"Growing STEM: Pipelines, Collaborations and Pedagogies for Diversity & Inclusion at Michigan"

A Cross-School Proposal for Consideration in the DEI Strategic Planning Process

The potential ramifications for improving STEM education for undergraduate students from underrepresented groups are broad and far-reaching. The societal benefits of a diverse workforce are clear across disciplines, but may be particularly important in STEM-related fields. For example, a diverse health care workforce has been show to improve access to health care, increase patient satisfaction, and increase efforts to reduce health care disparities[1]. Nevertheless, graduate and professional schools in STEM, including health-related fields[2,3,4,5,6] continue to have stagnant numbers of underrepresented students in their programs. This challenge remains despite national and local institutional efforts to shift the demographics of these fields to match the racial and ethnic composition of the United States' population. Students from underrepresented backgrounds enter college with similar levels of interest in STEM fields, however they are less likely to persist during their undergraduate experience[7,8] when compared to non-underrepresented counterparts.

"Growing STEM: Pipelines, Collaborations and Pedagogies for Diversity and Inclusion at Michigan" – a new collaboration at the University of Michigan – is a response to the disparities present at almost every level of STEM education. Faculty and leadership from the College of LSA, the Medical School and the School of Engineering have come together to build a sustainable and strong "pipeline" for underrepresented minority and women into STEM fields. This pipeline would encompass:

- Pre-college outreach, recruitment and admission
- First and second year undergraduate STEM education and retention into STEM majors

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[1] Saha S et al. Student Body Racial and Ethnic Composition and Diversity-Related Outcomes in US Medical School. Journal of the American Medical Association. 2008; 300: 1135-1145.
[2] Association of American Medical Colleges Altering the Course Black Males in Medicine 2015. Available at: https://www.aamc.org/download/439660/data/20150803_alteringthecourse.pdf
[3] Lopez N et al. Effective Recruitment and Retention Strategies for Underrepresented Minority Students: Perspectives from Dental Students. Journal of Dental education. 2003 67(0): 1107-1112
[4] Peery A et al. Diversity Must Start Somewhere: The Experience of One College of Nursing. Journal of Cultural Diversity 2013: 120-124.
[5] Greenhill LM et al. Introducing DVM: DiVersity Matters (An Association of American Veterinary Medical Colleges Initiatives). Journal of Veterinary Medical education 2007; 34 (2): 43-46
[6] Women, Minorities and Persons with Disabilities in Science and Engineering. http://www.nsf.gov/statistics/wmpd/2013/race.cfm
[7] Griffith, A. L. (2010). Persistence of women and minorities in STEM field majors: is it the school that matters. Economics of Education Review, 29, 911-922. http://dx.doi.org/10.1016/j.econedurev.2010.06.010
[8] Barr DA et al. The Leaky Pipeline: Factors Associated with Early Decline in Interest in Premedical Studies among Underrepresented Minority Students. Academic Medicine 2008.

- Preparation and mentorship for undergraduate students into graduate and professional programs
- Ideally this pipeline would encompass all stages from K12 outreach through graduate and professional schools, postdoctoral fellowships and entrance into careers.

The Growing STEM collaboration is open to all interested individuals, programs, schools and colleges at the University of Michigan.

Goals:

- Increasing the successful recruitment and admissions of URM, especially among those students who participate in various pre-college programs run by units at the University of Michigan.
- Increasing support for undergraduate URM students and women with STEM field interests through learning communities, mentorship, study groups and other forms of support.
- Increasing the retention of URM students and women in STEM majors, and continuing to insure access to a range of quality learning opportunities including lab placements, internship, study abroad, etc.
- Offering mentorship, including from peers, and support for URM and women STEM majors to encourage them to pursue graduate and professional studies; providing support through the admissions and recruitment process.
- Increasing levels and quality of support for URM and women graduate and professional students pursuing degrees.

History

This effort grew out of a September 22, 2015 event sponsored by Rob Sellers' office and hosted by NCID that brought together more than 50 members of the faculty and professional staff in STEM-related fields and programs from across the campus. The intent of the meeting was to examine opportunities for greater collaboration and success in advancing individuals from underrepresented groups into careers in medicine and the health sciences at the University of Michigan. The keynote speaker was Dr. Michael Summers, Howard Hughes Medical Institute Investigator and Professor of Chemistry/Biochemistry at the University of Maryland, Baltimore County (UMBC), who has played a key role in the success of the Meyerhoff Scholars Program at the UMBC. The hope was to engage in a discussion that might lead to greater awareness and partnerships across outreach programs, undergraduate programs, graduate and, at least initially, the medical school/health science programs.

Even during our brief open discussion many of us realized that our campus seems poised for a greater level of collaboration among and between programs in LSA, Public Health, Engineering, the Medical School and professional schools in STEM more broadly.

To foster this openness to collaboration, and to give us the information about each other and our programs that is essential in doing so, a small cross-campus working group hosted a follow up poster session on STEM education at Michigan on December 19th,

with emphasis on programs that support underrepresented minority students and women. *The central question was what the University of Michigan is currently doing to attract and support a diverse student body in STEM fields from undergraduate years to entrance into professions, and how could we all improve our individual efforts through greater collaboration.* Over 70 people attended the session; 21 individual posters were presented – all of which have been cataloged and archived. (A full list of poster topics and participants can be found in Appendix A.)

Lessons from the Poster Session: Challenges & Opportunities

We asked everyone who attend the poster session to spend ample time viewing the individual posters and having conversations. We also asked them to list the top three challenges for their individual programs and/or existing collaborations. Here were some of the most common responses:

- Knowing what else is going on around campus; connecting with other organizations on campus with convergent goals
- Lack of coordinated, mutually supportive outreach to high schools for target students
- Clear articulation of core messages in recruitment so perspective students and parents know what UM offers, along with guidance in making the best decisions about programs.
- Need for more coordinated pipelines from first and second year programs, like UROP, into majors, minors and other kinds of support programs.
- Funding! Many programs are on "soft money," grants and so forth.
- More resources for scholarships and student support.
- Staff, especially professional staff, to accomplish goals and to be able to start new collaborations.
- Scaling up initiatives, especially making the jump from "pilot" to full-fledged program.
- The need for more and better assessment mechanisms.
- Improving levels of diversity among graduate students and the faculty as integral to increasing diversity for undergrads.

During the final segment of the Poster Session we conducted a group discussion. This discussion also generated a series of suggestions and ideas about challenges and opportunities. Many of these suggestions had to do with creating more mechanisms for collaboration across the various segments of a STEM pipeline. Participants wondered aloud about the role that MPathways might play (and very few people in the room felt that they had much knowledge or insight about this); we talked about databases (like the one maintained by CEO) and creating institutional mappings to identify key hubs and nodal points in our current landscape; we also discussed using this moment around strategic thinking and planning for diversity, equity and inclusion.

Immediate Next Steps (FY16 Goals:)

We believe that all of this interest, activity and feedback provide ample justification to make a series of institutional commitments to "Growing STEM." We believe those next

steps will require hiring an appropriate person, at least half time, to do the kind of "retail work" involved in helping individuals and programs to coordinate the efforts below and make more generative connections. Someone already here and familiar with the UM would be ideal. Initial steps include:

1) Create a survey distributed to individual faculty with key questions designed to map the landscape of existing STEM outreach, recruitment and support programs for URM students and women. This mapping would use materials in current databases, in the Center for Educational Outreach and elsewhere, to do more effective data visualization and conceptual organizing. This bottom-up effort will complement the more top-down inventories already initiated and should include ability of individual programs to update their own programs. This map will initially be used to connect existing programs and identify gaps. It could also be used as a basis for eventual development of a visual tool for prospective and current students to find programs most relevant to their interests and needs.
2) Create a baseline of our status now in terms of outreach, recruitment, retention and support of women and URM STEM students, making sense of historical trends where possible.
3) Develop a series of "Growing STEM" presentations for the community at UM interested in growing, strengthening, and diversifying the STEM pipeline. These would be short talks, accompanied by a 1-page synopsis, designed to further introduce programs and approaches, and to do some "thinking out loud" grappling with a significant challenge around URM STEM recruitment and student success. These seminars would also allow us to think collectively about possibilities for collaboration and synergy. To incentivize the talks, we would offer a small grant of $500 toward the work of the program or initiative being represented. We aspire to do at least 1–2 such talks per term over the next two years.

<u>Goals for 2016-2017</u>

- Better institutional tracking from pre-college programs, through undergraduate admissions, and into STEM majors and minors and eventually into post-graduate education and professions so that we can evaluate which programs are most effective in keeping students in a STEP career pipeline. The most urgent need is tracking of pre-college program participants.
- Initiate institutional tracking of initial STEM interest, declaration of STEM majors, and graduation with STEM degrees by demographic characteristics such as race/ethnicity, gender, family income, first generation college status) (applies largely to LSA since Engineering is all STEM by definition).
- Initiate institutional tracking of participation in STEM-related co-curricular activities (e.g., STEM-related living-learning communities, peer-led study groups, UROP, upper division independent research, internships, by demography.
- Initiate a review of existing survey data from UMAY and other sources on climate issues to better understand experiences and perceptions around whether women and URM STEM students feel welcome and supported in

departments and programs, and how they express feelings of belonging, efficacy, and persistence.

- More effective mechanisms with the Office of University Admissions to coordinate recruitment efforts among current STEM programs. How can existing programs and, importantly, current student participants, be better used to recruit students?
- Clearer materials outlining and identifying various STEM support options and programs at UM to help students and families make the best choices.
- Establish a multi-phase pipeline mentoring program

Metrics for Success

- An increase in the number of under-represented minority students and women (where currently under-represented) in STEM majors, and elimination of disparities in how they experience climate issues around measures of belonging, support, confidence and efficacy.

- Elimination of any disparities in participation rates in STEM-related co-curricular activities (e.g., STEM-related living-learning communities, peer-led study groups, UROP, upper division independent research, internships)
- Elimination of any disparities in probability of graduating, given initial interest, with an undergraduate STEM major for under-represented minority students and women (where under-represented).
- An increase in the number of under-represented minority students and women (where currently under-represented) in STEM-related graduate and professional programs.
- Elimination of any disparities in probability of graduating with a graduate or professional degree in a STEM-related field for under-represented minority students and women (where under-represented).

Resources Required:

Efforts to slowly build this collaboration and think through its implications are ongoing, but it is already clear that the effort would require infrastructure to encourage meaningful collaboration, data tracking and analysis, and program support. These goals would require sufficient resources to hire 1-2 full or part-time staff members to support "Growing STEM" over the next three years. It would also need a visible location, preferably outside of a single school or college.

A mechanism to provide support to both stabilize and scale up existing projects, along with seed money to spark new initiatives and collaborations would also be needed. A specialized M-Cubed or TLTC funding program could be established on the order of $250,000 a year for a three-year period.

We would also need resources to host speaker series (see above), to send teams on site visits to other institutions with similar initiatives and to bring people with expertise and

experience to our campus, at roughly $15,000 per year for three years.
We view this proposal as a foundation and starting point to encourage further discussion. We are in the process of planning for a working meeting in late March or early April as a follow up to both the September 22nd gathering and the December 16th poster session. All of us who have signed on to this proposal endorse its overall aims and are committed to an ongoing investigation of its feasibility in the context of the University's Strategic Plan for Diversity, Equity & Inclusion.

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