support of scholarship of undergraduate female students in STEM areas where they are underrepresented, we funded four research fellows (one of them for two consecutive semesters). They each received $10 per hour for up to 100 hours over the course of the semester as well as up to $300 in supplies. To get funded, students needed to work with a faculty mentor and could not receive course credit. Students had to submit an application that mimicked a professional grant proposal, including a description of the proposed study, research objectives, a statement on the significance of the proposed study, and a budget. We were able to fund all applicants. At the end of each semester, fellows presented a conference-style and -length talk about their findings at an internal research symposium to which we invited the whole campus community. We were consistently so impressed with the quality of these presentations that we consider this element of the Fellowship the most successful.

Lastly, we selected five students each year to be ambassadors who reached out to students in elementary and middle schools to change perception of what a scientist looks like. This was, by far, our most popular program as evidenced by the many more applications we received than we had open positions. We asked applicants to describe an experience that led to their interest in a STEM major and how becoming an ambassador would contribute to their own career development. Lastly, applicants shared two ideas for programming in support of the fellowship's outreach goals. Each ambassador received a stipend of $50 dollars per semester. For this initiative, we built on existing connections between the university and/or individual faculty with local schools. While the excitement was initially big among the group, students only

found time to visit a science fair at a local school and facilitate a science-based playdate at our campus daycare. In the future, more concrete timelines and reporting structures might help ambassadors to move actively toward implementation of their ideas.

An Assessment Attempt

At maximum, our emails about the Fellowship went out to 1238 eligible students. Our meetings and events sign-in sheets show that, between the spring 2018 and spring 2020 semesters, 137 individual students engaged with us in person. 40 of these students came to two or more events. That means we reached about 11.1% of our possible constituents at least once and 3.2% on multiple occasions. Our low rates speak to the difficulty of engaging college students in co-curricular programming and mirror other initiatives' numbers. For example, while Dekhane and Napier's (2017) short-term summer program started with 48% of eligible students, two years later, that rate had gone down to 17% (p. 248). In our experience, it is arduous to get students to be interested in professionalization programs. Some of this lack of excitement is, of course, rooted in many students' need to work (often full-time) to support themselves. But we also, sadly, were confirmed in our previous impression that prevalent post-feminist rhetoric that claims that sexism is no longer an issue renders many female students blissfully unaware of and uninterested in the gendered issues they will encounter in the workforce. Importantly, this internal roadblock should not deter educators from implementing the kinds of programs we outlined here as they are still very much needed even if they benefit a smaller group than would be ideal.

While attendance was spotty at many of our events that tackled systemic issues with diversity, equity, and inclusion in STEM professions, engagement levels were consistently high, and the students' joy and excitement about learning together were palpable. Unfortunately, we had not thought of any more thorough assessment tools to measure engagement than debriefing sessions between faculty advisors and student mentors after each official gathering. In these meetings, we recalled how many attendees engaged in activities, raised questions, or shared their own experiences to decide on future programming and where we saw a need to cover specific content or skills. In the future, we plan on asking our fellows to fill out short pre- and post-surveys that will offer us insights into the impact of specific events a well as into students' connectedness with the group over time.

Out of our cohort, 14 fellows did not graduate and are no longer enrolled at our university as of fall 2020. All 14 students attended only 1 event/meeting with us, implying that the frequency of attendance might positively affect retention rates. These numbers are certainly complicated by COVID-19, which negatively influenced students' financial, emotional, and other abilities to attend school in spring and fall 2020. 25 of our fellows graduated within 4 years and one more fellow after 5 years at our school as members of our group.

Analyzing the major change rate of our fellows, we found that 5.8% (n=8) of them changed into a non-STEM major while the fellowship was ongoing. Our 94.2% retention in a STEM field rate diverts significantly from the rate at which our university retains women in a STEM major, which was at 40.4% between 2016 and 2018. This significant gap might be explained by women already invested in STEM being more likely to join our fellowship, while we might not have reached those women who had a tenuous hold on their STEM identity. 75% of the "changers" had only attended 1 fellowship event, suggesting a positive connection between attendance of events and staying in STEM fields. The numbers of female STEM students changing their major between fall 2018 and 2019—the year that the fellowship was most active—unfortunately, display a discouraging trend: In 6 out of 9 STEM majors, the percentage of female majors leaving increased on average by 9.2%. While we realistically understand that our fellowship had limited reach, this increase is indeed disappointing and highlights the need for additional intervention tools.

As our university does not systematically keep track of alumni's job placement, we reached out to each of our 26 graduated fellows, inquiring about their employment status. We were able to learn that 6 graduates are currently enrolled in a graduate program—4 of them at our own institution. Of these 6, 1 is pursuing a degree in Education, 1 is undecided, and 4 are in a STEM field. One former student now works as a research fellow at the National Institute for Health, another as a histotechnologist for a group of dermatologic surgeons, and a third alumna is now an AmeriCorps member at the New England Science and Sailing Foundation. All respondents commented positively on the fellowship. Lena, now in a Ph.D. program in Marine Science, for example, declared that getting research support through the fellowship and the opportunity to present her study "was a highlight of [her] undergraduate career and it is certainly one of the reasons [she is] in [her] current position." In addition, we recently heard from Sam, a currently enrolled Computing Sciences major, who, after an internship in summer 2020, was offered a job with a multinational company to start immediately after graduation. The student shared the news with us and "thank[ed us] for the great experiences that came with that fellowship."

COVID-19 and Future Alternatives?

Due to budget cuts that have been worsened by the impacts of COVID-19, the grant funding for the Women in STEM Fellowship ended in spring 2020, two years after its inception. While we hope to secure funds from individual colleges to implement at least some programming, our means for engagement will be severely limited. This is not just due to lack of financial support but also the limited options for interactions with students due to physical distancing measures currently in place. But we are determined to keep up the Fellowship in some shape or form. Possibilities consist of online workshops and guest speakers, including a virtual alumnae roundtable, which will save travel money but still expose students to networking options; if we are able to find students who are willing to become mentors even without financial compensation, we will continue the mentorship program online, for example via movie nights or book clubs, on social media, or in small physically-distanced group meetings for craft sessions; to offset the service load without compensation for the faculty advisors, it will be necessary to spread supportive tasks among a wider net of faculty and staff; collaborating with Career Services on professionalization events might also ensure some funding and student attendance; lastly, our institution now offers a Bachelor of Science degree in "Women in STEM," which combines studies in the sciences and Women's and Gender Studies. Ideally, the Fellowship could become a funded initiative connected to this new degree.

We firmly agree with Rivers and Barnett (2013) that "[s]ystemic changes are needed to give women a fair change" (p. 236). Gender inequality in STEM will not be eradicated by establishing programs like ours alone. Yet, as our assessment has shown, a professionalization community for women-identified students in STEM can have positive impacts on retention within STEM majors as well as at the institution. Beyond those categories, our fellows' feedback has attested to the initiative's effectiveness with regard to building confidence and has served as a motivator to keep pushing for the fellowship's existence, even in a modified version. Because, as one of our fellows affirmed, the "[f]ellowship has helped me connect with fellow women in various STEM disciplines as well as different research opportunities on campus. Without the Women in STEM Fellowship, I would not have this network of amazing women on campus."

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[1]The authors received IRB approval for reaching out to these students and changed respondents' names to protect their anonymity.

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