Statement on Outreach and Engagement

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For the past one and a half years I have lived on the island of Mindanao in the southern Philippines, working to facilitate education and development among the area's diverse indigenous communities with the non-profit organization Sigay Kauyagan. My role as a staff member is primarily to mentor, tutor, and teach students from indigenous backgrounds on the campus of Mindanao State University, one of the many community partners of our organization. I also assist in managing our campus student center dedicated to the holistic success of minority students. Through working with Sigay Kauyagan, I have participated in many programs and activities that have informed and motivated me toward a career of engaged research, teaching, and service.

I feel it is my responsibility as a teacher to leverage my knowledge and research to inform and equip community members for positive change, and in addition, to enrich my own curriculum in response to the insights and opportunities uncovered in my community interactions. Also, as an engineer and a scientist, I consider it a privilege to partner with communities to identify pressing problems and cooperatively research and design innovative solutions. *I intend to approach outreach and engagement by working in two primary capacities, (1) as an educator and (2) as an engineer.*

Outreach and Engagement as an Educator

I have had many opportunities to develop important skills for outreach and engagement in an educational capacity during my time with Sigay Kauyagan. Some of my activities have involved directly using my academic background and skills on behalf of the community. For instance, I have advised many students in their undergraduate theses, in tasks such as undertaking a literature review, statistically analyzing results, and writing in a scientific style. In addition, I have offered five-to-six-week mini-courses for small groups of students on topics such as study skills, scientific writing, and computer programming. I have also engaged with the university by giving guest lectures. In one instance, when speaking in an introductory mechanical engineering class, I emphasized the importance of integrity, ethics, and good communication in engineering by telling my eyewitness account of the 2007 Minnesota I-35W bridge collapse [1]. I also discussed the utility of an engineering degree by explaining some of my energy-related research results. My work with Sigay Kauyagan in ways such as these demonstrates my commitment to outreach and engagement and also serves as evidence of my capacity to carry out these activities in the future.

In my future work as a professor, I believe engagement should be more than one-way knowledge transfer from myself to the public. Rather, it will be best undertaken as a university-community partnership in which information flows both directions for mutual enlightenment [2]. As a university educator, my goal will be to participate in and promote outreach activities that tie to and influence my research and teaching. One implementation I would like to pursue in cooperation with other faculty involves hosting interdisciplinary lectures and discussions of relevance to the general public. These talks could address a wide range of topics, such as the mechanics and economics of hydraulic fracturing [3], or the impact of alternative fuels on world economics and global climate change [4]. Modeled after the successful STEAM Factory at The Ohio State University [5], these forums hold the potential to promote inter-faculty collaboration, facilitate dissemination of research findings in the community, and ground university teaching and research in practical applications. I believe a key component of such events will be the intentional dialogue between faculty and community members as lectures are conceptualized, delivered, and discussed. I look forward to seeking out and working closely with university outreach and engagement resources to build upon best practices and acquire funding for this concept.

In addition to direct community engagement, I also hope to promote outreach in my undergraduate teaching through service learning. Service learning courses will allow students to meet tangible community needs, especially when performing engineering design projects [6, 7]. In so doing, students will gain a deeper understanding of the course content, an appreciation for the subject matter, and a sense of civic responsibility. It will also provide me with the opportunity to learn about currently relevant problems and new research opportunities from my students [8, 9]. I

am eager to integrate research, teaching, and outreach in practical ways as I design and conduct service learning classes.

Not only do I wish to be directly involved in performing and facilitating outreach; I also want to engender a culture of educational service among those who will one day become faculty members. Unfortunately, current research reveals that, relative to undergraduate students, doctoral scholars have comparatively few opportunities to engage in service [9]. Therefore, I intend to provide time, encouragement, and coaching help to assist graduate students in my research team to pursue engagement opportunities. One possible idea I am interested to explore, based on a successful approach at the Colorado School of Mines, is to facilitate graduate student-teacher interactions in K-12 schools [8, 9]. In supporting this and other opportunities, I hope to build a culture of service in my laboratory, provide my students with chances to learn and practice good pedagogy, and allow my students to serve as community role models [12]. I am excited to enrich and motivate my research and teaching through outreach and engagement as an educator.

Outreach and Engagement as an Engineer

When performing outreach and engagement as an engineer, my goal has been to leverage the knowledge and resources available to me in order to convey scientific insights and devise inventive solutions that contribute to the public good. I have participated in several activities in my role as an engineer with Sigay Kauyagan that prepare me well for a career of academic service. For example, when I learned that most indigenous students at Mindanao State University had no access to inexpensive high-speed Internet, I worked with a telecommunications company to extend fiber optic service to our student center, and I installed a wireless network there. Since then, I have observed students watching educational tutorial videos and performing research on the Internet using their phones, laptops, and our center's computers. In undertaking this project, I applied my technical capabilities to address the felt needs of the community. I have similarly participated in formal capacities with the university, as well. In one instance, I served as a panelist judge for a student project exposition sponsored by the Department of Agricultural Engineering; in another, I provided third-party oversight during the public contract bidding process for repairs to several university buildings. By taking part in these efforts, I used my doctorate and professional engineering licensure credentials for public service. My activities with Sigay Kauyagan reveal my dedication and commitment to participate in outreach and engagement in the future.

As an engineer practicing engaged science, I plan to direct part of my research efforts toward collaborative projects that address local needs or benefit extra-university areas. One idea I would like to pursue stems from my time in the Philippines. Here, I have observed an underuse of energy resources and an excess of pollution creation. For example, I have seen a dearth of solar energy devices despite ample available solar radiation [13], a lack of processes and equipment to control motor vehicle emissions, and widespread urban burning of trash and biomass. In response, I would like to partner with faculty members and developing communities to explore the societal and economic barriers contributing to the so-called energy-efficiency gap, and to redesign or invent new devices and processes to overcome these obstacles [14, 15]. Projects such as this will expand my research efforts into new domains and also inform and ground my teaching in practical applications [16]. I hope to make these projects a part of my research portfolio, together with associated peer-reviewed publications and graduate student researchers [12, 17-19]. I am eager to seek out and make use of university resources in order to receive structured guidance and acquire startup funding to pursue this and other engaged scientific research ideas.

In summary, I am excited to partner with faculty, students, and communities to engage in new ways. Moreover, I am enthusiastic about applying university resources in order to collaboratively pursue my outreach goals. I intend to perform engaged scholarship that fosters two-way knowledge transfers with community members, solves problems of public importance, and informs and renews my research and teaching. I look forward to participating in outreach and engagement service as both an educator and an engineer.

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