

INCLUSIVE INNOVATION: CREATING A CONFERENCE TO PROMOTE DIVERSITY IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH

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The College of Engineering at the University of Missouri, Columbia (MU Engineering) develops engineering leaders who positively influence society and bring innovation to the global workforce. Recruiting top students from around the world to fuel an atmosphere of excellence and cutting-edge growth, MU Engineering prepares out-of-the-box thinkers, innovators, and entrepreneurs who stand ready to lead today and adapt to tomorrow. To engage all of our students with industry in an inclusive space, the MU Engineering Office of Diversity and Outreach Initiatives established the Diverse Engineering Professionals Conference in 2017 in partnership with a student committee. The committee included representatives from various organizations, including the National Society of Black Engineers, Society of Hispanic Professional Engineers, Engineering Student Council, Society of Women Engineers, and Out in STEM. Industrial sponsorships were secured with assistance from the MU Engineering Leadership, Engagement and Career Development Academy. The daylong conference recognizes diversity organizations and diverse students and their achievements while promoting our core college values of integrity, excellence, and collaboration. The conference includes professional development and diversity education workshops, research presentations, keynote speakers, and a closing ceremony. In its first year, the conference featured nine companies and attracted about 75 attendees. In year two, the conference nearly doubled its impact with 12 companies and 150 attendees, including students from all majors, years, and demographics. The conference was well received across both years and continues to grow as an annual effort in the college. Feedback from company representatives and students re-emphasized the need for an intimate company-student environment like that found at the Diverse Engineering Professionals Conference.

Key words: Diversity; Inclusivity; Student development; Career; Leadership; Industry; Industrial engagement; Inclusive Excellence

INTRODUCTION

There is a growing need for inclusive innovation and the removal of barriers for the next generation of students in science, technology, engineering, and math (STEM). STEM in higher education has

garnered great interest in recent years, with reports of the advantages such a degree holds for students in terms of financial stability and easier job placement, among other benefits (1). The National Science Foundation (NSF) reports that demographics in

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STEM consist of more males than females, and the field is populated by Caucasians and Asians more so than African Americans, Hispanics, or Native Americans (2). Students from underrepresented minority backgrounds (URM) in STEM refer to people who identify as African Americans, Hispanics, and Native Americans, as well as women and those with disabilities. Understanding the importance of diversity in STEM for global innovation, the Diverse Engineering Professionals Conference (DEPC) was created in the College of Engineering at the University of Missouri, Columbia (MU Engineering).

The lack of understanding about engineering and STEM careers creates an automatic barrier, particularly when the stereotype is that engineering is a “man’s world,” where one must be strong, objective, and analytical (3,4). In addition to not understanding STEM fields adequately, students do not easily find mentors in industry they can relate to and vice versa. These stereotypes about who makes up or “belongs” in STEM (gender and race) are reinforced by the reality that there is a clear underrepresentation of women and URMs in STEM careers. The NSF reported that 67% of scientists are white, and a majority of them are male, while African American and Hispanics make up 5% and 6%, respectively (2). The existing stereotypes and demographics set their own tone for the perception of who belongs in a STEM career. Similarly, higher education statistics show only 20% of engineering bachelor’s degrees are awarded to women, and 20% of science and engineering bachelor’s degrees are awarded to those from underrepresented groups (2). These divides trickle into the STEM workforce as well. White men make up about 50% of scientists and engineers in the workforce according to a recent NSF report (2). The for-profit sector is made up of 64% male scientists and engineers. Furthermore, in STEM occupations, only 5% of workers are black and 6% of workers are Hispanics as compared to 12% and 16% in the overall U.S. workforce, respectively. Underrepresented minorities who are also women have the highest unemployment rate among STEM majors compared to their counterparts. All of these statistics support the notion that STEM culture and the marginalization of certain subgroups transcends institutions of higher education. This fosters higher gender and

racial discrimination because of the disparity in representation (3). Innovative solutions, such as the DEPC, provide opportunities to break these stereotypes and reduce disparities.

The value of diversity can be seen at multiple levels. It provides for personal growth, new relationships, and higher levels of intellectual engagement (5). Amongst organizations, it allows for innovation, creativity, and enhanced productivity. For example, Fortune 500 companies with the highest proportion of women on their boards performed significantly better than firms with the lowest proportion (6). In addition, it is good for the bottom line, as shown by several studies, including a study showing racial and gender diversity as the largest contributors and predictors of positive change in sales revenue and relative profitability as well as the ability to retain more customers (7). Having diverse perspectives on a team will result in an array of solutions to challenges; however, this is likely to create conflict due to the range of ideas and lack of homogeneity (8). Exposure to this type of conflict results in employees being able to find better solutions as a team, improve team communication and dynamics, and adapt to turbulent environments, which fosters more productivity long term (8). As the Equality of Opportunity Project has stated, “if women, minorities, and children from low-income families were to invent at the same rate as white men from high-income families, the rate of innovation in America would quadruple” (9). DEPC aims to provide a path towards a diverse workforce that will change the landscape of innovation in America.

INCLUSIVE INNOVATION

At MU Engineering, we are developing engineering leaders who positively influence society and bring innovation to the global workforce. Recruiting the brightest students from around the world to fuel an atmosphere of excellence and cutting-edge growth, MU Engineering prepares out-of-the-box thinkers, innovators, and entrepreneurs who stand ready to lead today and adapt to tomorrow.

This means more than ensuring our students are proficient in engineering. Research from organizations such as the National Association of Colleges and Employers, the University Industry Demonstration

Partnership, and the *Chronicle of Higher Education* consistently shows that while companies are desperate to secure the workforce of tomorrow, they are demanding a higher level of career readiness (10).

Career fairs and job interviews are increasingly seen as artificial forms of interaction between students and industry. Relationships developed in a professional environment are key indicators of future success in the job market, and the soft skills honed through these relationships provide a foundation for continuous improvement (11). We provide the environment for this kind of activity at MU Engineering through efforts such as the Inclusivity Center and the MU Engineering Leadership, Engagement and Career Development Academy.

REMOVING BARRIERS

Those in the minority groups are prime examples of the iceberg theory, which suggests there is more beneath the surface impacting the outward performance and attitude towards STEM (1,12). As Agree et al. discuss, these invisible factors can include learning disabilities, socioeconomic status, gender identification, multiple ethnic or racial identities, cultural educational values, and many others, all of which emphasize the need for a holistic curriculum for students in STEM to address all aspects of an individual (1). As part of this holistic approach, engaging with companies is vital, as it shows students how they can utilize their degrees as they consider their future careers. DEPC was created by students from multiple student organizations at MU—including the National Society of Black Engineers, Society of Hispanic Professional Engineers, Society of Women Engineers, and Out in STEM—who yearned for a conference that mimicked their national conferences but had more intimate interactions with companies. Furthermore, DEPC provides a way for students to address ‘imposter syndrome’ by providing them opportunities to engage with industry among a group of their peers. Imposter syndrome refers to the self-doubt (of belonging in a major/field) and lingering feelings of inadequacy shown to be prevalent in women and underrepresented minorities (13). At DEPC, students often discover their classmates also struggle with imposter syndrome. Talking about their experiences results in peer to peer learning, which

is one of the best ways to tackle imposter syndrome.

DEPC also helps company representatives tackle implicit biases that may exist. Bias is an instinctual response or association based on previous experiences, media exposure, stereotypes, etc. that shapes how we perceive people and situations (14). When it comes to STEM, biases have long been established—some falsely so—via misguided research presentations. For instance, in the late 1980s and 1990s, researchers utilized a deficit model indicating that minorities and women lacked the abilities to be successful in STEM fields, whether that was manifest in their mathematics and computational abilities or aptitude differences (15,16). Clearly this is not the case, but biases do exist, particularly towards women and minorities in STEM. For students to succeed, they have to recognize the biases they face and avoid internalizing them. Through DEPC, we are also able to dive deeper into biases with company representatives by having them interact directly with students who would otherwise be stereotyped. This allows for an increased awareness of the potential for bias amongst representatives and in their company cultures.

In addition, DEPC tackles stereotype threats that students may be experiencing. A stereotype threat is defined as having a fear of fulfilling existing negative stereotypes or biases (typically related to their identity), which can result in self-hindrance (17). Steele and Aronson researched a range of situations, including how this affects African American students on standardized tests, women in math when compared to men, and white males when compared to Asian males in math performance (17,18). In all studies, stereotype threat negatively impacted performance. Students will shy away from interacting with larger companies for fear of confirming the stereotype that they do not belong in the field. DEPC tackles this by providing a more intimate exhibit fair that operates with the premise of getting to know each other—for both peer-to-peer and students with company representatives—and learning together. It removes the fear of being compared to other groups and provides an environment where biases are not as prevalent since companies tend to send diversity specialists or attend training sessions themselves during DEPC.

According to a recent Pew research study,

racially-motivated discrimination is faced by more than 60% of African Americans and 42% of Hispanics in the STEM workforce. These experiences include being treated as not competent for the job, being isolated in the workplace, facing environments where they are automatically associated with negative stereotypes or endure bias, being passed over for promotions, having to work harder due to higher standards set for them as a minority, and feeling unwelcome in their workplaces (19). These findings are similar to those discussed for the minority groups in higher education and are among the reasons why they change majors or lose interest in STEM—and, in this case, do not work in STEM—being unwelcome, commonly negated or disrespected, and not having room to grow as an important member of the team.

DEPC presented an opportunity for students to expand their networks in a less intimidating setting than a large career fair, where they may feel tokenized within company culture. Larger career fair settings are fast-paced: company representatives have a mission to recruit, and students aim to get a job. But not all recruiters are trained diversity specialists, so things can be said unintentionally that can foster imposter syndrome and stereotype threat. Students have expressed “how obvious it was that they were talking to me differently because I was a woman,” or that “they did not understand/value my involvement in X minority-focused organization, which was an important part of my college experience.” Companies tend to have lots of recruiters but not necessarily diversity specialists or those trained in diversity and inclusion. Therefore, they do not have a full grasp of the needs of students traditionally underrepresented in engineering. In this regard, DEPC allows for two-way conversations that mitigate imposter syndrome and stereotype threat.

INDUSTRIAL ENGAGEMENT

As company leaders approach higher education institutions, they express the desire to support diversity efforts, to diversify their employee makeup, to engage students from minority organizations with their organizations, and to retain students who intern with them as full-time employees after graduation. Industry leaders tend to struggle with how to do this effectively and strategically. Part of the current

approach is to donate money to different student organizations with hopes that it will have a return on investment in some form. However, students in organizations rarely know which companies sponsored or donated to their funds; the executive board may know, but rarely does that information get relayed to the student members. DEPC wanted to increase visibility of company leaders and representatives by giving them direct access to students—both in terms of financial support and their presence for a whole day—to really share what they can offer traditionally underrepresented students at their companies.

Industrial sponsorships were secured with assistance from the MU Engineering Leadership, Engagement and Career Development Academy. Student organizers attended the career fair hosted by the Academy and were able to form connections with company representatives to invite them to DEPC. The Academy also advertised the opportunity for companies to engage with DEPC and become sponsors.

STUDENT PERSPECTIVE

A typical student does not know much about each company’s culture except what they can see during interviews or internships or what they hear from other students. They note if there is anyone who looks like them, if there is anyone who can mentor them, or if it looks like they are the token hire. These can all trigger imposter syndrome and self-doubt, which may deter them from working for the organization or feeling like it is a good fit for them.

DEPC allows company representatives to be present at a conference that is focused on valuing diversity. They have a chance to share information about their employee resource groups, such as women’s resource groups and multicultural resource groups, which are typically corporate versions of student organizations. It also allows both students and company representatives to connect early on in the process. In addition, some companies opt to send a diversity specialist and a recruiter, which helps establish a sense of belonging before the interviews begin.

ACADEMIC PERSPECTIVE

At MU Engineering, we want to provide our students with every resource and path to succeed. We also want them to join companies where they feel

welcome and can achieve their full potential. It is both important to provide an avenue for company leaders to present their own diversity and inclusivity platforms, resources, and initiatives to students, as well as to provide students the opportunity to engage in topics that matter to them. DEPC helps provide that connection. Company leaders who understand our mission and values attend and recruit our students. DEPC is not focused on securing employment like most career fairs; instead, it focuses on building relationships, expanding networks, having important diversity and inclusivity conversations, and developing as an individual.

An interesting outcome from the launching of DEPC was the desire by non-minority groups, such as the MU Engineering Student Council, to be co-organizers and support their minority peers. They wanted to learn more about what their peers dealt with as well as provide a helping hand to ensure the success of DEPC. DEPC provides an avenue for student comradery, which is a valuable component of an inclusive college.

IMPLEMENTATION AND DESIGN

To organize the DEPC, every January, students started meeting weekly with the Office of Diversity and Outreach Initiatives to plan and implement DEPC in the fall. The conference was designed to include several workshop tracks: company information sessions, professional development, and diversity education. Advancing inclusivity should not be the burden of URM students; therefore, it was important to include diversity education workshops that catered to those wanting to learn more. Company representatives presented various professional development workshops with a focus on the experiences and needs of URM students. These all provided opportunities for company teams to connect with students directly. Topics included “Job Searching as a Person of Color” by Veterans United Home Loans; “Making the Transition from College to the Professional World” with Rockwell; “Mastering the Interview” with AT&T; “Exploring Privilege” with Diversity Peer Educators; “Understanding Your Company’s Diversity Policies,” “Diversity in Student Leadership,” and “Diversity and Inclusion in the Workplace” with US Bank.

The conference also included an exhibit fair where each representative shared opportunities available at

their company and information about their diversity and inclusivity initiatives. The exhibit fair also featured research poster sessions to highlight research students conducted and to engage graduate students. Lastly, the conference had a networking banquet that allowed for company representatives and students to informally meet each other over lunch.



Figure 1. Student organization and corporate sponsors for year one (A) and year two (B).

During the first year, the College of Engineering helped launch the conference by being a diamond sponsor. Word spread quickly among company leaders and students, resulting in a doubling of the engagement and sponsorships for the second year, with two different company leaders competing for top sponsorship. Sponsorships ranged from \$500 to \$5,000 and included logo placement in materials, reserved networking tables, speaking opportunities, and more. With increased sponsorship in year two, DEPC was able to host students from neighboring universities and cover their transportation and lodging costs. Figure 1 shows the different student and corporate sponsors.

OUTCOMES

Participant Demographics

Each year, students from multiple backgrounds attended (Figures 1 and 2). In both years, the same registration form was used to collect demographic data. A notable difference between years one and two was the increase in participation of students from Caucasian backgrounds, which grew from 20% to 46%. This is, in part, because of the Mizzou Engineering Student Council, a non-minority

focused organization, becoming a co-sponsor and an organizing entity in the conference. This provided a unique engagement opportunity for students who otherwise may not connect with each other in a traditional academic setting.

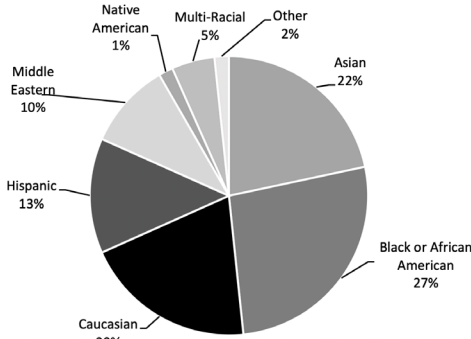


Figure 2. Participant demographics for year one of DEPC.

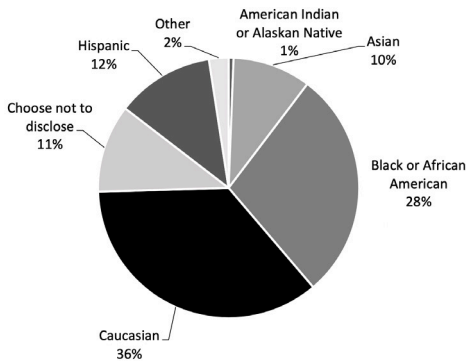


Figure 3. Participant demographics for year two of DEPC.

Persistence in STEM degrees

Ma and Liu discuss how there is a high number of students from underrepresented groups in first-year STEM programs, but their persistence rate to graduation is lower compared to their white peers (20,21). Knowing this, DEPC aimed to provide first-year engineering students with direct exposure to industry and potential careers to provide a hook for students and improve retention. Approximately 18% of participants were first-year engineering students, and 16% were sophomores. The conference

saw increased engagement of alumni and students of all years in the second year. In addition, all engineering majors were represented both years.

Feedback

At each conference, feedback was collected from participants and company representatives in the form of conversations or surveys (Figure 4). Company representatives indicated that they enjoyed and had the most interaction with students at the exhibit fair and the networking lunch. Students felt they were more prepared to network with representatives because of the intimate nature of the conference. In addition, students indicated they gained knowledge about how diversity and engineering are linked. Students cited how impressed they were to see the workshop topics, where company representatives discussed diversity and inclusion at their companies as well as having sessions that trained them on these topics. One student said, “I enjoyed the workshops because they inherently fostered inclusivity,” speaking to the goal of DEPC. Other feedback focused on conference structure, length of sessions, critique of specific sessions, and companies that the students wanted to invite in the future. Having students and company representatives in workshops together was impactful for both groups since company representatives were welcome to take part in the entire conference.



Figure 4. Feedback from participants about what they enjoyed most at DEPC.

FUTURE DIRECTIONS

Organizations such as the Science and Technology Policy Institute recognize that there are hindrances

for underrepresented groups, including women, to persist along the STEM pathway into a STEM career (22). They indicate the need to foster a pathway into STEM starting in K-12 populations as well as to provide universities with foundational resources to be able to address the needs of these students to ultimately enhance the STEM workforce. DEPC is one avenue to bridging the gap for URM students as well as engaging industry with students.

DEPC will continue to provide opportunities for students to engage with each other and companies. Utilizing our MU Engineering Leadership, Engagement and Career Development Academy and Office of Diversity and Outreach Initiatives, we will increase corporate engagement. Additional money raised will be used to support cultural competency developmental sessions throughout the year to engage all student organizations. Offerings will include sessions that help students from traditionally underrepresented backgrounds address imposter syndrome and stereotype threat. In addition, we will host industry speakers that students can relate to and be inspired by as well as host development sessions led by industry related to diversity and engineering. This will increase retention in engineering, help those who are facing imposter syndrome, and provide follow-up for DEPC.

CONCLUSION

The DEPC is the product of collaboration among our MU College of Engineering students, the MU Engineering Leadership, Engagement and Career Development Academy, and the Office of Diversity and Outreach Initiatives. The conference benefited students from groups traditionally underrepresented in STEM by helping overcome imposter syndrome, stereotype threat, and existing biases about being a minority in STEM. It grew to include an avenue for non-minority allies to support their peers. Further, DEPC provided an opportunity for industry representatives to engage with students on topics that mattered to them as well as share tactics in their companies that can promote the success of the student attendees. The feedback from the past two DEPCs shows the potential to impact the confidence of students traditionally underrepresented in STEM and promote a sense of belonging and retention in

STEM. In order to continue to be innovative and meet the needs of the future, it is important to create an inclusive environment to support the diversity of our students.

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