

## **Statement on Diversity, Inclusion, and Equity in Engineering**

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For the last year and a half I have worked in the southern Philippines with an organization called Sigay Kauyagan on the campus of Mindanao State University. Sigay Kauyagan's mission is to facilitate education and community development among the diverse cultural communities on the island of Mindanao. As a staff member, my role is to assist in managing our indigenous and Muslim student center and to mentor, tutor, and teach classes for indigenous and Muslim students. I also engage in continuous learning through team trainings, and even attended a weeklong cultural ethnography conference in order to better understand our student clients.

My involvement with Sigay Kauyagan reflects the value and significance I place upon diversity, inclusion, and equity. I believe it is morally and ethically important to empower the students that I encounter to perform at high standards, and furthermore that students from all backgrounds should be represented in a university educational setting. Additionally, in light of research findings that diversity promotes success in scientific and engineering environments [1-6], I view pursuing diversity as a critical means of achieving excellence in classrooms and laboratories. In my past and present occupations, I have strived to further diversity, inclusion, and equity. *I have promoted these ideals primarily through the approaches of mentoring and strategic recruiting, which I intend to continue throughout my service in academia.*

### **Mentoring**

Mentoring is important for diversity, inclusion, and equity, because it helps guide individuals toward success and improves retention within the science and engineering fields [7]. To give one example from my time with Sigay Kauyagan, two senior mathematics college students once approached me for help with their undergraduate theses. I eagerly agreed to assist them, but in doing so I remembered the unique challenges these scholars faced. To name a few, these students were women in a male-dominated field, Muslims in a primarily Catholic-religion nation, members of a tribal minority group, and economically disadvantaged compared to their peers; they faced frequent and significant racial and religious discrimination inside and outside of the university. The students and I met weekly throughout the semester to address both technical and non-technical challenges in their projects and careers. During our time together I demonstrated my value for their unique experiences by listening to their stories, and offered a long-term perspective and positive encouragement in order to spur them on toward the goal they so highly prized.

In addition to mentoring many students through Sigay Kauyagan, I also engaged in mentoring, both giving and receiving, while at Stanford University. As a new graduate student, I had the opportunity to assist an experienced female doctoral candidate, one of the few women in the laboratory group at that time. By watching her, I learned not just protocols and techniques, but more importantly how to speak precisely, strive for excellence, persevere through difficulties, balance competing priorities, and offer words of encouragement. This student exemplified good mentorship for me, and I later applied this knowledge as I directed two undergraduates in a summer research program and a master's degree student in another research project. Through my involvement with Sigay Kauyagan and Stanford University, I have learned how to advise and council students from a wide variety of backgrounds, helping them persevere through challenges and achieve success.

As a professor, I intend to build upon the mentoring foundation that I acquired through Sigay Kauyagan and Stanford University. A key to achieving and sustaining diversity within technological fields is to increase student retention. Unfortunately, students leaving STEM areas often report lacking a good personal fit within their educational and vocational communities [8, 9]. However, research shows that when students engage with and apply their classroom knowledge in purposeful and practical ways, they are more likely to complete their studies [10]. In light of these findings, my aim is to act as an advisor and advocate of students, to inform and inspire them about the creative potential and social utility of engineering from the very beginning of their academic journeys. I plan to do this by facilitating students' involvement in applied activities such as

internships, research, and publishing. Also, similarly to my work at Sigay Kauyagan, I intend to pay careful attention to the unique experiences and needs of all scholars when providing guidance, in order to help students establish a sense of belonging within engineering. Finally, knowing that advising and teaching are intertwined, I intend to use my courses to promote diversity, inclusion, and equity. I aim to accomplish this by understanding and responding to my students' educational backgrounds, assigning and assessing projects in ways that promote inter-student collaboration rather than competition, and designing and facilitating active learning experiences [11, 12]. I look forward to serving as a mentor in these ways as a professor.

### **Strategic recruiting**

Recruiting strategically is important in achieving diversity because it increases the strength of the applicant pool [13]. I currently serve on a committee at Sigay Kauyagan that awards scholarships to select minority students based on their demonstrated financial need and academic achievement. During my time interacting with students, I make a point to promote this opportunity widely and to assist students in completing the application requirements. In serving on this committee, I have built upon my initial experience from participating in the recruiting team at Sandia National Laboratories. Also important in strategic recruiting is assessing applicants fairly, which I emphasized while volunteering as an alumni undergraduate admissions interviewer for Duke University for eight years and while serving as a reviewer for National Defense Science and Engineering Graduate (NDSEG) fellowship applications. Knowing that research has shown the strengths of some female and minority applicants can be inadvertently overlooked [14], when considering such candidates, I asked questions to draw out their accomplishments and highlight their potential. Through these varied recruiting experiences, I have learned how to seek out, appreciate, and promote a diverse array of candidates in the sciences and engineering.

As a faculty member, I intend to continue promoting diversity, inclusion, and equity through my recruiting efforts. My goal is that, at a minimum, the representation of my laboratory group reflects the diversity of the university at large; this may be challenging due to the relative lack of diversity within engineering. Furthermore, my aim is that at least ten percent of my research group is composed of undergraduates, in order to provide practical opportunities to inspire and motivate aspiring engineers. To accomplish this, I intend to network with faculty, scientists, and administrators when seeking talent for my group, in order to identify a wide spectrum of promising students who I can specifically encourage to pursue research. In addition, I am interested in participating in campus/departmental visitation events, which would give me opportunities to speak with potential applicants. Furthermore, understanding that everyone, including myself, has judgment-clouding biases [15], I plan to seek second opinions from a diverse group of other professors when judging candidates and to allow myself adequate time to evaluate candidates to avoid making inaccurate generalization-based decisions [16]. Lastly, I intend to hire students based on both their demonstrated high achievement as well as their potential for future success [17]. Importantly, this requires communicating to potential students that a lack of research experience does not disqualify them from my team. Through these strategic recruiting efforts, I hope to further diversity, inclusion, and equity in my department and in my own research group.

Looking back at the two students working on their theses, I am proud to say that, after a semester of hard work, they arrived at graduation with finished copies of their original research. Their achievement reminds me of the power of mentorship to guide individuals, especially underrepresented minority students, toward success. Turning ahead toward the future, I await chances as a faculty member to strategically recruit students to become the science and engineering leaders of tomorrow. *Envisioning a thriving future for these scholars motivates me to continue pursuing diversity, inclusion, and equity using the approaches of mentoring and strategic recruiting.*

## References

- [1] Poppy Laurretta McLeod, Sharon Alisa Lobel, and Taylor H. Cox, Jr. (1996). Ethnic diversity and creativity in small groups. *Small Group Research* 27(2)248-264.
- [2] William A. Wulf and the National Academy of Engineering (2002). The importance of diversity in engineering. In *Diversity in Engineering: Managing the Workforce of the Future*. Washington, DC: The National Academies Press. DOI: 10.17226/10377.
- [3] Lu Hong and Scott E. Page (2004). Groups of diverse problem solvers can outperform groups of high-ability problem solvers. *Proceedings of the National Academy of Sciences of the United States of America* 101(46)16385-16389.
- [4] Anthony Lising Antonio, Mitchell J. Chang, Kenji Hakuta, David A. Kenny, Shana Levin, and Jeffrey F. Milem (2004) Effects of racial diversity on complex thinking in college students. *Psychological Science* 15(8)507-510.
- [5] Stefan Schulz-Hardt, Felix C. Brodbeck, Andreas Mojzisch, Rudolf Kerschreiter, and Dieter Frey (2006). Group decision making in hidden profile situations: Dissent as a facilitator for decision quality. *Journal of Personality and Social Psychology* 91(6)1080-1093.
- [6] Mathias Wullum Nielsen, Sharla Alegria, Love Börjeson, Henry Etzkowitz, Holly J. Falk-Krzesinski, Aparna Joshi, Erin Leahey, Laurel Smith-Doerr, Anita Williams Woolley, and Londa Schiebinger (2017). Opinion: Gender diversity leads to better science. *Proceedings of the National Academy of Sciences of the United States of America* 114(8)1740-1742.
- [7] Christina M. Vogt (2013) Faculty as a critical juncture in student retention and performance in engineering programs. *Journal of Engineering Education* 97(1)27-36.
- [8] Angela C. Johnson (2007). Unintended consequences: How science professors discourage women of color. *Journal of Engineering Education* 91(5)805-821.
- [9] Rose M. Marra, Kelly A. Rodgers, Demei Shen, and Barbara Bogue (2013). Leaving engineering: A multi-year single institution study. *Journal of Engineering Education* 101(1)6-27.
- [10] Christiane Corbett and Catherine Hill (2015). *Solving the equation: The variables for women's success in engineering and computing*. American Association of University Women (AAUW). Available at <https://www.aauw.org/files/2015/03/Solving-the-Equation-report-nsa.pdf>
- [11] Karl A. Smith, Sheri D. Sheppard, David W. Johnson, and Roger T. Johnson (2005). Pedagogies of engagement: Classroom-based practices. *Journal of Engineering Education* 94(1)87-101.
- [12] Clive L. Dym, Alice M. Agogino, Ozgur Eris, Daniel D. Frey, and Larry J. Leifer (2005). Engineering design thinking, teaching, and learning. *Journal of Engineering Education* 94(1)103-120.
- [13] Diana Bilimoria and Kimberly K. Buch (2010). The search is on: Engendering faculty diversity through more effective search and recruitment. *Change: The Magazine of Higher Learning* 42(4)27-32.
- [14] Corinne A. Moss-Racusin and Laurie A. Rudman (2010). Disruptions in women's self-promotion: The backlash avoidance model. *Psychology of Women Quarterly* 34(2)186-202.
- [15] Corinne A. Moss-Racusin, John F. Dovidio, Victoria L. Brescoll, Mark J. Graham, and Jo Handelsman (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences of the United States of America* 109(41)16474-16479.
- [16] Richard F. Martell (1991). Sex bias at work: The effects of attentional and memory demands on performance ratings of men and women. *Journal of Applied Social Psychology* 21(23)1939-1960.
- [17] Rachel E. Scherr, Monica Plisch, Kara E. Gray, Geoff Potvin, and Theodore Hodapp (2017). Fixed and growth mindsets in physics graduate admissions. *Physical Review Physics Education Research* 13(2) 020133.