

## **Increasing Academic Success for Underrepresented Minority PhD Graduate STEM Students Through Self-Advocacy Education**

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# Increasing Academic Success for Historically Minoritized Graduate Students in STEM Through Self-Advocacy Education

## 1 Introduction

Many minoritized graduate students in Science, Technology, Engineering and Math (STEM) experience climates of intimidation within institutions of higher education in the form of daily microaggressions and expectations of assimilation (defined as cultural conformation vs. social integration). In this project, we include Black/African American, Indigenous, and Latinx graduate students, as well as underrepresented women in STEM PhD programs as part of the historically minoritized graduate students that participated in the GRaduate Education for Academically Talented Students (GREATS) professional development program.

Although the effects of chronic external stressors on increased mental health disorders and decreased physiological health is well known [1-3], evidence-based practices of support systems specifically for minoritized graduate students to reduce the effects of climates of intimidation are not common. Indeed, researchers have found that minoritized students “would benefit if colleges and universities attempted to deconstruct climates of intimidation [4].”

In a comprehensive study of Latinx graduate students in STEM at a Hispanic Serving institution found that “Faculty mentors played a greater role in their success compared to their non-Latino peers. In addition, Latinos/as were also more likely to use support services on campus than their non-Latino/a peers” [5]. The same researchers also found that it was of critical importance for institutions to provide support to bridge “the social capital gap that is found among students of color and their White peers” [5]. As such, the authors have implemented a professional development program on preparing minoritized graduate students in STEM on self-advocacy based on the three tenets of self-advocacy: empowerment (or instilling a sense of agency), self-awareness, and social justice. This program will support the students’ professional development and academic success since it supports their identity within STEM and is strongly linked to academic success [6]. Likewise, building self-efficacy of URM graduate students as scientist increases motivation to pursue science career. Ways to increase this self-efficacy in URM graduate students is to increase their opportunities to interact with other scientists, such as by providing for technical conference travel and opportunities for mentorship among peers and other faculty [6].

In 2003 and updated in 2018, the American Counseling Association (ACA) published the Advocacy Competencies between the three areas of client/student, school/community, and public arena advocacy as part of their guidelines for effective counseling of minoritized high school students [7, 8]. The Advocacy Competencies were based on a social justice framework to overcome systems of oppression that students experienced within educational environments [9]. Within the different forms of practicing and teaching advocacy, working with students by teaching them the skills of Self-Advocacy within the client/student structure was found to help minoritized students reach academic success.

This practice has been used extensively within the learning disability (LD) communities to help students advocate for themselves in the creation and implementation of their Individual Educational Plans (IEPs). A comprehensive review of evidence-based practices for teaching self-advocacy within the LD communities found that there are three critical factors that, when combined result in increased academic success: **empowerment or a sense of agency** (having control over decisions and life events), strong **self-awareness** (knowing what is right for oneself and setting goals based on this criteria), and **social justice** (knowing how to identify and challenge negative social climates and systems of oppression) [10]. The same comprehensive review of evidence-based practice on teaching students with LD on self-advocacy found that LD student’s retention increased during critical transitions to post-secondary education or that they had increased participation in STEM disciplines, while also increasing academic success. Within

the education community, minoritized students that are trained in self-advocacy will have “strong self-worth and self-efficacy” and feel “empowered to challenge discriminatory social, economic, and political policies [11].” As a result, students will be retained through critical transitions and have increased academic success. As can be seen, teaching self-advocacy is a means to empower students that results in improved academic success and health and well-being [12]. Finally, within higher education, the LD community has implemented into practice teaching strategies and programs that develop self-advocacy skills which result in increased academic success in college and increase participation in STEM disciplines [13-16]. Based on these evidence-based practices, the central research question for this project is: *Does teaching the three factors strategy for self-advocacy result in increased sense of belonging, agency, and promote health and well-being in minoritized graduate students in STEM?*

## 2 GREATS

We present the program development during its first year of inception to teach self-advocacy as the core of a professional development program for minoritized PhD graduate students in STEM. Self-advocacy is rooted in the theory of self-determination [12, 15]. Self-determination theory posits that it is a person’s “inherent growth tendencies and innate psychological needs that are the basis for their self-motivation and personality integration, as well as for the conditions that foster those positive processes [12]”. Research in self-determination has identified how “antagonistic” social environments undermine a person’s self-motivation, social functioning, and health/well-being.

The corresponding program objectives were to:

- 1) **Build Empowerment:** Develop leadership skills of minoritized STEM graduate students to increase their feelings of empowerment, learn to effectively self-advocate so that they experience social integration and sense of belonging in their peer-groups instead of experiencing chronic stress from having to conform to the dominant social groups.
- 2) **Increase Knowledge of Self:** Build a sense of self awareness that is focused on personal goal setting, mentoring and knowledge of self-care in order to increase awareness of mental and physical well-being.
- 3) **Learn About Social Justice:** Teach social justice within the STEM disciplines to enhance their knowledge of historical oppression in engineering and science professions and educate them on policies of access and equity in higher education. In many ways, this touches on the internalization of oppression, where a historically minoritized student may feel that it is because of who they are that they do not fit in or cannot succeed.

Because of the pandemic, we pivoted all events and outreach to virtual platforms. The program director, Dr. Carmen Lilley, outreached with all the Directors of Graduate Studies in the STEM departments at the University of Illinois at Chicago and included the College of Engineering departments, and Chemistry, Math, Physics, Biology and Earth and Environmental Sciences in the College of Liberal Arts and Sciences. During the summer of 2020, the program director and co-director Dr. Greg Larnell met biweekly during the year, starting in the summer of 2020 for the initial planning of events and outreach to STEM departments. Planning for events and outreach were virtual based on the continuously changing status of campus closures due to the pandemic. Therefore, there was great uncertainty on whether we would have any on campus access or whether all students would be fully remote and the duration of remote instruction.

During the fall 2020 academic year, the director did active recruiting through contacting the director’s of graduate studies and emailing additional faculty and students identified from the graduate college as having graduate fellowships in STEM programs. There was an applicant pool of thirteen students. The program director did in-take meetings one-on-one to introduce the students to the program scope and objectives at the end of fall 2020. Eleven of the applicants

then decided to accept the offer to enroll in the program and started activities in the Spring 2021 semester. In addition, a new student joined the program mid-Spring 2021 based on the advocacy of one of the scholars to help a racially minoritized woman who was in a negative research laboratory environment. The director and collaborators mentored her by providing guidance on policies for relocating laboratories within her program.

At the start of Spring 2021, faculty mentors in different departments, but still in STEM disciplines, were assigned to eleven of the 12 students that requested external faculty mentors. In addition, monthly seminars were planned for teaching the principles of self-advocacy. A total of four seminars were conducted in the spring 2021 semester. Through professional and peer presentations, group readings and discussions, workshops and expert panels, we provided educational programming on the three tenets of Self-Advocacy. These were "Leadership in STEM" by invited speakers Drs. Denise Simmons and Kyle Gipson, in addition to a book club discussion on self-awareness and social justice on the book "Black, Brown, Bruised: How Racialized STEM Education Stifles Innovation" by Dr. Ebony Omotola McGee. Self-awareness included the workshop by the wellness center on "Solutions to the Top Ten Self-care Challenges" by the director of the wellness center, Ms. , with an emphasis on self-care for health and well-being. There was a final spring panel discussion on "Social Justice in STEM" with Drs. Greg Larnell, [Name], [Name], and [Name]. During the summer, a networking event was hosted based on the feedback from program participants. Finally, also during the summer an affinity group meeting among the women was also hosted by the director Dr. Lilley. Informal feedback was collected from the students using one-on-one mentoring conversations, from Slack Channel conversations and from seminar discussions. For example, the Slack Channel was created for the group with the program team also enrolled based on the request of one program participant and readily adopted as the platform for communication among the participants.

To date, students are engaged and part of the program planning has pivoted to focus on their interests and requests. Outreach for the new academic year cohort has been strong. The outreach to DGS included Dr. Lilley, but more impressively it was the outreach by current GREATS scholars that is proving most effective to recruit new members entering in Fall 2021 for the upcoming year's program. The GREATS 2020-2021 cohort have been invited to continue in the program to participate in the events with the new cohort and we hope to further strengthen our sense of community and belonging.

### 3 Discussion

We aim to present the initial findings by the program directors on the implementation during year one and discuss some of the effects that the pandemic had on programming and student participation. We redefined our active participation as meeting with their mentor(s) at least twice a semester and attending at least two program events in the Spring and an additional event in the summer. Sustaining program participation by URM graduate students in STEM can be challenging due to the demands on the student's time for coursework and research. The Covid-19 pandemic also raised the barriers to recruit students and sustain engagement. Many of our GREATS graduate students are first generation in STEM or come from lower socioeconomic status with limited financial resources. Therefore, we originally built in several incentives to recruit students and help promote their participation through the duration of this grant. The first incentive is the opportunity to participate in the program elements. An additional incentive is to provide various forms of resources. These including offering to provide laptops for their use in classes, research and even Teaching Assistant work. The majority of PhD graduate students in STEM at UIC begin their academic education by serving as Teaching Assistants. Thus, we believed that laptop resources be attractive for students with higher financial need, and would help support them academically. Students would be able to retain their laptops until they were done with their programs and remained actively participating on the GREATS program. Although there were not

many students that requested a laptop (2 out of 12), they were students that had high financial needs for this resource and thus would not have been able to afford a new laptop to support their classes and research as new students.

Another incentive is that students in the program will be provided travel funds to attend a conference in their field after they have completed two semesters of active participation in the program. The pandemic has dealt a significant delay for students to access these funds due to travel restrictions and the uncertainties that remain have resulted in no funded travel during the first year of the program. The program director Dr. Lilley has been continuously reaching out to students to remind them of the travel support with the aim of funding students for the spring of 2022 with the expectations that travel restrictions will finally be reduced as more individuals in the US and international get vaccinated. We also believed that offering consultant resources to provide scientific editorial service to help them write their first conference or journal manuscripts and plan their initial preliminary exam thesis writing would be an attractive resource based on anecdotal evidence on need for writing resources. Surprisingly, these writing resources have not been leveraged by the students to date although the resource has been continued to be offered. Because the pandemic also resulted in less funding needed, e.g. travel resources, by the students, the program directors have pivoted to think of expanding the type of resources we could make available to the students and is part of the current program discussion and feedback request to the students.

#### 4 Conclusions

The external evaluation and research on findings of this program is in the early stages. As a result, there is limited data that can be presented on the student outcomes. However, the current program has two cohorts that share workshops, seminars, mentoring opportunities. In addition, we are building the community support structures for all of the GREATS scholars through active outreach via Slack and through the book club, where we can engage in longer and more directed discussions. We also plan on introducing peer mentor by having students in the first cohort mentor new students. One of the challenges that we have encountered to building the size of the program however is the decrease in enrollment by minoritized students which we believe is in part due to effects from the pandemic. Thus, we believe that retention of racially/ethnically minoritized students has become the priority for our program to ensure that our students not only remain but achieve success during their academic experience at our institution. The program director is also working more closely to prepare seminars on the different forms of leadership and career pathways for PhD students based on the feedback from the first cohort. For instance, some of the planned seminars for 2021-22 include having a community college professor who is a Latina woman and former undergraduate and graduate student talk about why she values inclusive STEM education and access for minoritized students. Another speaker is a leader within her industry and engineering society and will discuss the value of service to a student's professional society and how it helps shape opportunities for professional development and advancement in career pathways. We will also address social justice learning by implementing seminars on policies that impact student's academic experiences (e.g. is there family leave as a student or what happens if I am in a toxic lab?).

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