

PAPER: From the Bottom Up: Amplifying Student Voices to Inspire Culture Change

Prof. Jill Davishahl, Western Washington University

Jill Davishahl is Associate Professor and First Year Programs Director in the Engineering + Design department at Western Washington University. Jill's teaching, service, and research activities focus on enhancing the first year student experience by providing the foundational technical skills, student engagement opportunities, and professional skill development necessary to improve success in the major. Her current research focuses on creating inclusive and equitable learning environments through the development and implementation of strategies geared towards increasing student sense of belonging.

John Misasi PhD, Western Washington University

Dr. John Misasi is an Associate Professor of Polymer Materials Engineering at Western Washington University. He currently focuses his teaching and research on the relationships between the structures, processing, and properties of industrially-relevant polymers and composites. His passion is in educating next-generation engineers and scientists about materials and manufacturing through hands-on curriculum and meaningful research experiences. This philosophy has led to successful collaborations with plastics and composites industry partners ranging from Boeing, to Safran Aerospace, and Solvay. John's ultimate goal with his teaching and research is to make the world a cleaner, more sustainable, and overall groovier place to be.

From the Bottom Up: Amplifying Student Voices to Inspire Culture Change

Abstract:

This full paper shares the experience of empowering engineering students to help drive cultural change in an engineering department. A positive and supportive academic culture in engineering education is crucial to student success. Culture has been shown to impact identity development, sense of belonging, academic achievement, social relationships, diversity, and retention. The student viewpoint is an essential, yet often overlooked, component to understanding the depth and breadth of cultural issues. The authors, who include the students leading this work, describe the various strategies employed to amplify student voices and the impact it had on the department, specifically with regards to change. The methods used included focus groups, surveys, and feedback sessions which were initiated, led, and supported by student leaders in the department. The paper details how the student feedback was gathered, analyzed, and summarized, what was learned, and the methods used to share it with the administration. The findings indicate that students expect their academic environment to be professional and respectful. They want a culture that puts inclusion and equity at the forefront and expect faculty to be positive role models. When they experience a cultural climate that deviates from this expectation, it can lead to negative social/emotional experiences which may lead some to question their decision to pursue engineering as a career path. The students leading the work showed a deep commitment to sharing the student voice however, they also experienced an emotional impact due to the uncertain and challenging nature of the work. Overall, they reported this as a rewarding yet challenging experience through which they learned about the complexities involved in navigating change and advocating for an inclusive culture. The department benefited from hearing the student perspective as has inspired them to develop more comprehensive strategies and solutions to foster a positive, supportive, welcoming culture.

Introduction:

A positive and supportive academic culture in engineering education is crucial to student success. Culture has been shown to impact identity development, sense of belonging, academic achievement, social relationships, diversity, and retention [1]. The impacts of culture also extend beyond the academic setting, impacting students' overall well-being. A negative academic environment has been shown to induce feelings of stress, depression, and anxiety in students in STEM. Interpersonal support from faculty can aid in ameliorating these feelings spurred by adverse learning environments [2]. Mentorship, positive interactions, and effective communication from faculty have been shown to improve student satisfaction and academic performance [3]. Similarly, literature suggests that success of student engineers is positively influenced by connections with role-model figures, and underrepresented minority students have expressed value in being connected with diverse faculty [4]. Pertinent to the current study is evidence suggesting that when students are given a say in the academic setting, students feel a greater sense of being respected, valued, and worthy of being heard [5]. Curating a positive engineering culture meets student needs within and outside of the classroom, contributing to a sense of belonging and positive mental health while supporting student preparedness and academic achievement. Contribution of faculty in the development of this positive culture provides students with healthy role models who underpin academic and personal success.

This project takes place at Western Washington University (WWU), a public institution with approximately 16,000 full-time undergraduate students and 160 academic programs. The

Engineering & Design Department (ENGD) offers four undergraduate-only programs: Electrical & Computer Engineering (EECE), Manufacturing Engineering (MFGE), Polymer Materials Engineering (PME), and Industrial Design (ID). Students first enroll as pre-majors in the department and then apply for the major, typically in their second year. There are approximately 230 major-level students and 250 pre-major students.

Over the past 5 years, the Engineering & Design department at WWU has spent considerable effort focused on supporting students with the goal of improving student sense of belonging and creating inclusive and equitable learning environments. Efforts have included updating the first year curriculum to incorporate social justice [6], starting a peer mentor program focused on student engagement and belonging [7] [8] [9], integrating inclusive practices into the departmental makerspace [10] [11], creating a summer bridge program for engineering students [12], hosting events designed to increase belonging and engagement [8] [13], conducting research on impacts of curricular and co-curricular changes on belonging and identity [14] [15] [16], and offering undergraduate research opportunities to pre-major students. These efforts were spurred by an internal research study that found the following:

1. The percent of women-identifying, first-generation, Pell-eligible, and underserved students declines from pre-major to the major more significantly than their counterparts.
2. There has been a significant decrease in diversity as the programs have become more competitive.
3. Pre-majors, women-identifying, and underserved students report a statistically significant lower sense of belonging than their counterparts [17].

Unfortunately, it has recently come to light that students' experiences in the Engineering & Design department include feelings of exclusion, dismissal, and unease. There is a culture that doesn't meet the expectations of a modern engineering department, where diversity and inclusion are fostered. These cultural issues have come in varied forms (ex. unprofessional student behaviors, disregard for lab policies, harassment, hostile work environments, and lack of accountability for actions) and have impacted both students and faculty. To address the culture problem, a group of peer mentors (called "Student Engagement Liaisons" or SELs) and faculty members in the ENGD department teamed up to spearhead conversations about the current cultural climate with the goal of finding solutions that would amplify student voice to curate a more inclusive, equitable environment.

Approach:

While many of the departmental efforts focused on inclusion and belonging have led to positive outcomes, there remain significant challenges and institutional roadblocks when it comes to improvement of the overall culture climate at WWU. Due to rising concerns, a team of faculty and staff formed together in the summer of 2023 to identify the problem(s) and work toward plausible solutions that could improve overall culture in the department. This team dedicated themselves to the "Engineering a Culture Overall" (ECO) initiative, which is an effort focused on improving the culture in the department by focusing on accessibility, diversity, equity, and

inclusion (ADEI). In the Fall of 2023, undergraduate students joined the ECO team with the intention of amplifying the student voice to help enact change that would benefit the department.

The ECO team consists of 2 faculty, 1 staff member, and 4 undergraduate students. The undergraduate student members are paid employees and officially hold the title of “Student Engagement Liaison” (SEL), a type of peer mentoring program. A large portion of the work of the SELs, as detailed in their job description, is focused on cultivating an inclusive and equitable environment in the ENGD department. Table 1: SEL demographics summarizes the gender identity, race/ethnicity, program major, and year of study of the SELs.

Table 1: SEL demographics

SEL Initials	Gender	Race/Ethnicity	Major*	Year of Study
AR	Woman	White/Asian	PME	3
KA	Woman	White	ID	3
DH	Woman	White	PME	3 (+4 postbac)
NA	Woman	White	PME	4

The ECO team’s initial attempts at departmental culture solutions led to rebellious outcries from select faculty and students, ultimately deepening the culture problems. The challenges with these groups required the ECO team to rethink their methods and solutions, and efforts shifted to investigating department-wide student perspectives on both the problems and potential solutions.

Data Collection

The data collection process involved gathering feedback from ENGD undergraduate students during Fall quarter 2023. Data was collected over the course of 2 weeks and focused on student expectations of culture in an engineering department and student experiences with the current cultural climate. Feedback was gathered using multiple methods including open discussion, open-ended survey, and class visits. Although different methods were used to gather data, to ensure consistency of feedback, the following two prompts were used for each method:

Prompt 1: “What are your expectations regarding department academic culture?”

Prompt 2: “What are your thoughts/feelings regarding the current culture climate in the department?”

The methods used to gather feedback from students included a hosted event in the makerspace, an anonymous survey, and class visits as described below.

Culture Conscious Event (n=24): The SEL group hosted a “Culture Conscious” event in the makerspace where they gave a summary of the rationale for discussing culture and the goal of gathering student input related to expectations and current experiences. This event focused on an open discussion using the prompts above to guide the conversation. One of the SELs acted as a scribe during this discussion so the feedback gathered could be organized and analyzed later. Student participants could also choose to write their thoughts/feelings on a poster (one for each prompt). Finally, there was an anonymous comments box which allowed students to share their feelings more privately.

Department Survey (n=21): The ECO group created a survey to gather input from students who were unable to attend the in-person event. The survey consisted of questions about major level (interest, pre-major, major), type of major (ID, PME, EECE, MFGE), student club affiliation, student employment, and the two prompts listed above. The survey was distributed to students via posters, social media, and through the department canvas course. The survey was open to all ENGD students and responses were anonymous.

Class Visit & Feedback Form (n=76): The SELs visited two 100 level engineering classes to gather feedback from first and second year students. Paper copies of a feedback form consisting of the two prompts were handed out to all students. Participation was optional and responses were anonymous.

In total, 112 students provided feedback about the culture in the ENGD department. These students were representative of all 4 programs: ID, PME, EECE and MFGE. All student major levels were represented including interest level (students who have indicated an interest in engineering), declared pre-majors, and major level students. In addition, various student groups were represented including student employees, teaching assistants, club members, and club leadership.

Data Analysis

Grounded theory [18] and thematic coding [19] were used to explore student expectations of culture and their experiences with the current department climate. Five people (all members of the ECO team) analyzed the data through a process of open coding techniques followed by focused coding. The coding process involved identifying *a priori* codes in line with the literature as well as emergent codes. These codes were refined through a process of individual coding and research meetings explicitly focused on aligning and refining the research teams understanding and implementation of the coding scheme/schema. Included in this was a process of focused coding in which each person individually coded the data and then gave feedback and asked questions about each other's coding process. As a result of the coding and memo-ing, the ECO team identified and refined emergent themes, articulated below.

Being new to engineering education research, the SEL team worked closely with advising faculty members to conduct the data analysis. The SEL team was involved in all aspects of the data gathering and analysis process. The collaborative team-based research approach proved effective in systematically sifting through the extensive responses, narrowing it to essential topics. Their work also extended to extracting quotes that captured the student's experiences, concerns, and sentiments regarding the department's operations and responses to incidents that they planned to share with the department faculty.

Results & Discussion:

Research findings were categorized into three overarching themes that aligned with the question prompts: student expectations (Prompt 1), challenges with current climate (Prompt 2), and general impact on students (both Prompt 1 & 2). For each main theme, researchers then identified sub-themes as described below. The themes provided the SEL team with meaningful

data to present to faculty as well as with a starting point to examine the overarching problem and develop solutions.

Theme 1: Student Expectations

This first theme of **expectation** relates to *Prompt 1: What are your expectations regarding engineering department academic culture?* Expectations, in this context, are defined as the students' feelings or beliefs around how they interact with different elements in the ENGD department. Culture refers to the outlook, ethics, interactions, and rules of the department such as how the department operates, what might happen because of a particular action, and how students are treated as a member of the department.

Student expectations were categorized into two sub-themes: **cultural expectations** and **departmental responsibilities**. Cultural expectations focused on 5 main areas: professionalism, respectful behavior, inclusion, equity in access, and faculty/staff as role models. Many students commented on the lack of inclusivity in lab/classroom spaces, primarily around inequity in access to educational spaces. In addition, students described instances of gender and racial bias as being prevalent in both lab and classroom spaces. It was clear from the feedback that students expect professional and respectful interactions between both faculty and other students. When it came to department responsibilities, students expect immediate response to problems, clear accountability measures, and commitment to positive change.

Theme 2: Challenges with Current Climate

This second theme, **challenges with current climate**, relates to *Prompt 2: What are your thoughts/feelings regarding the current cultural climate in the department?* The researchers defined challenges as roadblocks, barriers, and obstacles to positive interactions and experiences.

Broadly speaking, the cultural challenges identified by students regarding the current climate generally fell under the DEI umbrella. The sub-themes that were most prevalent were **exclusion** and **lack of professionalism**. Exclusion, in this context, related to the prevalence of unwelcoming environments, lack of diversity, and negative interactions between student groups. Lack of professionalism was connected to departmental attributes such as lack of transparency in decision making, lack of action when culture issues arise, and poor behavior modeled by faculty along with the appearance of acceptance of that type of behavior by administrators. Generally, students were surprised by the lack of professionalism in the department and recognized that the status quo did not meet their expectations. The students attributed the challenges to systemic issues and the cultural stereotypes that are prevalent in engineering such as exclusion, lack of diversity, and unwelcoming work environments.

Theme 3: Impact on Students

This third theme, **impact on students**, related to both prompts and was clearly articulated by students throughout the feedback. The impact on students was defined as the effect of experiences or feelings on students. These findings can be divided into two sub-themes: **social/emotional** and **academic/professional**. The social/emotional impact relates primarily to feelings. Students shared that they felt disappointed, frustrated, unwelcome, angry, unheard, and worried. The academic/professional impact on students was primarily focused on disengagement. Students shared that they weren't willing to join specific clubs, don't use certain classrooms or

labs, and questioned their choice to study engineering. Furthermore, students expressed concern about their future career choice as well as the reputation of the department and university. The findings indicate that the current culture climate may lead students to disengage from departmental co-curricular supports or, worse, to pursue other majors.

Dissemination of Findings & Administration Reaction:

The SEL team presented the findings at an all-department meeting which consisted of 30+ ENGD department faculty and staff members along with the Dean of the WWU College of Science & Engineering. The presentation began with a brief introduction from each SEL, which followed with an explanation about the motivation behind gathering student feedback on their perceptions of department culture. The slideshow included information about the number of students surveyed, how students were surveyed, who was represented, and what questions were asked. The presentation then shared the research findings focused on the three themes discussed above. The presentation concluded with a proposal for next steps, which included the SELs noting they'd like to present at a future faculty meeting, with the next focus being on solutions to address the student concerns. The SELs provided a QR code on the final slide that directed faculty to a survey where they could share their potential solutions to improve department culture. A link to the survey was distributed via email after the presentation. The SELs asked faculty to complete the survey by the third week of Winter quarter 2024.

Presented between the content slides of the presentation were direct quotes from students who had completed the survey. These quotes were not read aloud to the faculty, rather those attending were asked to read these quotes to themselves and were given approximately 30 seconds to do so. Posted on the walls to the left and right of the room where the faculty were seated were large posters with additional quotes gathered from the surveys and feedback sessions. At the end of the presentation, the SELs noted the presence of these posters and encouraged faculty to read through them following the meeting. The inclusion of these direct quotes grounded the data being presented, creating a greater sense of the validity of the student voice and highlighting the need for departmental action.

After the presentation, the SELs remained present for the remainder of the meeting, after which multiple faculty members approached them to comment on the presentation. The faculty members who commented provided positive feedback and expressed gratitude for the collection and sharing of student voices. One faculty member contacted a SEL directly expressing interest in discussing the survey findings and relating them to potential progress in the ID program. Two faculty members from the PME program created their own presentation on expectations for professionalism and inclusion in the program and presented this to the junior and senior PME cohorts to spur a program-level discussion about the importance of positive culture in the academic setting. These responses from faculty have started the Winter 2024 quarter efforts to encourage more program-level discussions about departmental culture to continue the momentum in inspiring positive change.

Impact of the Work on the SELs:

It was my first time doing any ADEI work, and I have learned from this experience that it is a very hard thing to navigate. I have learned that I am

very passionate about efforts like this, especially ones that I am involved in such as my department, so I have learned that professionally this is something that I want to continue with doing in relation to my career. -KA

The faculty members of the ECO group asked each of the SELs to reflect upon their experience with the culture related work. The purpose of the reflection was to better understand the experience of the students leading the work to help determine what supports they might need going forward and the overall impact of the work on them as student mentors. The SELs were asked to write a written reflection on what went well, what was challenging, what they were proud of, and how the experience impacted them professionally and/or personally.

For all SELs, the number of students who participated in the feedback events was a successful element of their work. Through the 3 events, they heard from a diverse cross-section of students who provided meaningful feedback which allowed them to create an impactful presentation.

I think that our student outreach went really well, and...yielded strong results and [through] our presentation, faculty were able to listen to and understand the student perspective. -AR

The emotional element of the work proved to be the most challenging aspect of the experience. The SELs described experiencing nervousness, disconnect, disappointment, worry, and uncertainty. Two of the SEL shared that they questioned their choice of major due to the “disconnect between STEM and mental wellbeing.” They also mentioned that the lack of administrative support made their work difficult. Despite the challenges, they reflected that the work was rewarding.

Being the face of something like this is very rewarding but it is also difficult, especially if you don't have the support you need from the people that can actually make these changes happen. -NA

The emotional side of this process was the largest challenge for me. I found myself feeling so hyper aware of the actions and comments of others in my department—faculty and students. It's almost like I could see even more distinct differences between those who are helping to create a better culture and those who are indifferent to the cause. -DH

I was worried about conflicting with other professors or somehow coming across as "controversial". I also feel worried about not being able to fulfill what my peers are asking for and the expectations they have for us to communicate their feelings effectively and hopefully create change in the department. -AR

All four SELs mentioned that they were proud of their commitment to ADEI work and to their work as an SEL. Although they experienced a lot of uncertainty, they felt strongly that their work

was worth doing and were committed to sharing the student voice with the administration in hopes of meaningful change.

We came together with a common goal and desire to curate a better culture for the department and not let this conversation fall through the cracks like it has in the past, and we got that ball rolling. -DH

We all committed a lot of time and effort beyond what we are expected to do and I'm proud of the quality of work we presented to the faculty and department. - AR

All four of the SELs expressed their commitment to ADEI work throughout the reflection. They shared their desire to continue their work to improve culture in the department. A couple of the SELs mentioned their desire to continue working on this into the future and noted the importance of a positive culture in the workplace.

I want to be the role model I needed as a young woman wanting so badly to be an engineer when she was younger, but who just didn't feel worthy enough. This process has connected me to that young woman, and it feels like I'm fighting for her just as much as I am for the wonderful students of our department. DH

These events have also made me realize that culture in your work environment is really important. Now that I am currently job hunting and doing interviews, one of the first questions I am asking them is 'what is your company's culture like?' The culture of where I will work in the future is just as important to me as the job itself. - NA

Conclusion & Future Work:

When faced with a challenging cultural climate in their department, a group of student leaders set out to make change. When their voices landed on deaf ears, and change did not happen as expected, they questioned their experience and wondered if they were the only ones who felt there was a culture problem. They wanted to know what students expected from an academic environment and what types of experiences they were having. Together with a small group of dedicated faculty and staff, the student leaders gathered input from the engineering department student body. Through this work, they learned that students expect a professional and respectful environment when at school. They expect faculty to be role models and mentors. They expect the department to respond promptly and efficiently when problems arise and/or when people break rules. Unfortunately, the findings indicated that these expectations are not being met. Through the various feedback instruments, students shared experiences related to lack of professionalism from faculty, a prevalence of unwelcoming environments, lack of accountability, and inequity in resources and access. Students expressed disappointment, frustration, anger, and worry, which clearly impact their social/emotional wellbeing. Many students shared their dissatisfaction with the department culture and noted the negative impact it had on their academic experience. Some even questioned their choice to study engineering.

You can't fix a problem until you know it exists. The student leaders were able to share this data with the engineering department faculty, many who were unaware of the student expectations and experiences with culture. By and large, the faculty were shocked by the results and saluted the student leaders dedication to this work. Despite receiving support from various faculty and staff, the SELs were met with lackadaisical administrative response, which poses as a primary challenge to future solution based ADEI work. This lack of administrative response and support has been emotionally onerous for the SELs. Despite this challenge, they remain eager to find feasible solutions that they have control over implementing and will continue to work to improve culture from the bottom up. So far, this work inspired two of the engineering academic programs to host conversations related to culture for their upper division students. There is hope that the other two programs will follow suit. The ECO group is currently working on gathering ideas for solutions from faculty and will present those at a future department meeting. The student leaders are planning a follow-up department wide culture session to brainstorm student-generated solutions. In addition, the faculty members of the ECO group are working on developing policy that will govern lab and classroom use, with clear accountability measures in place for when rules are violated. The SELs will be a part of policy development efforts to represent the ENGD student body voice in decisions that impact their wellbeing and ability to reap the benefits of departmental resources. The group also has plans to develop norms around professionalism. Without the student leaders taking on the task of amplifying the student voice, the department would not have realized the extent of the culture problem. The SELs remain dedicated to being a part of ADEI efforts in the ENGD department as an extension of their current roles, with a common goal being to keep the conversation of cultural improvement alive, to amplify student voice, and to work on implementing solutions.

The importance of a positive academic culture cannot be understated as it can impact student well-being and academic success. Work to improve culture is important and needs to be prioritized if we want to make meaningful changes in our engineering programs and workplaces. Continuing to prioritize **doing** technical engineering work over **being** caring, respectful engineers will only continue to perpetuate the harmful stereotypes of the field and drive students away from engineering.

References

- [1] G. Kuh, "High-impact educational practices.," *Peer Review*, vol. 10, no. 4, 2008.
- [2] A. C. Arnold, K. G. Wilkins-Yel, J. M. Bekki, B. Bernstein, M. Natarajan, A. K. Randall, R. Francies and C. E. Okwu, "Examining the effects of STEM climate on the mental health of graduate women from diverse racial/ethnic backgrounds," in *American Society for Engineering Education*, 2020.
- [3] P. Umbach and M. Wawrzynski, "Faculty do Matter: The Role of College Faculty in Student Learning and Engagement," *Research in Higher Education*, vol. 46, 2005.
- [4] S. Martin, "Engineering Retention: Improving Inclusion and Diversity in Engineering," Murray State University , Murray, Kentucky, 2018.
- [5] D. Anderson and A. Graham, "Improving student wellbeing: having a say at school," *School Effectiveness and School Improvement*, vol. 27, no. 3, 2015.

- [6] J. Davishahl, "Centering Social Justice in Engineering: A new course model for first year engineering education," in *American Society of Engineering Education Annual Conference*, Baltimore, MD, 2023.
- [7] J. Davishahl, A. Boklage and M. Andrews, "Peer Mentors Forging a Path in Changing Times," in *Paper presented at 2022 ASEE Annual Conference & Exposition*, Minneapolis, MN, 2022.
- [8] J. Davishahl, E. Mediavilla, A. Nelson, L. Shibata and N. Winney, "Cultivating Community through Student Engagement," in *American Society of Engineering Education Zone IV Conference*, Vancouver, BC, 2022.
- [9] J. Davishahl, E. Mediavilla and A. Nelson, "Cultivating community for first year students: Experiences in adapting a peer mentoring program to remote format," in *First Year Engineering Experience Conference*, 2021.
- [10] J. Davishahl, C. Boland and N. Crow, "Increasing Inclusive Access to Makerspaces using Digital Badges," in *International Symposium on Academic Makerspaces*, Atlanta, GA, 2022.
- [11] J. Davishahl, "Keep it simple, keep it real: Creating Inclusive Makerspace Environments," in *Proceedings of American Society of Engineering Education Collaborative Network for Engineering and Computing Diversity*, 2021.
- [12] J. Davishahl, J. Brobst, S. Alqudah, A. Klein and L. Litzler, "Math to Makerspace: Evolution of a bridge program to support cohort development.," in *Proceedings of American Society of Engineering Education Conference*, Baltimore, MD, 2023.
- [13] J. Davishahl, A. Boklage and M. Andrews, "Development of Social Engagement Activities to Increase Belonging," in *Proceedings of the 127th American Society of Engineering Education Conference and Exposition*, Minneapolis, MN, 2022.
- [14] J. Brobst, J. Davishahl, L. Litzler, S. Alqudah and A. Klein, "Examining first-year engineering programs' impacts on sense of belonging across gender," in *Proceedings of American Society of Engineering Education Annual Conference*, Baltimore, MD, 2023.
- [15] J. Brobst, E. Litzler, S. Alqudah, R. Barber DeGraaff, J. Davishahl, P. Fizzano, D. Hartenstine and A. Klein, "Developing sense of belonging in isolation: insights from two projects supporting STEM undergraduates," in *American Educational Research Association*, San Diego, CA, 2022.
- [16] J. Brobst, E. Litzler, J. Davishahl, S. Alqudah and A. Klein, "Impacts of supports on student affect in an engineering-focused S-STEM," in *Transforming STEM Higher Education Conference*, 2020.
- [17] *WWU Institutional Data, Engineering Department*, 2019.
- [18] M. Miles, M. Huberman and J. Saldana, *Qualitative data analysis: A methods sourcebook*. 4th edition, SAGE Publications, 2019.
- [19] G. Gibbs, *Thematic coding and categorizing. Analyzing Qualitative Data*, London: Sage, 2007.