The Pitt STRIVE Program: Adopting Evidence-Based Principles "The Meyerhoff and PROMISE Way"

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Abstract

According to the Science and Engineering Indicators 2018 report, racial and ethnic minority groups, including Blacks, Hispanics, and American Indians or Alaska Natives, have low levels of participation in STEM (science, technology, engineering, and math) fields both compared with other groups and compared with their proportion in the population. Much of the research on underrepresented minorities in STEM draws from a deficit model, whereby researchers attribute the lack of diversity in STEM education or a STEM career, to a STEM education pipeline problem whereby leaks start in preschool and continue through the highest levels of education. Less research has focused on the extent of institutional change necessary to support academic success, the building of partnerships, or the possibility of replicating effective practices that have worked at other institutions. While a limited number of institutions have developed successful models, expanding the reach of these achievements continues to be a critical challenge for today's colleges and universities. This study focuses on one such partnership and model of replication.

Two programs that demonstrated success in increasing the number of underrepresented students pursuing and completing STEM doctoral programs are housed at the University of Maryland, Baltimore County (UMBC). The Meyerhoff program has demonstrated over 30 years of unmatched successful recruiting, retaining, and transitioning underrepresented undergraduate STEM scholars to graduate programs all over the country. The PROMISE Program, an NSF AGEP funded program which began in 2003, provides graduate programming with special emphasis on historically underrepresented persons to increase the number of Ph.D. graduates who pursue faculty positions.

Many argue that the success of these programs cannot be replicated at other universities and that a unique set of circumstances are what makes these programs successful in their missions. To test this notion, in 2015 the University of Pittsburgh was awarded an NSF AGEP-KAT award to adapt and adopt strategies and practices of the aforementioned programs. While there are differences between UMBC and the University of Pittsburgh, we feel that the *adoption of the principles* of the programs provides a framework to replicate these successful results. The goal of this paper is to identify the evidence-based principles that contribute to the continued success of the Meyerhoff and PROMISE programs housed at UMBC and illustrate the alignment of these principles within our institution to create and adapt a baseline by which the success of the University of Pittsburgh's AGEP program (the Pitt STRIVE Program) can be assessed.

Introduction

Despite efforts to increase diversity in the STEM workforce over the past decades, the overall impact has been low. Across the nation, with the help of federal, state, and private funding, several graduate schools have implemented an array of programs and interventions designed to strengthen graduate education and expand the pipeline of underrepresented minority (URM)—Blacks, Hispanics, and American Indians or Alaska Natives--students in science, technology, engineering, and mathematics (STEM). These policies, practices, and interventions were developed to minimize institutional barriers that influence matriculation into and through higher education spaces. Funded at the national and institution level these reform efforts aim to increase

retention of and degree completion by URM students in STEM doctoral programs, including the National Science Foundation's (NSF) Alliance for Graduate Education and the Professoriate (AGEP), Louis Stokes Alliance for Minority Participation (LSAMP), Bridge to the Doctorate programs, the Meyerhoff Scholars Program, McKnight Doctoral Fellowships, and the CGS PhD Completion Project [1]. These programs have been highly successful in building a diverse STEM workforce. Programs and curricula have been developed on a case-by-case basis based on each institution's priorities. With broader implementation of programs that explicitly benefit URM students, diversity and inclusion should not be simply a mechanism to increase the number of URM students, but a catalyst for institutional change. However, the flexibility and uniqueness of programs can present challenges. Without outside funding, implementation of these programs can be prohibitively expensive. In an era of constrained resources, it is far more cost-effective to systematically replicate effective solution(s); when programs rise to the fore with strong, proven results, it makes sense to ask whether that success can be institutionalized, reproduced, scaled up, or customized to new settings. In an effort to facilitate the transfer of knowledge about successful implementation of strategies and approaches, as well as about evidence-based practices, from one state institution to another, this article describes the process of developing and adopting these two programs to support URMs at one state-funded institution.

According to the Council of Graduate School's *2015 Doctoral Initiative on Minority Attrition and Completion Report*, "the problem of underrepresentation of race/ethnic minorities in STEM doctoral program is magnified by the fact that, in comparison with those of all STEM doctoral students, their completion rates tend to be lower and attrition rates tend to be higher" [1]. The problem extends to a lack of representation in the STEM workforce whereby the finding from the 2018 *Science and Engineering Indicators Report*, document racial and ethnic minorities maintain low levels of participation in Science and Engineering fields when compared with members of majority groups [1]. The National Science board notes that "the number of URM with their highest degree in S&E collectively increased nearly four-fold since 1993. Nevertheless, they are underrepresented in S&E occupations (13%) and degrees (16%) relative to their proportion (28%) of the U.S. residential population age 21 or older" [2].

Evidence suggests that students from all backgrounds benefit from interacting with and learning from diverse faculty members [3], [4]. Therefore, it is imperative that steps are taken to support members of historically excluded groups such that STEM graduate attrition rates are minimized; creating a larger pool of diverse candidates who could fill faculty positions. While several programs exist with the intent of recruiting, retaining, and transitioning underrepresented minority (URM) STEM students to the professoriate, one of the most successful of these to date is the MYS Program at the University of Maryland, Baltimore County (UMBC).

The Meyerhoff program has demonstrated over 30 years of unmatched success in recruiting, retaining, and transitioning underrepresented undergraduate STEM scholars to graduate programs all over the country. The program, which began through the vision of Dr. Freeman Hrabowski, the president of UMBC, and financial backing and support from Robert and Jane Meyerhoff, is an undergraduate program housed at UMBC that was created to increase the number of undergraduate URM students to enter STEM fields, with a primary emphasis on further pursuit of graduate degrees [5]. Using a strengths-based model as the foundation for the program, and evidence-based theories to develop a culture and family-oriented environment for

the success of underrepresented students, as of August 2019, the program hails a family of 1300 scholars, with 1200 alumni, several of which have made notable contributions in their fields and around the world [6]. Table 1 details the unprecedented outcomes as a result of participation in this program. In fact, evidence suggests that students were 5.3 times more likely to pursue and complete STEM PhD programs than their counterparts who were eligible to be a part of the program but chose to attend other schools.

Table 1 Meyerhoff Scholar Alumni, graduate degree breakdown (as of August 2019)

Category	**Number of Alumni**
PhD	319
MDs/DO (Medical Doctor/Doctor of Osteopathic Medicine)	147
Masters	280
Currently enrolled in graduate programs	Over 300

The Meyerhoff Graduate Fellows Program, albeit younger than its undergraduate counterpart, boasts graduate retention at 80%, and produced 98 PhDs and has 98 students currently enrolled [7]. Although the primary funding source stems from an MBRS-IMSD (Minority Biomedical Research Support-Initiative for Maximizing Student Diversity) differs from that of the undergraduate MYS program, both programs are housed at UMBC.

In 2003, UMBC was awarded NSF's Alliances for Graduate Education and the Professoriate (AGEP) (hereafter referred to as PROMISE) grant, which was developed to support U.S. URM students in completion of their STEM doctorates and pursuing academic careers [8]. This well-known program (formally known as PROMISE) formed an alliance with University of Baltimore (UMB) and University of Maryland, College Park (UMCP) based on best practices that have been actualized by the Meyerhoff Undergraduate and Graduate programs. Thus, as a whole, UMBC has been recognized as a top institution for cultivating and producing URM STEM graduates [9].

Based on the notion that we should learn from institutions that have been successful, several institutions have tried to replicate components of programs housed at UMBC [10], [11]. However, none have garnered the record success of UMBC. Some critics have argued that although the Meyerhoff program is successful at UMBC, its success is because of specific factors that cannot be replicated elsewhere. They maintain that UMBC is a unique campus with a president who is African American and a program champion in a way that cannot be matched. Others claim the high program expense make its replication, adoption, and adaption unrealizable. While these factors unmistakably aid program success, the native culture and climate in which these programs are developed cannot be ignored, and in fact, are key to program success. As with UMBC, success will depend on the buy-in and deep involvement of faculty and staff beyond institutional leadership. Furthermore, as with the original Meyerhoff program at UMBC, this adaptation effort includes a rigorous evaluation program that serves to inform program development and validate proof of concept.

In 2015, The University of Pittsburgh's Swanson School of Engineering (SSOE) was awarded the NSF AGEP-KAT award (#1434012) to adapt and adopt strategies and practices of the programs described above, in order to support AGEP's mission of increasing the number of

URMs who successfully complete doctoral work and pursue careers in higher education. While there are notable differences between UMBC and the University of Pittsburgh's SSOE, understanding and replicating key principles of UMBC's programs provide a framework to propagate successful results. In essence, over the past five years, the University of Pittsburgh's SSOE has *adopted* (i.e., has accepted and taken on) the key principles of UMBC's programs; and the University of Pittsburgh's SSOE has *adapted* (i.e., adjusted) many of the programs and strategies that are the hallmark of UMBC Meyerhoff and PROMISE programs. The goal of this descriptive paper is to highlight key replicable factors and/or principles that support sustained success of URM academic programs developed at UMBC. Employing content analysis methods, we illustrate the alignment of these principles within our institution to create a baseline by which the success of the University of Pittsburgh's SSOE program (hereafter referred to as Pitt STRIVE) can be assessed.

Supporting the Academic Success of URM in STEM: Evidence Based Theories

Fundamental to the measured success of all academic programs, regardless of academic level, demographic background, or discipline is the recruitment, retention and transition of students. In order for a developing program to support these facets, factors that support and hinder recruitment, retention, and transitions of students must be explored. While strong aptitude in STEM disciplines is an obvious requirement for success in STEM, an appreciation of theories in social science form the foundation for the evidence-based practices that tie all the components together. Given the measured success of UMBC's programs, it is important to identify key elements within its university and program structure that, based on evidence, contributed to its outstanding results.

Deficit vs. Strengths Based Models

Initially, the incorporation of URMs into STEM disciplines was explored through the lens of deficit-based models [12]. Deficit-based perspectives hinge on the belief that groups to which the model is being applied are lacking when compared to the majority population. Deficit models imply that standards are being lowered so that those with deficits can "meet the bar", meaning those with deficits are taking from others or negatively influencing program outcomes. In education, racial gaps attributed to factors such as low-test scores, and financial barriers were used to support these theories. This approach perpetuates negative stereotypes, and is alienating to students who are historically underrepresented; so much so, that many URMs who are academically qualified to pursue STEM and higher degrees within predominantly white institutions (PWIs) are not retained as a result of poor social integration, lack of support, and low expectations [13], [14]. Thus, one would expect that programs and universities that view the integration of diverse populations within the student population as creating a deficit will have challenges in recruiting, retaining, and transitioning students through their programs.

In 2019, Domingo et. al describe the Meyerhoff program as a strength-based programs that includes students interested in URM issues in STEM regardless of gender, ethnicity, or background [15]. This study compared MYS program outcomes to that of undergraduate scholar programs housed at The University of North Carolina at Chapel Hill and Pennsylvania State University at University Park. Comparisons of these programs enabled researchers to concisely

identify five keys to developing and maintaining successful strength-based programs, shown in Table 2.

Table 2 Summary of Key components for undergraduate program success based on Domingo et. al (2019) Program Comparison

Summary of Key components[15], [16]
1. Commitment to the entire MYS model
2. Administrative support
3. Full-time program staff
4. Interinstitutional training and support
5. Faculty participation

The adoption of strengths-based models has been a key factor in improving URM matriculation through undergraduate and graduate programs. Rather than a mission towards improving deficits, the program focuses on building upon the existing strengths of its student body through strategic environmental influences in and out of the classroom [17]. Furthermore, the strengths-based model focuses on what students of diverse backgrounds can bring to a campus setting, which ties directly into the theory of psychological sense of community.

Psychological sense of community (PSOC)

Based upon the works of Sarason (1974) and McMillian and Chavis (1986), psychological sense of community is fundamental for diversity in STEM. One could argue that historically, the relevance of a psychological sense of community was overlooked because the of the racial and gender homogeneity among the majority in the STEM workforce already had these needs met [18]. Key components of this theory include [19], [20]:

- Membership among a community that has clear boundaries. Communities in which members feel there are boundaries can support emotional safety, sense of belonging, and increase personal investment among members
- Influence within a community builds trust, which can enable members to hold a sense of pride within the community, and willingness to sacrifice and/or conform to rules out of a desire to belong within the community.
- Integration/fulfilment of needs is based upon the recognition of shared values that enables the exchange of ideas, resources, as well as friendship.
- Shared emotional connection is critical for the basis of a true community, due to the spiritual bonds cultivated among members within the community.

The actualization of psychological sense of community theories echo throughout research that has been conducted to improve our understanding of the challenges that URM students often face when pursuing STEM. In fact, this concept is particularly key in much of the research pertaining to the MYS program, as evidenced by data collected in focus groups, and scholar anecdotes, as many focus on how the program helped form their sense of identity and a community of support that includes peers with similar ambitions and aspirations [16]. Many refer to this community as

“The Meyerhoff Family”. The concept of membership within the MYS community is evident through sayings such as “Once a Meyerhoff, always a Meyerhoff”, and the development of cohesion and pride among members of the entering cohort that was selected for this highly prestigious program. In fact, the sense of community developed among scholars who participate in UMBC programs is so great, that “‘…when you see a Meyerhoff, you know it…[it] goes a long way.’” [16]. The sense of membership within the community is furthered through the shared experiences related to key components of the program, and initiation into a cohort for each academic year corresponding to the program’s existence. While sense of community does not directly address factors such as economic standing, test scores, and aptitude for the rigors associated with STEM degrees, there is significant evidence that demonstrates it’s significant role in the recruitment and retention of URM in STEM [21]–[23].

Methodology

This research was conducted as a thematic analysis because of the overall flexibility of the methodology [24]. Given the goal of determining how well the Pitt STRIVE Program adopts and adapts UMBC’s programs, the first of which is an undergraduate program, it was critical that themes linking these programs were identified and mapped in a manner that successfully demonstrates the similarities and differences between each program.

Given the critics’ belief that UMBC is an anomaly that cannot be replicated, we find evidence to the contrary in the recent project at Pennsylvania State University-University Park, and the University of North Carolina-Chapel Hill [15]. They find that MYS can be adopted at institutions that are much different from UMBC, with outcomes immediately matching or exceeding MYS. Therefore, we first explore UMBC and the University of Pittsburgh at a macro level to understand the larger ecosystem in which both programs operate. This search included basic demographics for each University, Carnegie ratings, and published retention data. Furthermore, we explore the hierarchical structure of both institutions to determine if there were key differences at UMBC that could prevent the University of Pittsburgh from replicating UMBC’s programs. Through this search, we also identified key elements through which each University advertises itself, as well as overall rankings to understand each program’s image.

Documentation of UMBC’s Meyerhoff Program, Meyerhoff Graduate Fellows, and PROMISE AGEP programs were explored for familiarization with the history and formulation of each program for comparison to our own, as well as the overall structure of each program, and how each program actualized its vision through program activities. Primary documentation of UMBC’s programs included research publications, news articles, websites, and immersion in the program experience, while secondary documentation included discussions and collaborations with leaders and participants within each program community.

While the previous research by Domingo et al, focused on exact duplication of the MYS program using the five components described earlier, we feel that the true heart of the programs lies within those who support and buy into the program’s goals and values (components 1, 2). We wondered if all of the components needed to be present in order replicate the success of the MYS program? To address this question more fully, we focused on exploring and mapping

overarching program components, rather than attempting complete mimicry of every actuated program housed at UMBC.

Results

University Level Comparisons

It is common to approach learning through reverse engineering. We take a device apart piece by piece in an effort to understand the purpose of each component, and how each component contributes to the success of the next. Similarly, our approach aimed to highlight key concepts found through our reverse engineering of UMBC's conception as a basis for comparison and development of our own program. Table 3 illustrates high-level institutional components to establish a contextual framework for the rest of our analysis. Although the University of Pittsburgh enrolls twice as many students as UMBC, both institutions are public 4-year universities recognized for their high research productivity by the Carnegie Classification of Institutions of Higher Education ®. UMBC also attracts approximately triple the percentage of URM students, and twice the percentage of diverse faculty. However, this aligns with demographic statistics found for each respective location.

Table 3 Institution Comparison: University Level

CATEGORY	**UMBC**	**THE UNIVERSITY OF PITTSBURGH**
Geographical Location	Catonsville, MD	Pittsburgh, PA
Established	1966	1787
Institution Type	Public, 4 year	Public, 4-year
Research Activity [25]	High Research Activity	Very High Research Activity
Total Student Populations (Fall 2017) [25]	13,662	28,642
(% URM) student population [Black, Hispanic/Latino]	25.5%	8.8%
%Faculty from diverse backgrounds	19%	8.3%

Arguably, the most interesting difference between the institutions are the dates they were established. UMBC was established not long after the Supreme Court ruling for Brown vs. Board of Education, which ruled that school segregation was illegal. It is worth noting, that UMBC was the first integrated school in Maryland that was open to all-regardless of race and/or ethnicity from the beginning. While we do not believe this difference would make UMBC's programs non-reproducible, it is an important aspect that will be addressed in following sections.

In Freeman Hrabowski's recent book, *The Empowered University*, he addresses several factors that, on an institutional level, create space and opportunity for the cultural changes that many students, faculty, staff, and university leadership crave. He notes that the success of UMBC's programs are founded upon a shared vision that reflect the common values of all involved parties [26]. For any institution, including UMBC, the development of this shared vision required

significant time, financial support, passion, safe space for difficult conversations, strategic planning and detailed documentation [27]. Deeper investigation into UMBC's academic history revealed that it was not always a highly regarded institution with prestigious accolades. In the beginning, it was a school that lacked direction, with low expectations for and from its attendees. Given these humble beginnings, one could argue that the results of UMBC's programs are more than just a result of coincidence, but a willingness to acknowledge the need for change, and the strategic actuation of that change.

The first step was *identifying challenges within the existing culture*. Thus, the campus culture needed to be defined prior to setting plans for change. This was done through several conversations, meetings, and focus groups with all parties in order to develop a foundation of understanding and acceptance. It should be noted that many of these conversations were uncomfortable, but necessary for identifying root challenges within the institution. In this example, it was shown that on the surface, the challenge was that students were not performing well in their engineering classes at UMBC. When URM students were asked, they thought they were not doing well due to racist professors. However, the majority students were also not performing well, and noted that the climate at UMBC was cold, and calculated. Many students felt that the professors created a competitive environment that did not support teamwork. This observation suggests that: 1) All viewpoints are necessary and valuable: 2) Perception is critical: 3) Albeit uncomfortable, it was several conversations and instances such as this that led to the Meyerhoff experiment. Another key component of UMBC culture is the desire to not fit into a box. While many universities value either STEM or liberal arts over one another, UMBC chose to value both. This is an important distinction, because many of the key components that were considered for establishing the Meyerhoff Program were based in liberal arts and humanities theories.

A final component that was critical for the development of programs was persuading others that that the program was necessary in the first place. Ultimately, the reason we considered replicating this program is because the success of MYS is evidence-based. This project allows for real time data collection, course correction, and proof of concept. For all institutional stakeholders in higher education, empirical evidence helps in terms of getting administrative leadership buy-in and financial support for any new program or for the sustainability of any program.

Program-Level Comparisons

To help sell the concept, Hrabowski made Meyerhoff a scientific experiment; he considered the this approach as "a good way to sell a need that may not be understood/accepted by all" [28]. He was convinced that a developing research institution would respect the concept of good scientific design. Simply put, he talked to the research faculty in a language they could support and understand.

Table 4 serves as a high-level overview of the MYS program, the Meyerhoff Graduate Fellows Program, and the PROMISE AGEP Program parallel to The University of Pittsburgh's program. The MYS program, the oldest of the programs compared here, served as a template for the programs that followed. Thus, critical program components were strategically implemented as

foundations for the Meyerhoff graduate fellows program, and the PROMISE program [29]. While the program missions are similar, funding sources, student populations, and hired staff vary greatly among the programs. Although the undergraduate MYS program serves as a template for many other programs housed at UMBC, it is important to clarify that the initial MYS program was specifically geared towards undergraduate students. This distinction is important to understand as a part of the adoption and replication process, as there are some elements of the overarching MYS program that, by function of the Graduate School structure, would not be possible. Of the 13 key components (shown in table 5), the two that were least applicable were tutoring, and summer research internships. Given the research-intensive nature of graduate programs, we felt that research is an inherent part of the process. Additionally, the nature of the tutoring component is better served through utilization of resources, program community, and study groups.

Table 4 Overview of Programs

Program	Start Date	Program Mission	Funding Source	Student Population
Meyerhoff Scholars Program	1989	*"To increase diversity among future leaders in science, engineering, and related fields"*	Private, Federal, Institutional	Undergraduate STEM, emphasis on URM
Meyerhoff Graduate Fellows	1996	*"To increase diversity among students pursuing PhD degrees in the biomedical and behavioral sciences"*	NIH-MBRS Initiative to Maximize Student Development (IMSD) grant	Graduate Biomedical Sciences, emphasis on URM
PROMISE AGEP Program	2003	*"To recruit, retain, graduate, and transition students to STEM careers, with special emphasis on the professoriate"*	NSF-AGEP	Graduate students
University of Pittsburgh SSOE Pitt STRIVE Program	2015	*"To adopt and adapt the UMBC models (i.e. Meyerhoff Scholars Program, Meyerhoff Graduate Program, AGEP PROMISE Program) within the University of Pittsburgh in order to increase the number of URM students recruited, retained, and transitioned through STEM. To evaluate and disseminate our findings within the University of Pittsburgh and external academic communities."*	NSF-AGEP KAT	Engineering graduate students, emphasis on URM

This adaptation is also evident when exploring the structures of the PROMISE and Meyerhoff Graduate Fellows Programs. The variation in funding sources is a major factor that impacts the ability for program coordinators to plan and execute activities that support key elements of programs for graduate students. For example, the undergraduate and graduate Meyerhoff Programs provide funding to students to support academic expenses during their time at UMBC. The PROMISE program, however, was created as a program with a similar mission (see Table 4) but was developed as an additional support to already existing structures. Therefore, of the programs evaluated, PROMISE is not a fellowship program for graduate students in that it does not provide funding to support individual students, and therefore does not require an application process. Furthermore, the PROMISE program is unique in that the grant was written as a collaborative effort but housed at UMBC-- making UMBC the lead institution. Because it provided professional development for URM students across other institutions in the University System of Maryland (USM) schools and connected URM students to a larger critical mass of like-minded individuals [8], it was supported and valued by several neighboring USM schools. Given the centralized nature of the Graduate School and integrated culture at UMBC, it is no surprise that each program would be structured to have common goals and desired outcomes but provide support in different ways that complement each other. UMBC's collaborative success, shows that, while securing funding can be a significant burden, collaborative strategic planning can enable a newly formed program to yield successful outcomes through co-hosted and collaborated events.

Table 5 13 Key components identified through evidence-based research that support success of URM students in STEM [16]

13 Key Components	***Principles Adopted by The University of Pittsburgh's SSOE Pitt STRIVE Program***
1. Recruitment	Yes
2. Financial Aid	Yes
3. Summer Bridge	Yes
4. Program Values*	Yes
5. Study Groups	Yes
6. Program Community	Yes
7. Personal Advising and Counseling	Yes
8. Tutoring	No
9. Summer Research Internships	No
10. Mentors	Yes
11. Faculty Involvement*	Yes
12. Administrative Involvement and Public Support*	Yes
13. Family Involvement	Yes

*Identifies overlap with key elements identified in table 2.

Table 5 summarizes the 13 key components of the MYS, and the combined implied program missions for all Minority Engineering Programs (MEPs), which are to recruit, retain, and transition students through programs [16]. Given key differences between UMBC and the University of Pittsburgh illustrated in Table 3, we recognize that the actuation of these values

may differ, but these differences further emphasize the need for difficult conversations within institutions to highlight challenges specific to the established culture and long-held traditions.

Table 6 depicts a high-level comparison of the University of Pittsburgh's SSOE Pitt STRIVE program adaption and actuation to that of UMBC's hallmark programs. We found that fundamental similarities between the programs exist in the long-term goal of diversifying the STEM workforce, with emphasis on higher education and faculty, by creating an environment that supports the recruitment, retention, and transition of URM through graduate programs. Furthermore, given the success and length of the Meyerhoff Scholar's experiment, we felt that replication of our program required the incorporation of the 13 key components of the Meyerhoff program, as were identified and supported through scientific evidence. For brevity, we will describe only a few select elements that were implemented in the Pitt STRIVE Program. However, in the spirit of the AGEP mission, we aim to continue to disseminate our experimental results for detailed components of the Pitt STRIVE program.

Early indicators of Program Outcomes

We noted that most Minority Engineering Programs (MEP) programs will have either a recruitment or selection process, depending on the specific goal of the funding source. Pitt STRIVE initiates similar methods of recruitment through advertising, communication with department chairs, and word-of-mouth student advertising. However, we would like to briefly highlight our *Pre-PHD program*, which was developed to provide a 6-week research intensive experience. This program was developed to expose juniors, seniors, and accepted graduate students to the University of Pittsburgh's SSOE Pitt STRIVE Program and challenge them to develop their research acumen prior to their first day of graduate school, which incorporates the theory of community building, acclimation to campus, and sense of belonging. While not a literal translation, this program is similar to an extended Selection Weekend, a key element of the MYS recruitment plan, and Horizons, a former PROMISE event. Each of these recruitment programs were established to help provide information to prospective candidates and expose them to the communities that they could become a part of if selected, or if they choose to participate. Social integration within these communities and the core values that drive them are critical components for the branding and sustainability of each program, as well as the overall success. Furthermore, these recruitment techniques promote feelings of trust, acceptance, and integration, all necessary components required for the retention and transition of URM students within all programs.

Preliminary results from the Pitt STRIVE Program, shown in Figure 1, indicate substantial growth in URM enrollment relative to total enrollment across all graduate engineering programs. The sharp increase in URM enrollment coincides with the inception of the Pitt STRIVE Program. This early display of URM graduate growth suggests a promising outlook for culture, diversity and the pursuit of PhD's within the school of engineering.

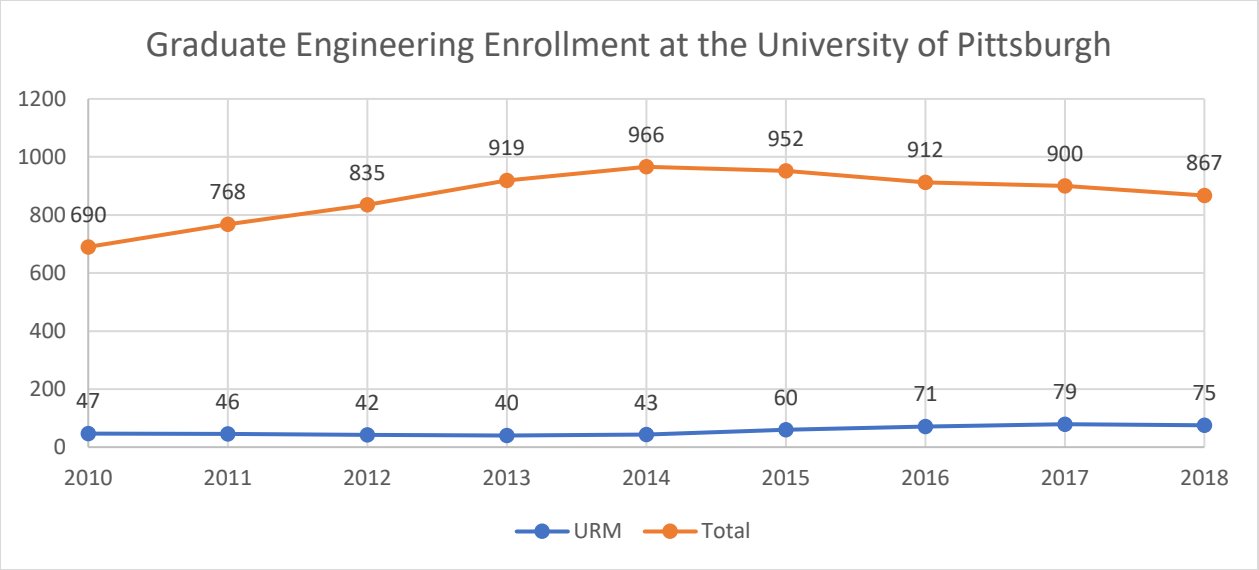

Figure 1 Visual display of Graduate Engineering Enrollment for URM and all graduate engineers from 2010-2018.

The overall goal of all Pitt STRIVE retention activities is to reduce social isolation, increase a sense of belonging and build a community of scholars among URM graduate students on campus. Elements that have been critical in supporting retention include developing community events that URM members to not only reduce isolation and stress but also cultivate bonds beyond the walls of their labs, and classrooms. The annual programs developed at UMBC and the Pitt STRIVE Program have been institutionalized and enthusiastically embraced by members of the community. One of the most attended, and anticipated events supported by the Pitt STRIVE Program is our annual *mentor-mentee retreat*. This retreat, now in its 5th year, was specifically designed to support the continued engagement of faculty, graduate students, staff, and their families in cultivating a safe space beyond the walls of the University, and to further develop the sense of belonging that is critical to the experience URM students in STEM disciplines. This program encompasses several key aspects from UMBC's programs listed in tables 5 and 6, with emphasis placed on faculty involvement within the community, and identification and establishment of mentors beyond academic advisors. Of all the programs developed by the Pitt STRIVE Program, we feel this is the most impactful-not only to those who participate, but as the catalyst for developing the shared vision of cultural change to move the SSOE forward.

The final key towards increasing diversity in STEM is transition. In alignment with AGEP's overall directive towards producing more URM graduates that transition into the professoriate, the Pitt STRIVE Program has established the *Future Faculty Program*. This program aligns with methods actuated by UMBC's PROMISE program, as it supports bringing high-achieving graduate students that share a desire to pursue faculty positions together to establish critical mass, and to develop cross-campus networks of support. This program is also critical for current faculty at the University of Pittsburgh, as it promotes dialogue that we hope, and have already begin to witness, will increase the number and depth of conversations required to actuate the cultural shift needed to maintain program success.

Table 6 Actuation comparison through key program components

Comparison of University of Pittsburgh's initiatives to MEP Milestones and UMBC Program Components				
All MEPs		**University of Pittsburgh's Pitt STRIVE Program**	**Meyerhoff Scholar's Program (UMBC)**	**AGEP PROMISE Alliance (UMBC)**
RECRUITMENT				
1. Recruitment of MEP candidates/Program Values	Advertising program recruitment with campus community			
	Recruitment programs	Pre-PhD Program [6 weeks]	Selection Weekend [2 days]	Summer Horizons (SSI) [1 day]
	Select/Invite Program participants	Interview potential candidates	Nominations/interviews of potential candidates	All graduate students are welcome
	Networking outside of campus community (academic and professional conferences, and campus visits)			
2. Financial Aid	Partial Scholarships/Stipend Funding/Event financial support	Graduate Stipend/Funding per agreement with departments	Academic Scholarship (2 tiers)	Event financial support
RETENTION/GRADUATION				
2. Financial Aid	Maintain scholarships/stipends through good academic standing			
3. Program Community	Programming to encourage community engagement	Annual Fall Cookout, Fall Harvest Dinner	Family Picnic, Stress Busters	Summer Success Institute (SSI) [2 days], Ski Retreat, Fall Harvest Dinner
	Student-run organizations with direct affiliation to MEP program	EDGSA, GWEN	NSBE, Meyerhoff Student Council	------
4. Faculty Invovlement	Programming to encourage joint community engagement with faculty	Mentor-Mentee Retreat	Undergraduate Research Opportunities	PhD Candidacy Ceremony
5. Personal Advising and Counseling	1 on 1 mentoring	1 on 1 mentoring with program faculty	1 on 1 mentoring with program staff	1 on 1 mentoring with program staff
	Community Academic Support	Dissertation Retreat	Tutoring, Group Study	Dissertation House
	Professional Development Porgrams, workshops, and Seminars			
6. Mentors	Programs to encourage mentorship within the community	Mentor-Mentee Retreat	Upper classmen counselors (acadademic supporters)	Summer Success Institute (SSI)
TRANSITION				
3. Program Community	Network of affiliates and alumni			
4. Faculty Invovlement	Programming support to aid successful transition post graduation	Future Faculty Discovery Development Porgram	-------	AGEP PROMISE Academy Alliance

Discussion/Lessons Learned

The goal of this paper was to examine some of the key principles that contribute to the sustained success of UMBC's programs that could be *adopted* (or replicated) at other institutions. Evident by the extensive and thoughtful documentation of UMBC's programs, the importance of institutional leadership and investment should not be overlooked [12]. Long-term fundamental changes take time and is not the sole responsibility of a University's president, or the staff that support students from diverse backgrounds from day to day, or even the diverse population itself. While program components are critical, and one could argue all are necessary to experience the impressive success of UMBC's programs, the most critical component is shifting, if necessary, the existing culture and climate of the institution, which serves as the structural anchor point for these programs [5]. In essence, "The Meyerhoff and PROMISE Way" is a team effort at its core, working in a sense comparable to the human body. At a high level, each organ in the body serves a specific function within the organ system, each needing to perform its duties. However, these duties are not carried out alone but in concert with other organs, to serve the ultimate purpose of maintaining optimal function. Furthermore, the body does not stay constant; it maintains homeostasis by adapting to internal and external cues. The integration of a more inclusive culture through the replication and inception of proven successful programs. Hence, our institution fully adopted the tenants and key principles that created the success of UMBC's programs, but in implementing their programs and strategies, we were cognizant of the differences and took care in adapting these programs and strategies for our institution.

We confirmed through our extensive research and experiences while implementing our Pitt STRIVE Program, that the first step in replicating programs established at UMBC is to identify the needs within the specific institution. One challenge encountered in implementing our Pitt STRIVE Program has been improving our understanding of the existing culture and climate within the University of Pittsburgh and it's Swanson School of Engineering. To address this, we revised our data collection methods to incorporate additional qualitative analyses that can improve our understanding of how the history of our institution may have impacted its current culture and climate, as well as ways we can continue to shift our climate to be more inclusive for all who attend the university.

As we continue to develop our program through lessons learned from UMBC, we aim to complete our mixed-methods program analysis to share the findings and lessons within the larger academic community. Through our established programs, we have already begun the challenging, yet rewarding process of ensuring our campus culture is as inclusive as possible. In this light, we also acknowledge that while the overall mission of the UMBC programs is to increase the pool of URM students that successfully complete graduate work in STEM fields, buy-in to this concept not only improved outcomes for URM students, but for all students at UMBC.

Finally, we conclude that perception is critical to success. While UMBC is revered for its positive reputation and diverse students, it is important to recognize that this was not always the case. Efforts placed towards inclusive excellence among all shifted the mentality on campus from "many of you will not succeed", to "we can all succeed if we work hard and work together". This mentality contributes to a shared common vision, a sense of pride, and cultivates

a sense of belonging [16]. Although our Pitt STRIVE Program was not an exact replicas of UMBC's programs, we assert that we have maintained the integrity of the "Meyerhoff and PROMISE Way", as they are based on the fundamental theories that were identified as being critical to URM student success.

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