Easing the Tortuous Road that Under-represented Minorities Travel to Become Engineering Faculty

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Abstract

Numerous studies have been conducted on the issues facing underrepresented minorities in engineering disciplines. However, very little has focused on the issues faced by underrepresented minorities who pursue a graduate degree or the need for effective mentoring of post-docs and faculty in engineering to attract and retain them to pursue academic careers. Women and ethnic minorities usually do not persist in academia because they frequently receive lower salaries, heavier teaching loads, less research support, and serve on more committees than their male counterparts. Although these disparities are more pronounced at the faculty level, this leads to higher attrition rates at every level of career their development, starting at the undergraduate level.

This paper will present our approach and preliminary results of a National Science Foundation (NSF) sponsored workshop to broaden the participation of underrepresented engineering minorities from senior undergraduates to assistant professorship. The 1.5 day workshop will be held at three institutions: University of Akron (October 2014), Mississippi State University (January 2015) and University of Houston (June 2015). Each workshop will focus on areas that underrepresented minorities can readily address (awareness of what is needed in the career, time management, and teaching skills), as well as the skill set for early negotiations (equitable pay, and work load) and a development of a new network to expand their opportunities. Each session in the workshop will use pre and post survey questions to evaluate what participants have learned. The overall effectiveness of the workshop to increase the number of underrepresented minorities that purse an academic career in engineering will be evaluated by qualitative and quantitative methods. Conducting the workshops at three universities increases the number and diversity of individuals impacted, assists with assessment, and enables assessment of broad topics for undergraduate up to assistant professors pursuing engineering careers, as well as tailored for a specific underrepresented group. The use of three distinct institutions will also demonstrate the ease of implementation at other universities.

Introduction

There are numerous studies on the issues facing underrepresented minorities in science, technology, engineering and mathematics (STEM) disciplines. Across all groups, women participate at lower levels than their co-ethnic male counterparts.[1-3] Most activities to rectify such a deficiency in STEM disciplines have focused on K-16 initiatives to address lack of preparation, inability to balance coursework and external commitments, self-efficacy, and financial limitations.[4-6] However, there has been minimal focus on issues faced by graduate students or the need for effective mentoring of post-docs and new faculty in engineering to attract and retain them in academic careers. This is alarming as one approach to increase the number of underrepresented minorities who graduate with a STEM degree is to use hierarchical mentoring, i.e., undergraduate mentor to faculty mentor.[7] This is a vicious cycle considering that

in order to increase the number of underrepresented minorities that pursue advanced degrees, there needs to be a critical mass already in place to attract more minorities.[8,9]
Interaction with faculty is vital for all undergraduate and graduate students' development. This interaction may be in the classroom, laboratory, or casually around campus. Unfortunately, a gender and ethnicity gap may drive a wedge between the student and professor as studies have shown that student behavior is heavily influenced by gender and race.[10-12] The gap is more significant in engineering.[13] Research has shown that students develop personally and academically when they have close interactions with their professors.[14,15] More specifically, African Americans, some Hispanics and women tend to be more 'group oriented' and may therefore be more likely to interact with people of similar groups.[16,17] These interactions or lack thereof may have a considerable effect on student learning. Therefore it is imperative that women and underrepresented minorities are provided with role models or those with whom they can relate to in the classroom.

However, simply infusing women and underrepresented ethnic minorities at lower levels is rarely sufficient for increased representation at higher levels.[18] The American Society for Engineering Education (ASEE) compiled 2012 data for all engineering degrees and reported that underrepresented ethnic minorities held 12.6% of B.S. degrees, 7.9% of M.S. and 4.6% of the Ph.D.'s, and less than 10% of the faculty positions. Similarly, although women held 18.4% of the B.S degrees and 22% of the Ph.D.'s; only 13% of the faculty was women; of which only 8.7% held the rank of full professor.[19] Studies have also shown that the gap between male and female faculty was narrower in early career and widens significantly by 15 years after their Ph.D.[18] Underrepresented minorities, both ethnic and gender based, need to comprise at least 15% of academia before they can influence the culture and agenda.[7]

The Computing Research Association for Women (CRA-W) has several mentoring programs for women in computer science pursuing an industrial position.[20] Some of the activities provide new computer scientists with opportunities to interact with senior researchers and government agency representatives. The website also contains statistical information and publications. There are two primary differences between the CRA-W program and the project described in this paper: the CRA-W focuses on computer science and industrial research. The project described in this paper was for engineering underrepresented minorities pursuing academic careers.

The goal of this paper is to describe the approach and preliminary results of a National Science Foundation (NSF) sponsored workshop to broaden the participation of underrepresented minorities who are engineers from senior undergraduates to assistant professorship. The 1.5 day workshop will be held at three institutions: University of Akron (October 2014), Mississippi State University (January 2015) and University of Houston (June 2015). Preliminary data will be based on the first workshop while the presentation will contain results from all three workshops. The workshops focuses on areas that underrepresented minorities and women can readily address, as well as the skill set for early negotiations, and the development of a new network to expand their career opportunities.

Overview of approach

The institutions involved in this project are The University of Akron (UA), The University of Houston (UH), and Mississippi State University (MSU). The overall student population at UA is similar to most mid-sized state institutions. MSU, a primary majority serving institution, has a 19% combined undergraduate and graduate African American student population and UH is a Hispanic serving institution with 29% Hispanic population. Although the number of underrepresented minorities in the undergraduate population is in line with National numbers, increased diversity at the graduate and faculty levels is lacking. For instance, only 13% (i.e., 12) of the faculty at UA are women. Similarly, only two engineering faculty at UH are Hispanic compared to the 23 graduate students or 620 undergraduates.

The 1.5 day workshop was/will be held at each institution to increase the number of underrepresented minorities (based on ethnicity and gender) who enter graduate school and pursue an academic career in engineering. The workshop's target participants were for graduate students, post-docs, and early career tenure track faculty in engineering. Senior undergraduates were invited to participate to raise awareness as to graduate school and academic career opportunities. As such, undergraduates were provided an additional topic: Graduate school (how to apply, selecting the best program, and select an advisor). This last session will also provide useful information for early tenure track faculty to share with their undergraduate advisee's. The contents of each session are described briefly below. Past tense will be used in the description as the UA workshop was already held. The same approach will be used for the workshops at MSU and UH.

Session 1: Graduate School 101
This session was used to assist undergraduate students to navigate graduate school opportunities, as well as provide new faculty with information for their future undergraduates. The session covered how to select potential graduate programs and advisors, how to apply to each institution, importance of personal statement and reference letters, preparing for the GRE, difference between part time and full time programs. Information on funding mechanisms spanned the difference between stand-alone tuition waivers, University sponsored stipends (TA or GA), research sponsored projects, and Fellowships. Information pertaining to fellowships encompassed where to find the solicitation, how to complete the application, as well as the importance of adhering to the instructions and deadline.

Session 2: Future Faculty Forum: What is Assistant Professorship?
Introducing the audience to the different aspects of the career will dispel any myths surrounding the roles of an assistant professor, as well as to encourage them to consider pursuing this career. Key topic areas included: A guide to a successful academic job search; The 'hats' of a tenure track faculty member: teaching, research, and service; Grant funding options for engineering faculty; Proposal writing that yields results; The importance of dissemination of intellectual works: publishing 101; Service: expectations as a junior faculty; What is promotion and tenure and how do I get there? Interactive activities, such as a small case study were included as well.

Session 3: Topic: Time Management
One of the biggest obstacles facing a new researcher or academic is insufficient time to get everything done. There are multiple approaches to managing time with the best approach being different for each participant. This session provided examples and discussions as to how the

session facilitator's have made it. Topics included: How to balance graduate courses, TA assignments and thesis/dissertation experiments? How does new faculty successfully manage teaching, research and service requirements? How to balance multiple projects and student needs? How to balance your career and personal life?

Session 4: Mastering the Science of College STEM Teaching
Participants were introduced to adult learning theories and the personal aspects of teaching. They were also introduced to resources that will aid them in developing lecture notes and designing learning experiences that build conceptual understanding of course content. Specific activities included: familiarity with teaching/content for the anticipated course, formulating a statement that describes their beliefs about teaching and learning; completing a learning assessment and analysis of teaching case studies that depict effective classroom teaching.

Session 5: Culturally Responsive Teaching in STEM
This session utilized resources from the Association for Curriculum Development (ASCD), The National Center for Culturally Responsive Educational Systems (NCCREST), the National Education Association (NEA) and the STEM Education Research Institute to encourage future and new STEM faculty to: be cognizant of the importance of student's socioculture; act as leaders of change and acceptance; and adopt a teaching and learning perspective that embraces the use of critical thinking and multiple perspectives to approach problem solving. Participants used the guidelines for developing culturally responsive teaching skills to map a plan to hone the skills.

Networking Lunch
All participants were involved in 'speed networking' during lunch where they met the other participants and exchanged contact information, career goals, research interests, and desire to be a mentor/mentee. All investigators were also involved in this session to describe the approach, as well as serve as facilitators and observers for the qualitative assessment. Additional engineering faculty members from the host institution were invited to attend the lunch to provide more opportunities for attendees to network with individuals in their specific discipline.

Session 6: Mentoring/Career Coaching
The goal was to increase the understanding of the roles of mentors in enhancing the academic and professional outcomes of senior undergraduates and graduate students, as well as post-docs and early career faculty who are members of underrepresented minority groups. The session introduced what it takes to be a good mentor. Topics addressed included: What is mentoring? The different types of mentoring and how they work; Role of the mentee; Role of the mentor; benefits to mentors and mentees; finding the right mentor for you, but most importantly be a mentor.

Session 7: Transitioning and Importance of Being Proactive
The session content may change slightly depending on the workshop location and the specific questions identified in its respondents pre-registration forms. In addition to addressing the specific concerns/questions of the registrants, the following topics were included: i) Transitions: how does a specific target group transition from being a 'big fish in a little pond' to a majority institution?; and ii) Being Proactive: the importance and approach to being proactive. For

instance, how does a specific target group become proactive versus waiting for an invitation to join a research group? Do target assistant professors know the importance of and approach to forming a working group with other faculty members?

Session 8: Roundtable/Panel Discussion
This session addressed any questions that arose throughout the workshop. At the end, we provided a "Tips" sheet on the areas of discussion in the workshop. Specifically, the tips sheets contained useful bulleted points on negotiation strategies, research success strategies, successful mentorship, culturally relevant teaching, lab management and time management.

Assessment

The overarching goal of the workshops was to increase the participation of underrepresented minorities in engineering fields that pursue graduate degrees and eventually enter into academic careers. This was assessed by pre surveys that quantified those initially thinking to attend graduate school, in a graduate program and those thinking about becoming academics. This information was compared to how/if answers changed by the end of the workshop, as well as those that actually pursue graduate studies and academia. Pre and post surveys were also used to qualitatively assess any changes in perception. For instance, one pre-survey question was "What do you think a faculty member does? and Do you want to be a faculty member?" The corresponding post-Survey was "Based on what you learned at the workshop, are you still interested in being a faculty member, why/why not?"

Several sub-goals were identified for the each session of the workshop. They were to: 1. Better prepare undergraduates for graduate school opportunities; 2. Increase the awareness of what is "needed" to be an assistant professor; 3. Assist in the development of better time management skills; 4. Increase participant knowledge on effective STEM learning; 5. Advance awareness and skills pertaining to Culturally Responsive Teaching; 6. Understand the roles of mentors and mentees in advancing academic and professional careers; 7. Increase awareness of why being proactive is important; and 8. Increase the networking opportunities of post-doctorial students and assistant professors. Realization of these sub-goals was achieved both quantitatively (i.e., comparison of pre and post surveys) and qualitatively. Qualitative methods that will be used to enhance the assessment include face-to-face discussions during session breaks, observations throughout each session by co-investigators, and comments made during the panel session. Qualitative results were analyzed as outlined in Fitzpatrick et al.[21] and Vaterlaus and Higginbotham[22].

The post workshop survey assessed if any of the attendees attitudes changed, what was the most interesting concept learned, would they recommend it to colleagues, and were they willing to participate in the network forum. Comparison of survey results across the three institutions can provide information as to what is important/needed for a specific underrepresented minority group. Longitudinal assessment at each host institution will be achieved by tracking the job placement of participants.

UA Workshop Results

The UA workshop was comprised of 6% males and 94% females. The largest fraction of the attendees were Caucasian (43.75%) followed by Asian (31.25%), African American (6.25%), Hispanic, (6.25%), Cuban (6.25%) or mixed ethnicity (6.25%). Thirteen percent were post-docs, 31% assistant professors and 56% students. Of the student attendees, 11% were undergraduates, 33% were pursuing a master's degree and 56% a PhD. Before the start of the workshop, 44% of the students had expressed a definite interest to pursue an academic degree to inspire future generations in STEM (11%) or teach at the college level (22%); whereas 33% were not sure if they wanted to have an academic career.

It was interesting that 60% of the Assistant Professors did not have a post-doc prior to their current academic position. This group of attendees had listed networking (20%) and industrial experience (20%) as beneficial components in securing their current position. Although 60% found securing research funding as the most difficult aspect of their job, time management (20%) and recruiting good graduate students (20%) were also a concern.

Prior to the Grad School 101 session, all of Assistant Professors knew the differences between a TA/GA and RA, however only 33% of the students knew what each meant. Students ranked past experiences (67%), goals (44%) and interests (33%) as the three top types of information to include in the personal statement of a graduate/fellowship application. Both faculty (50%) and students (33%) identified having a similar work ethic as important when selecting a potential advisor. Before the session, students were confident with their ability to find fellowship opportunities while 50% of the faculty either thought only Federal agencies provided fellowships or did not know where to look.

After the Grad School session, 65% of all participants (56% students, 100% of faculty) found the information on potential Fellowships to be the most interesting section. Students also found the information on the GRE (22%) and differences between selecting faculty advisors versus programs (22%) to be interesting. The awareness of where to find potential fellowships also increased. Internet web address (specifically those provided during the session) was ranked the overall highest (45%) method. Thirty-six percent of all attendees (33% for students and 50% faculty) indicated that becoming aware of cultural differences was a valuable unexpected benefit of attending graduate school. Surprisingly, none of the students identified networking as a benefit of graduate school.

The second session pertained to the early years of an Assistant Professor. As expected, all of the session participants were aware that a PhD is required to teach engineering at a 4-year college before the session started. However, only 44% of the students and 33% of the faculty thought a post-doc was required to secure an academic position. This was not surprising, as 60% of the faculty attending the workshop did not have a post-doc prior to starting their own tenure track. Surprisingly, 33% of the faculty and 67% of the students were not aware of how to search for an academic position. Students were also only partially aware (33%) that tenure was required.

The post session survey found that all (100%) of the attendees found the session to be informative. In addition, all of them felt they had gained essential information of how to apply

for an academic position. None of the attendees felt that universities provided support to find the right life-work balance for their employees. Approximately 50% felt that amount and type of support would vary depending on the institution. Twenty-two percent of the students felt that you must ask the administration if you wanted help.

The pre session survey for time management found that although 100% of the faculty had indicated they used a calendar, they were all self-proclaimed procrastinators. This was a little surprising, as 100% of the faculty and 78% students had previously sought advice on time management, with only 73% (100% faculty and 67% students) feeling that it had worked to some degree. After the session, 100% of the assistant professors and 67% of the students expressed a possible need to change their current time management practices. One way to assist participants with changing practices as well as to fully meet expectations would be to provide a few more examples. For instance, a few examples of how to manage multiple research projects or how to successfully complete new lecture notes while developing a lab will be beneficial.

Prior to the Master STEM Education session, all of the faculty participants had listed learning outcomes, grading scale and contact information as required components of a syllabus, whereas students were more concerned (50%) with test schedules. This was most likely due to what each groups expectations or use of the syllabus relates to. The dichotomy could be the reason for the potential reasons students may switch to a non-STEM major. All faculty participants listed either difficulties with math courses or feeling overwhelmed. Thirty-three percent of students attributed it to 'not being good at STEM,' difficulty with math or feeling overwhelmed. It was not surprising that both students and faculty could list possible mechanisms to assess student learning before the session. Surveys and/or evaluations were the primary methods for assessing an instructor's teaching effectiveness. Traditional lectures were considered very effective for organization (100% faculty, 50% students) and providing students an idea of what to study (100% faculty, 50% students).

After the STEM education session, 75% of students identified goals and objectives as an essential component of a syllabus. Perceptions as to why someone may switch to a non-STEM major had also changed. Quality of teaching, learning styles and being underprepared were the top reasons (100% faculty and 50% of students). Similarly the use of peer evaluations (100% faculty, 75% students) and listening skills (100% faculty) as a means to self-assess teaching effectiveness increased. Participants also listed assessing a student's body language as beneficial new information.

Prior to this session, most of the participants did not know how to define Culturally Relevant Teaching (CRT) or why it may be important for STEM education (Table 1). However, 25% of students and 33% of faculty thought CRT could be incorporated by "simply engaging students in dialogue." After the session, all participants had a clearer idea of how to define CRT. Potential benefits to STEM education included maximizing student learning and retention, as well as to account for the fact that students are 'vastly different.' Similarly session participants were able to provide two possible methods of incorporating CRT into classrooms. Student participants appeared to be the most enthusiastic about the contents of this session. They listed being aware of slang, be fair to all, always project positive outlook, speak up if you hear something offensive and don't teach to one teaching style as new information gained from the session.

The pre-session surveys indicated that only 20% of the session participants had not had a mentor. Of those that had, 62% of the mentors were female. Interestingly, the 8% who indicated that they had 'not been satisfied' was associated with individuals who had male mentors. Expectations of what a mentor "should do" is shown in Table 2. All attendees reported some level of expectation that their mentor would tell them how things 'really are.' Only the students indicated that mentors are supposed to be friendly or encouraging. Although the faculty did not feel this way, it is something they may need to be aware of when they mentor students.

Table 1. Pre and Post Session Results for Culturally Relevant Teaching

Pre-Session Question	Response	Students	Assist. Prof	All
Definition of CRT?	Good teaching	20%	33%	25%
	Aware of cultural significance	60%	33%	50%
	Don't know	0%	67%	25%
Why incorporate CRT Into STEM?	Diverse student body	60%	67%	64%
	Increase retention	20%	0%	13%
	Don't know	0%	33%	13%
List two methods of CRT.	Engage students/dialogue	20%	33%	25%
	Relate to home	20%	33%	25%
	Relate to current issue	20%	33%	25%
	Don't know	0%	67%	25%
Post Session				
Definition of CRT?	Aware of climate	29%	100%	44%
	Embrace differences	29%	50%	33%
	Know students/own beliefs	14%	0%	11%
	Create equality	14%	0%	11%
Why incorporate CRT Into STEM?	Students are vastly different	29%	0%	22%
	Benefits research	14%	0%	11%
	Increases retention	29%	0%	22%
	Maximize student learning	29%	50%	33%
List two methods of CRT.	Use visual aids different country	14%	0%	11%
	Set ground rules	14%	0%	11%
	Fair	43%	0%	33%
	Ensure comfort/group	14%	50%	22%
	Enhance inclusion	29%	50%	33%

Overall, 67% of the session attendees had mentored someone, even the students. They were willing to be a mentor to someone to help with the transition to graduate school (27%), provide insights from their own experience (13%) and the enjoyment derived from giving advice (20%). Participants had not served as a mentor if they felt they were still learning (7%), had insufficient time (7%) or not had a real opportunity to do so (13%).

Table 2. Attendees Expectations from mentors before session

Response	Students	Assistant prof	All
Provide guidance	78%	50%	60%
Available to "bounce ideas" or get advice	25%	40%	56%
Ethical	11%	0%	7%
Edits work, feedback	11%	0%	13%
Friendly or encouraging	22%	0%	13%
Available	44%	0%	27%
Frank, tell things how they 'are'	33%	25%	27%

After the mentoring session, all except two Assistant Professors expressed a desire to be both a mentor and a mentee. The reasons given for wanting to have a mentor or be a mentee are given in Table 3. Not included in the Table 3 were the responses from the Post-docs, where 50% were 'motivated by the session to become a mentor' as they would 'love to give back.' Surprisingly only the Assistant Professors identified a mentor as someone to help you with your career path (25%) while students expressed desire to also continue being a mentee as they 'still needed to use my mentor' (44%). Twenty-five percent of the attendees preferred mentors of the same gender while 73% had no preference. It is important to note that discussion during the networking lunch indicated that some of the students perceived an interchangeable role between faculty advisor and mentor. This perception had changed by the end of the panel discussion.

Table 3. Reasons for Being a Mentee or Becoming a Mentor

Response	Students	Assistant prof	All
Still need their mentor	44%	0%	27%
Love to give back	67%	5%	60%
Good to have someone on your side	11%	0%	13%
Okay to ask for help	11%	0%	7%
It’s a learning process	13%	25%	11%
Help with career path	0%	25%	7%

Before the workshop, all of the participants knew how to define racism. However, 67% of the attendees did not know what a micro-aggression was. Surprisingly, none of the faculty listed possible benefits of being proactive. Students listed that some people may be shy (22%), can't sit and do nothing (22%), you get to learn (11%) and can avoid potential problems before they occur (22%).

Post session methods to increase participation were more concrete and reflected that session attendees did learn something (Table 4). Student responses appeared to be based how they would increase their own or another students participation, while faculty responses seemed to pertain to how faculty could be proactive. One of the post-session survey questions asked what they thought was an interesting fact they learned from the session. Seventeen percent of all attendees (11% students and 33% of faculty) were surprised that even though helping someone is a good thing, you 'do not want to help too much.' Students also stated that sometimes helping someone to be proactive and 'make all the difference' (11%), that changing the 'tenor of discussion' (11%) could help facilitate participation and decrease micro-aggressions from others. Prior to the session, none of the attendees were aware of how to handle the occurrence of micro-aggressions.

Table 4. Post Session Results for Transitioning-Proactive

Post-Session Question	Response	Students	Assist. Prof	All
Best ways to engage underrep minorities in Classroom or group?	Networking	68%	0%	58%
	Study groups	11%	0%	8%
	Speak up, ask for help	0%	33%	8%
	Prepare in advance	0%	11%	8%
Most interesting fact learned about helping others to participate?	Don't help too much	11%	33%	17%
	May make all the difference	11%	0%	8%
	Importance of feedback	11%	0%	8%
	Change tenor of discussion	11%	0%	8%
	Speak up	11%	0%	8%
	Show responsible options	0%	33%	8%
Were you aware how to handle microaggressions before the session?	Yes	0%	0%	0%
	No	100%	100%	100
Did session meet expectations?	Yes	78%	100%	83%

The last session was the 'round table' discussion where participants could ask any question(s) they wanted. A few of the questions from the participants, and the corresponding answers are listed below. Answers will be in an abbreviated form rather than a full discussion.

Q: How to submit multiple proposals a year and still have them be different?
Ans: Change the lead investigator to reflect focus of research and/or tasks. Can also expand area(s) of potential topics or focus more on one subset. For instance the focus of a task can change based on where it will be submitted.

Q: How to choose/select grad students?
Ans. Will change with time. A MS student from home institution is easier as you already know the students capability. Establishing a network with other institutions can

help with recruiting good students. With time you will learn how to interpret GPAs and GRE scores from different international institutions.

Q: How to judge who is 'safe' to collaborate with?
Ans. Trust your gut instinct, observe how they treat/interact with students and other collaborators. If you make a mistake, learn from it. You can still be professional, while not actively seeking continued collaboration with the individual.

Q: What entails a startup package?
Ans. Teaching load, number of departmental supported graduate students, salary, health benefits, relocation expenses, month of summer salary first year, laboratory space, and money for equipment/supplies.

Q: How to balance family life and work?
Ans: Choosing the right partner is key. Someone who understands the time commitment during the early years and is willing to 'pitch in' at home would help. Other aspects will be different for everyone.

Q: What about adding coauthors? When is it appropriate?
Ans. Potential co-author must have participated in 2 of 5 key areas: experimental design, actual experiments, statistics, writing or securement of funding. Another suggestion was ~25% rule of participation. If the project could not have been completed without their participation.

Q: What was your (panel's) biggest career mistake?
Ans. Responses varied. One was a discussion pertaining to choosing the 'wrong' mentor and how to handle the situation. Another was "although I am an advocate for others, I have not been an advocate for myself." A third response pertained to having a research collaborator 'claim sole credit' for an idea. Another response was 'not speaking up sooner about pay inequality."

Conclusions and Recommendations

The first workshop was a success in that 22% of the student attendees had changed their mind from 'not interested in' to 'wanting to pursue a career in academia'. Two additional participants stated they would consider it after they had "*worked in industry to lend credibility to their findings*." Of those who indicated their interest had not changed, it was because they were already interested in an academic career (50%) or they wanted to work in industry (33%). As expected, responses varied when asked what they found most helpful overall. The highest overall pertained to mentoring information (69%) and networking activities (62%). This was in-line with what participants listed as the sessions they found most beneficial. A faculty member that attended stated that although Grad School 101 was not directly beneficial to her, she would share the information with the students at their home institution. We were happy to see that 23% (11% students, 50% faculty) found the workshop to be a safe place to share. Seventy-eight percent of the students and 100% of the faculty attendees wanted to be included in the new networking email forum. In fact, the network has already been used by participants.

By the time of the meeting, we will have completed the second workshop. This will enable a cross comparison to see if the findings were similar and if there were differences based on participant demographics. Such comparisons might indicate future directions for research pertaining to broadening participation in engineering and other STEM fields. Additionally, as each workshop is presented and its findings evaluated, central issues facing the lack of underrepresented minorities interest, participation and retention in engineering will be addressed. Using these workshops as a vehicle through which these issues can be uncovered can only provide a foundation needed for other researchers and policy makers to move toward the implementation and solutions to erase the absence of a diverse and competent engineering faculty. This will be expanded upon after the evaluation of the third workshop to be held at University of Houston in June 2015 is completed.

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References

1. Cochiara, F., Bell, M.P., Berry, D.P. Latinas and black women: key factors for a growing proportion of the U.S. workforce. Equal Opportunities International **25**(4): 272-284, 2006.
2. Hernandez, P.R., Woodcock, A., Schultz, P.W., Estrada, M., Chance R.C. Sustaining optimal motivation: a longitudinal analysis of interventions to broaden participation of underrepresented students in STEM. Journal Educational Psychology **105**(1): 89-107, 2013.
3. Jackson, J., The story is not in the numbers: academic socialization and diversifying the faculty. NWSA 16(1): 172-185, 2004.
4. Concannon, J.P., Barrow, L.H. A reanalysis of engineering majors' self-efficacy beliefs. J Science Education Technology **21**: 742-753, 2012.
5. Kokkelenberg, E.C., Sinha, E. Who succeeds in STEM studies? An analysis of Binghamton University undergraduates. Economics Education Review **29**: 935-946, 2010.
6. Wilson, Z.S., Iyengar, S.S., Pang, S.S., Warner, I.M., Luces, C.A. Increasing access for economically disadvantaged students: the NSF/CSEM & S-STEM programs at Louisiana State University. J. Science Education Technology **21**: 581-587, 2012.
7. Wilson, Z.S., Holmes, L., deGravelles, K., Sylvain, M.R., Batiste, L., Johnson, M., McGuire, S.Y., Pang, S.S., Warner, I.M. Hierarchical mentoring: a transformative strategy for improving diversity and retention in undergraduate STEM disciplines. Journal Science Education Technology **21**: 148-156, 2012.
8. Butts, G.C., Hurd, Y., Palermo, A.S., Delburne, D., Saran, S., Zony, C., Krulwich, T.A. Role of institutional climate in fostering diversity in biomedical research workforce: a case study. Mount Sinai Journal Medicine **79**: 498-511, 2012.
9. Maton, K.I., Pollard, S.A., McDougall Weise, T.V., Hrabowski, F., III. Meryerhoff scholars program: a strengths-based, institution-wide approach to increasing diversity in science, technology, engineering and mathematics. Mount Sinai Journal Medicine, **79**: 610-623, 2012.
10. Blake-Beard, S., Bayne, C.B., Crosby, F.J., Muller, C.B. Matching by race and gender in mentoring relationships: keeping our eyes on the prize. Journal Social Issues **67**(3): 622-643, 2011.

11. Bowman, K.J. Gender diversity changes in a small engineering discipline: materials science and engineering. Equality Diversity Inclusion: International Journal **30**(2): 127-144, 2011.
12. Kim, Y.K., Sax, L.J. Student-faculty interaction in research universities: differences by student gender, race, social class, and first generation status. Research Higher Education, **50**: 437-459, 2009.
13. National Center for Science and Engineering Statistics (NCES). Data on women, minorities, and persons with disabilities in science and engineering. Available from http://www.nsf.gov/statistics/wmpd/2013/pdf/tab9-25.pdf, 2010.
14. Lau, L.K. Institutional factors affecting student retention. Education **124**(1): 126-136, 2003.
15. Pascarella, E.T., Terenzini, P.T. How college affects students (volume 2): a third decade of research. San Francisco, CA: Jossey-Bass, 2005.
16. Banks, J.A., Banks, C.A.M. Multicultural Education: Issues and Perspectives. Hoboken, NJ, John Wiley and Sons, 2010.
17. Merolla, D.M., Serpe, R.T. STEM enrichment programs and graduate school matriculation: the role of science identity salience. Social Psychology Education **16**:575-597, 2013.
18. Bilimoria, D., Joy, S., Liang, X. Breaking barriers and creating inclusiveness: lessons of organizational transformation to advance women faculty in academic science and engineering. Human Resource Management, **47**(3): 423-441, 2008.
19. Yoder, B.L. Engineering by the numbers. Engineering College Profiles & Statistics ASEE, 2012.
20. CRA-W, Career mentoring workshop for women in computer science, www.cra.org/events/career-mentoring, accessed January 13, 2015.
21. Fitzpatrick, J.L., Sanders, J.R., Worthen, B.R. Program evaluation: Alternative approaches and practical guidelines (4th ed.). Boston, MA: Pearson, 2011.
22. Vaterlaus, J.M., Higginbotham, B.J. Qualitative program evaluation methods. http://ncsu.edu/ffci/publications/2011/v16-n1-2011-spring/index-v16-n1-Marchr-2011.php