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Peer Leadership and Mentoring in Engineering: A potential path for changing organizational culture to positively impact diversity, equity and inclusion

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Peer Leadership and Mentoring in Engineering: A potential path for changing organizational culture to positively impact diversity, equity and inclusion

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Abstract

In Fall 2017, the College of Engineering implemented an “all-in” mentoring program, called the Engineer-to-Engineer Network, linking first-year students with an upper-level engineering student peer mentor. A sequence of two, one-credit seminar courses are under development to provide foundational support for the network. In the spring, *Special Topics in Mentoring* will provide training for the upper-level engineering peers on how to be an effective mentor and what to look for in a mentoring relationship for themselves. Engineer-peers enrolled in the class will develop strategies for engaging the first-year student cohort entering the subsequent fall. *Peer Leadership in Engineering* will be offered each fall to support implementation of the Engineer-to-Engineer Network while also taking a deeper dive into topics of diversity, equity, and inclusion, providing peer-engineers insight on how to work effectively with a wide range of individuals. *Peer Leadership in Engineering* will also be utilized as a “sandbox” in which to test methodologies for discussing equity and inclusion issues with engineering students. The goal is to subsequently implement effective tools within core departmental seminar courses at the first-year through senior level and/or through evening workshops. Our hypothesis is that a long-term positive shift in the culture of the College, making it more welcoming and supportive of all, will result from working closely with a core group of undergraduate leaders each year to welcome all new students and provide rich extra-curricular opportunities for students across levels and departments to interact. A more welcoming climate will in turn support the College’s efforts to increase the number of women and students of color, while simultaneously improving persistence and graduation rates. Background information on the motivation for these efforts, further details, and preliminary findings of this work in progress are presented.

1. Motivation

Undergraduate enrollment in the University of Massachusetts (UMass) College of Engineering (COE) has almost doubled over the last decade, however the number of female and underrepresented minority (URM) students has not increased proportionally. In Fall 2017, 18.4% of our students across the College were female and 7.5% URM [consisting of 2.8% Black or African American, 0.3% American Indian, 3.5% Hispanic, and 0.6% mixed]. These data represent a slight increase in the percent of women over the last 20 years (compared to 16.3% in 1996) but a decrease in the percent of URM students (compared to a high of 12.6% in 1996). The number of degrees awarded by our COE is slightly below national averages for females, and at about half of the national average for URMs, Table 1. Time to graduation and graduate rate by demographic group are highly variable but indicative of equity issues for our engineering URM undergraduates. Persistence data for students who have declared engineering as a major by their second year are presented in Table 2. While women tend to graduate from engineering in six years at a rate equivalent or higher than the total population, graduation rates for URM students within engineering are consistently lower. Although a number of these students graduate from the University with other degrees, others choose to leave the University.

Table 1: Undergraduate degrees awarded by gender and race/ethnicity
(shaded rows represent national data)

Undergraduates	Women	URM
NSF (2014)	19.8%	15.0%
UMass (2014)	16.6%	8.3%
ASEE (2015)	19.9%	14.7%
UMass (2015)	17.8%	6.8%
UMass (2016)	16.0%	6.9%
UMass (2017)	16.0%	7.5%

Table 2: Six-year graduation rate for students declaring engineering as a major by their second year
(Persistence data for shaded rows reflect 5-year or 4-year graduation rate.)

Entrance Year	Percent graduating with degree in engineering			Percentage graduating with degree from the University		
	Total	Women	URM	Total	Women	URM
Fall 2006 (Grad in 6 yrs)	53.10%	62.07%	28.57%	75.26%	75.86%	42.86%
Fall 2007 (Grad in 6 yrs)	55.89%	54.35%	25.00%	78.11%	80.43%	58.33%
Fall 2008 (Grad in 6 yrs)	61.84%	63.46%	47.83%	80.78%	90.38%	69.57%
Fall 2009 (Grad in 6 yrs)	60.32%	44.9%	42.86%	81.27%	77.55%	71.43%
Fall 2010 (Grad in 6 yrs)	58.69%	58.62%	29.17%	77.83%	81.03%	50.0%
Fall 2011 (Grad in 5 yrs)	59.13%	63.46%	34.62%	78.75%	88.46%	69.23%
Fall 2012 (Grad in 4 yrs)	59.57%	62.41%	34.78%	75.00%	88.14%	65.22%

Both the University and the College have a shared commitment to ensuring a diversity-focused culture and climate that is welcoming, inclusive and supportive of all, however recent campus climate surveys indicate that there is still work to do. Perceptions of overall climate and climate within the classroom vary across social groups and level, such as undergraduate or graduate students (www.umass.edu/diversity/campus-climate). In particular, black and Latino/a undergraduate and domestic graduate students report a higher level of dissatisfaction with racial climate at the campus level. In the classroom, roughly 30% of undergraduate and graduate students report feeling “sometimes” or “often” silenced on a basis of some aspect of their social identity, while 13% of undergraduates and 18% of graduates students report they have “sometimes” or “often” experienced course instructors stereotyping¹.

Informal college level data provide further insight on the climate challenges present within engineering. In Spring 2017, a ‘diversity dialog’ provided significant insight from the student perspective; in particularly highlighting the need for better information dissemination, ranging from increased awareness about existing services to more diversity, equity and inclusion (DEI) focused

¹ College level survey data were not available at the time of this draft but are anticipated for the final paper

formal and informal education. Examples of student comments, questions, and ideas stemming from the dialog are shown in Table 3. Key take away messages include:

- Students want more diversity in terms of demographics; they want to know both how well the university and college are currently doing as well as what is planned to achieve improvement.
- Students want to feel faculty are invested and interested in them; they want to be able to relate to the faculty as well as to other students.
- Students want to see a greater awareness of DEI issues within the college, including education about diversity from college faculty, as opposed to getting this education entirely from the other side of campus.
- Students and faculty would benefit from training and tactics (e.g., for identifying and managing implicit bias and power imbalances, building greater cultural awareness and support for group work, etc.).
- Potentially perceived lack of engagement by students around DEI issues is not due to apathy; they feel stressed and overworked, and need time and space to “care”.

While participants were drawn from across demographic groups, they self-selected to participate, making it unclear from the dialog data if climate concerns are uniform across groups. A subsequent student-led pilot study, consisting of semi-structured in-person interviews, did find discrepancies in student experience and satisfaction across demographic groups. LGBTQIA and students of color, in particular, indicated feeling marginalized both within an outside the classroom. The initial results of their work were presented in 2017 at the ASEE regional spring meeting [1].

The new “all-in” first-year mentoring Engineer-to-Engineer Network is designed to engage the entire engineering community in building a culture more welcoming of diversity, equity and inclusion. The remainder of this paper describes original mentoring program efforts, the new network in more detail, provides a summary of initial results, and outlines next steps and vision.

Table 3: Spring 2017 diversity dialogue student comments, questions and ideas

I wasn't aware of this stuff (e.g., DEI issues) until I took a General Education course last semester.
As an engineer going into conversations like this, students from other majors seem to know a lot more
More white male professors need to step up to these kinds of conversations.
As a student of color, I'm not aware of other groups, such as LGBT, for example.
As a queer student, I'm unable to find STEM faculty to identify with.
As a student of color, I want faculty of color that I can relate to.
How is the university doing relative to its strategic action plan for diversity? How is the college doing?
Some faculty just don't seem nice/interested in us. What can we do, especially for students who are not culturally accustomed to standing up for ourselves?
I want to know more about the socio/political implications of engineering endeavors.

2. Original Mentoring Initiative

The College has run a voluntary (i.e., opt-in) peer-mentoring program with limited success. The program began in 2011 as part of a National Science Foundation (NSF) funded study conducted by the University of Massachusetts Amherst Department of Psychological and Brain Sciences to examine the long-term impact of mentors on female students specifically within UMass COE [12]. The study tracked the success of incoming female engineering students over four consecutive years, and found that 100 percent of the women students mentored by upper-level female students stayed in engineering at the end of their first year in college, compared to a 11% dropout rate for women with no mentors and an 18% dropout rate for women with male mentors [12]. Better retention was correlated with female students' sense of belonging and confidence, rather than grade point average or performance in engineering courses [2].

In 2014, COE began to expand and run the mentoring program internally². While the Dennehy and Dasgupta study had great success encouraging first-year students to voluntarily sign-up, recruiting 150 incoming female engineering students over the four-year study, subsequent recruitment efforts by the College were considerably less successful. The COE program supported 3 mentor-mentee pairs in 2014-2015, 10 in 2015-2016, and 3 in 2016-2017. The reasons for lack of success in recruiting are not entirely clear, but potential factors include: (1) messaging strategies, (2) a need for additional structure, staffing, and support, and (3) competition with other campus initiatives. Each potential factor is briefly addressed below.

In 2011 – 2014, recruitment emails for the NSF study were sent in late August to all incoming female students from COE on behalf of Dr. Dasgupta. The recruitment email invited students to “participate in an important study focusing on the experiences of students in engineering to understand and identify what helps new students succeed in the major”. A small monetary enticement was offered to both mentees (\$85) and mentors (\$100) for their participation. Notably, no words such as “mentor”, “mentee”, or “mentoring” were utilized during recruitment or throughout the study. When the NSF study was concluded and COE began offering a peer-mentoring program, it was advertised as the “Connect for Success Mentoring Program” through direct emails to all incoming females (starting 2015) and students of color (starting 2014), and to the entire engineering student body through an electronic newsletter as well as bulletin board and electronic monitor fliers. While engineering students at all levels were welcome to participate, the goal of Connect for Success was specifically to support first-year females and students of color, aiming to repeat (and expand to students of color) the positive retention impacts observed in the Dennehy and Dasgupta study. The Connect for Success mentoring program coordinator hosted several open house events with food to recruit mentees, and enlisted the assistance of the 25 plus engineering student organizations, instructors of the required freshman engineering seminar course, and faculty teaching the core freshman engineering courses in each department to recruit further. Giving a choice, first-year students chose not to participate in a “mentoring” program, but were apparently willing to participate in an “important study”.

The structure of the mentoring program offered by COE aimed to mimic the NSF study program format. The same mentor training materials were adopted, and mentors were asked to meet with

² The study author's requested that COE not offer a mentoring program until they had a sufficient cohort of participants, and associated control groups, across multiple years to establish statistical significance of the study findings. In 2014, they felt they had sufficient numbers but requested we not directly recruit incoming female students prior to the start of the semester (e.g., allow them to recruit first).

their mentees once a month (7-8 times during the year) at times and locations of their choice. Mentors were given autonomy in terms of their initial and subsequent email communications with their assigned mentees. There were, however, three changes of graduate student staff in the coordinator role from 2014 through 2016. It is possible that these changes in staff resulted in unintended impacts on structure and support that negatively impacted participation of first-year students.

During the same period, other units on campus were developing and promoting mentoring programs, including several of our engineering student organizations (underscoring the need of efforts to collaborate with them), the UMass Center for Multicultural Advancement and Student Success (CMASS), and the alumni association. Students may also choose to live in a wide-range of Residential Academic Program (RAP) Academic Learning Communities, including one specific for engineering. It is unknown how many incoming students chose to participate in these programs in place of the Connect for Success Program.

The Connect for Success Mentoring Program was sunset at the end of the Spring 2017 semester.

3. Peer Leadership and Mentoring in Engineering Initiative

The Engineering-to-Engineer Network launched in Fall 2017. The new initiative consists of two core elements: (1) peer mentoring of all first-year engineering students by trained upper level peers, leveraging student driven social and technical events and (2) leadership and DEI training for upper level mentors. The goals of the program are to:

- Improve retention of female and URM students by increasing their sense of belong and confidence through connecting them with peer engineers from similar demographic groups,
- Engage the entire first-year population in the Network to avoid any potential inferences that women or URM students are more “needy” of support,
- Impart to students the importance of DEI to the College at the start of their academic career, and repeat this message routinely through graduation,
- Provide opportunities for students to improve their cultural awareness and competency,
- Provide opportunities for students to build their leadership skills,
- Provide rich extra-curricular opportunities for students across levels and departments to interact,
- Impart a positive shift in the culture of the College, making it more welcoming and supportive of all,
- Ultimately increase in the number of female and URM students enrolled in the College, as well as their persistence and graduation rates.

The peer-mentoring component of the Engineer-to-Engineer Network is designed based on a model utilized by the Isenberg School of Management (ISOM). Incoming first-year students were informed of the program during New Student Orientation (NSO) over the summer, and told to anticipate an email from their engineering peer in late August. Each incoming first-year student was assigned to an engineering peer in August once class rosters were finalized. Whenever possible female students were paired with female mentors, and students of color were paired with mentors of color. However, first-year students were preferentially paired with an upper-level student in their intended major. Mechanical and industrial engineering students were paired at the rate of about 15 to 18 mentees per mentor, while chemical engineer students were paired at the rate of about 8

mentees per mentor, in part due to a large number of upper-level chemical engineering students committing to being mentors compared to the incoming class. Mentors (i.e., the engineer peers) were asked to communicate with their mentees every week to two weeks and to invite them to participate in College events. Based on the ISOM model, the goal is for 10% of the first year students to “engage” with their engineer-peer in some capacity.

A sequence of two, one-credit seminar courses provide foundational support for the mentoring program. Ultimately, in the spring *Engin 391M: Special Topics in Mentoring* will provide training for the upper-level students on how to be an effective mentor as well as what to look for in a mentoring relationship for themselves. As part of this class, students will also lay the framework for the freshman-peer mentoring program for the subsequent fall. This framework will include planning and scheduling a series of student driven social and technical events – called “pizza plus” events – designed to bring students across the College together. The students enrolled in the class will also set personal and program goals, draft examples of effective mentee communications, discuss important information to share, and help make recommendations based on program. In the fall, *Engin 391P: Peer Leadership in Engineering* will support the peer-mentors week-to-week while also taking a deeper dive into topics of diversity, equity, and inclusion, providing peer-leaders insight on how to work effectively with a wide range of peers. *Peer Leadership in Engineering* will also be utilized as a “sandbox” in which to test approaches for engineering faculty to discuss DEI issues with their students. The goal is to subsequently implement effective approaches within core departmental seminar courses at the freshman through senior year and/or through evening workshops. Ideally upper level students will be recruited and register for Engin 391M in the spring, then serve as an engineer peer the following academic year, enrolling in Engin 391P in the fall.

This year, the first year of the Network, we were unable to recruit and train engineer peers in the spring. Thus the first offering of *Peer Leadership in Engineering* incorporated elements on mentor training that will subsequently be moved to the spring *Special Topics in Mentoring* course. Table 4 provides a listing of YouTube videos, readings, and activities incorporated in the initial offering. Each engineer peer developed a statement of their mentoring philosophy, articulated their personal goals, and defined what “success” would look like to them. Each class period the mentors were asked to share their email strategy, providing a variety of examples in terms of style and content, and share their successes and failures. Class periods were also utilized to discuss the course readings, to participate in hands-on activities, and to provide room for planning the “pizza plus” events. The students were invited to help design evaluation materials for the program, and to pro-actively make suggestions for modifications, one of which was to add the spring *Engin 391M: Special Topics in Mentoring* course.

Since this fall was the first year of the program, only limited data are currently available to evaluate effectiveness. An unexpected outcome was disappointment amongst the engineer peers due to lack of response from their mentees – they did not meet the 10% engagement goal. One conclusion is that further education and work on messaging is needed. A tactical mistake based on the lessons learned from Connect for Success was the use of the word “mentor” in introductory emails to the first-year students. The first-year students do not understand what mentoring is, or its benefits, and as such shy away from engagement when confronted with the term. The suggestion moving forward is to use the terminology Engineer-to-Engineer network and “engineer peer” to refer to the program and mentors, respectively.

The “pizza plus” events were envisioned as an effective way to build cross-departmental and cross-graduating class collaborations that can engage the freshman more quickly. During the fall, three pizza plus events were held that were very successful. The first was a small engine tear down, the second was for students interested in starting an astronomy student group, and the last was a study break during finals “Cookies, coco and pups!”, which provided students the opportunity to pet and play with several dogs. It appears that there is a strong interest in more such events – similarly spanning the range from technical to social – from both the upper-level and first-year students. However there was insufficient time to plan and organize events this fall. While several more events are in planning stages for the spring, one focus of the spring Engin 391M cohort will be to plan and schedule pizza plus events for the Fall 2018 first-year cohort.

Table 6: Videos, readings, and activities utilized in Engin 391P in Fall 2017

YOUTUBE VIDEOS	
Speaker	Topic
Brené Brown	[3] Brené Brown on Empathy vs. Sympathy
Brené Brown	[4] Brené Brown on Blame
Patrick Boland	[5] Failure and the Importance of Mentors
LITERATURE	
Author	Title
Jo Handelsman	[6] Mentoring Learned Not Taught
Tara C. Dennehy and Nilanjana Dasgupta	[2] Female Peer Mentors Early in College Increase Women’s Positive Academic Experiences and Retention in Engineering
Women in Science & Engineering Leadership Institute	[7] Benefit and Challenges of Diversity in Academic Settings
Katherine Phillips	[8] Diversity in Science – How Diversity Makes us Smarter.
Jonathan Kozol	[9] Still Separate, Still Unequal
Elliot P. Douglas	[10] Engineering as a Space of White Privilege
Joachim Walther, Shari E. Miller, and Nicola W. Sochacka	[11] A Model of Empathy in Engineering as a Core Skill, Practice Orientation, and Professional Way of Being
ACTIVITIES	
Topic	Tool
Social and Personal Identities	[12] Discovering Our Personality Style Through True Colors
	[13] Social Identity Guide: Love, Race, and Liberation. “Who Am I? The Question of Identity”, by Tanesha Barnes
Leadership/Grp Work	[14] Activity 3.1: Aerospace team activity: Survival on the Moon
Implicit Bias	Resume review (name bias activity)
	[15] Project Implicit (https://implicit.harvard.edu/implicit/takeatest.html)
	[16] Rate my professor’s gender (theconversation.com/rate-my-professors-gender-37370)
	[17] Ben Schmidt’s Gender and Teacher Reviews interactive website (benschmidt.org/profGender/#)

Currently an on-line survey is open for the first-year students, which they have been asked by their “engineer peer” to complete. While less than 5% have responded to date, the majority (90%) of respondents indicate that they’d like to continue receiving emails. Around 40% indicate that they didn’t need any help, but it was nice knowing someone was there. Smaller numbers reported reaching out or meeting with their engineer peer, or attending an activity, using a tip or resource, or

joining a group mentioned in the emails. The engineering residential living program, academic supports, and clubs were noted as things they found particularly useful in adjusting to college.

The engineering peers have also been asked to complete an on-line evaluation of the videos, readings, and activities utilized in the fall. While data are incomplete, overall the engineering peers valued the opportunity to learn about DEI issues in the workplace, in particular seeing and discussing engineering specific data, but also talking about engineering as a space of white privilege. More than one seminar period ended with students staying longer to talk, reflect, and think further about ways to improve the culture.

One goal of the Engineer-to-Engineer Network is to effect a long-term positive shift in culture, making the College more welcoming and supportive of all. It is anticipated that several years worth of data will be needed to adequately gauge program success.

4. Next Steps

The College will continue to build the Engineer-to-Engineer network during the spring semester, focusing on providing a series of pizza plus events for our current first-year students, as well as training mentors and building the scaffolding for the Fall 2018 cohort through the spring *Special Topics in Mentoring* seminar course. Throughout the spring, options to translate insights learned from the fall *Peer Leadership in Engineering* seminar into materials for inclusion in the freshman and departmental upper-level seminar courses will be explored in collaboration with the Institute for Teaching Excellence and Faculty Development (TEFD) and the departments. Additional options to support faculty and student development around DEI issues will also be explored. Over the summer, the new cohort of incoming students will be paired with engineer peers, and updates to *Peer Leadership in Engineering* will be made.

Evaluation of the program is on going, including data collection through surveys and more qualitative feedback from small group discussions with the upper-level engineer peers and their first-year mentees. Quantitative data on the first-year students will also be tracked, including GPA and retention to second-year. Currently the College does not conduct exit surveys for students leaving the major, but this is under consideration. After three years the “all in”, Engineering –to-Engineer Network will be re-evaluated to determine if it should be continued.

5. Vision for the Future

The nation is becoming increasingly diverse, and it is expected that by mid-century there will be no clear racial or ethnic majority [18], [19]. Diversity contributes to better decision-making, and more innovative, creative approaches to problem solving [20], [21], [22], [23], [8]. Cultural competency is critical for success in a global marketplace [20], [21], [22]. Several studies have shown that more diverse teams generate more patents, and increased diversity is correlated with better corporate performance [23], [8]. Beyond losses in innovation, creativity and revenue, lack of equity and inclusion in science, technology, engineering, and mathematics represents a mark against the principles of a democratic society that are the foundation of the Nation and its public, land-grant universities [10]. Societal costs associated with the status quo when it comes to diversity within engineering could be significant.

The College is committed to preparing our students for life and leadership in a multicultural, technological career by not only providing opportunities for forming intellectual and social connections with people from a variety of backgrounds, but by also helping students to understand

the value of such connections. In support of this goal, the College aims to see improvement in student, staff, and faculty satisfaction with climate over the next five years, particularly for black and Latino/a students, and an increase in the number and persistence of underrepresented minorities in engineering at all levels. A range of metrics will be utilized to track success, including application, selectivity and yield data, GPA, time to graduation, graduation rate, and climate measures by demographic group. The tactics to achieve this vision, including the Engineer-to-Engineer Network, are outlined in the College's DEI strategic plan.

In Fall 2018, a new engineering community and creative learning space will open. Designed specifically to promote an inclusive and welcoming environment, approximately one-half of the renovated space is devoted to communal work areas and lockers for graduate students, and the other half to collaborative workspace for undergraduates, including a large conference room. The office of the Assistant Dean for Diversity will be co-located in the undergraduate space, which is designed to welcome our six diversity focused undergraduate student organizations as well as the broader undergraduate student body through engagement of the more than twenty additional engineering student led organizations. The goal, aligned with that of the Engineer-to-Engineer Network, is to create a community space that invites students to come together both academically and socially.

6. References

- [1] Z. Noel and V. Martinez, "Diversity in UMass Amherst Engineering: the visible, invisible, an hypervisible", presented at the American Society for Engineering Education Northeast Section 2017 Annual Conference, Lowell, Massachusetts, April 27 – 29, 2017.
- [2] T.C. Dennehy and N. Dasgupta, "Female Peer Mentors Early in College Increase Women's Positive Academic Experiences and Retention in Engineering," *PNAS*, vol. 114, no. 23, pp. 5964-5969, June 6, 2017.
- [3] B. Brown. "Brené Brown on Empathy vs Sympathy," *YouTube*, Apr. 1, 2016 [Video file]. Available: <https://www.youtube.com/watch?v=KZBTYYViDPIQ>. [Accessed: Aug. 30, 2017].
- [4] B. Brown. "Brené Brown on Blame," *YouTube*, Feb. 3, 2015 [Video file]. Available: https://www.youtube.com/watch?v=RZWf2_2L2v8. [Accessed: Aug. 30, 2017].
- [5] P. Boland. "Failure and the Importance of Mentors," *YouTube*, Jan. 28, 2016 [Video file]. Available: <https://www.youtube.com/watch?v=-o-uGCPnHCw>. [Accessed: Aug. 30, 2017].
- [6] J. Handelsman, "Mentoring: Learned, Not Taught – Identifying Challenges" in *Entering Mentoring: A Seminar to Train a New Generation of Scientist* J. Handelsman, C. Pfund, S.M. Lauffer, C.M. Pribbenow. Madison, WI: The Wisconsin Program for Scientific Teaching, University of Wisconsin-Madison, 2005, 52 – 64. [Online] Available: www.hhmi.org/grants/pdf/labmanagement/entering_mentoring.pdf. [Accessed: Aug. 30, 2017].
- [7] Women in Science & Engineering Leadership Institute, "Benefit and Challenges of Diversity in Academic Settings," University of Wisconsin-Madison, 2010, 9 pp. [Online] Available: https://wiseli.engr.wisc.edu/docs/Benefits_Challenges.pdf. [Accessed: Aug. 30, 2017].
- [8] K.W. Phillips, "How Diversity Makes Us Smarter," *Scientific American*, Oct. 1, 2014. [Online] Available: <https://www.scientificamerican.com/article/how-diversity-makes-us-smarter/>. [Accessed: Aug. 30, 2017].
- [9] J. Kozol, "Still Separate, Still Unequal: America's educational apartheid," *Harper's Magazine*, pp. 41 – 54, September 2005.
- [10] E.P. Douglas, "Engineering as a Space of White Privilege," *Understanding & Dismantling Privilege*, vol. V, Issue 1, 37 – 44, February 2015.

- [11] J. Walther, S.E. Miller, and N.W. Sochacka, “A Model of Empathy in Engineering as a Core Skill, Practice Orientation, and Professional Way of Being,” *Journal of Engineering Education*, vol. 106, no. 1, pp.123-148, Jan. 2017.
- [12] Head Start of Greater Dallas, “Discovering Our Personality Style Through True Colors,” Head Start of Greater Dallas, undated. [Online] Available: <https://www.pgdsd.org/cms/lib/PA01916597/Centricity/Domain/568/True%20Colors%20.pdf>. [Accessed: Aug. 30, 2017].
- [13] T. Barnes, “Who Am I? The Question of Identity” in *Love, Race, and Liberation. ‘Til The White Day is Done*, J.L. Calderon and M.R. Hall, Eds. New York, NY: Love-N-Liberation Press, 2010, pp. 11 – 19.
- [14] Educationdocbox.com, “Activity 3.1: Aerospace team activity: Survival on the Moon”. Posted by Jemima Greer. [Online] Available: http://educationdocbox.com/Homework_and_Study_Tips/66817588-Activity-3-1-aerospace-team-activity-survival-on-the-moon.html
- [15] Project Implicit. [Online]. Available: <https://implicit.harvard.edu/implicit/takeatest.html>. [Accessed Aug. 30, 2017].
- [16] A. Bartlett, “Rate my professor’s gender,” *The Conversation*, Feb. 9, 2015. [Online] Available: theconversation.com/rate-my-professors-gender-37370. [Accessed Aug. 30, 2017].
- [17] Ben Schmidt, “Gender and Teacher Reviews,” Feb. 2015. [Online]. Available: benschmidt.org/profGender/#. [Accessed Aug. 30, 2017].
- [18] D. Cohn and A. Caumont, “10 Demographic Trends that are Shaping the U.S. and the World,” *Pew Research Center*, March 31, 2016. [Online] Available: <http://www.pewresearch.org/fact-tank/2016/03/31/10-demographic-trends-that-are-shaping-the-u-s-and-the-world/>. [Accessed: Dec. 28, 2017].
- [19] National Action Council on Minorities in Engineering, “Trends in the U.S. Population and Engineering Workforce,” *NACME Research & Policy*, vol. 3, no. 5, January 2014. [Online] Available: http://www.nacme.org/images/pdfs/research/Trends_US_Population_Engineering_Workforce.pdf. [Accessed: Dec. 27, 2017].
- [20] S.E. Page, *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies*. Princeton, NJ: Princeton University Press, 2008.
- [21] S.A. Hewlett, M. Marshall, and L. Sherbin, “How Diversity Can Drive Innovation,” *Harvard Business Review*, vol. 91, no. 12, pp. 30+, 2013. [Online] Available: <https://hbr.org/2013/12/how-diversity-can-drive-innovation>. [Accessed: Dec. 27, 2017].
- [22] Forbes Insights, “Global Diversity and Inclusion: Fostering innovation through a diverse workforce,” New York, NY: Forbes Insights, 20pp., 2011. [Online] Available: https://i.forbesimg.com/forbesinsights/StudyPDFs/Innovation_Through_Diversity.pdf. [Accessed: Dec. 28, 2017].
- [23] M. Ouimet, “5 Numbers that Explain Why STEM Diversity Matters to All of Us,” *Wired*, 2015. [Online] Available: <https://www.wired.com/brandlab/2015/05/5-numbers-explain-stem-diversity-matters-us/>. [Accessed: Dec. 28, 2017].