Peer Mentors Forging a Path in Changing Times

"When I first started thinking about inclusivity, I recognized that I wanted to share what I was learning. I also want to spread word about my department and even more I want to spark more interest for STEM and/or engineering, keep working on inclusive practices, and work on welcoming new people to engineering." – SEL

Abstract

This complete evidence-based practice paper examines the experience of two peer mentors, known as Student Engagement Liaisons (SEL), as they worked to cultivate community and sense of belonging for first year engineering students. Over the past two years, the educational pendulum has swung wildly as students have gone from in-person to online learning and back again. Many students continue to navigate a changing landscape as they straddle between the two worlds of in-person and remote learning with some classes continuing to meet online and others being fully in person. These abrupt transitions have left many students struggling to develop meaningful connections with their peers, faculty, and their educational programs, all of which have negative ramifications on their academic progress and sense of belonging. This investigation uses a critical constructivist theoretical approach to explore how two SELs, who were tasked with enhancing student engagement and building social networks for first year engineering students, modified support mechanisms in response to the changing teaching and learning modalities. Of particular interest is how the SEL program has evolved during this tumultuous time, the mentors' experiences exploring and developing new ways of connecting students, and the impact of the experience on the mentors themselves. The results indicate a shift in focus solely driven by the mentors, along with a willingness to reframe activities, events, and support measures to meet the dynamic needs of the students. Their ability to listen, pivot, and adapt to changing needs of students indicates a commitment to creating inclusive and accessible social environments through community centered solutions. We recognize that these new ways might be innovative because of the circumstances, but they can also continue to be integrated as ways to support and engage students, particularly because they were created by students. The SELs used the COVID-19 pivots as an opportunity to reinvent what it means to mentor their peers and, with that, have explored and experimented with new ways of creating community.

Introduction

In March of 2020, the COVID-19 pandemic disrupted education worldwide thrusting remote teaching into the spotlight, testing the "flexibility and resilience of students, faculty, and administrators" [1]. This COVID-19 instructional pivot challenged engineering educators in providing a virtual substitute for the lab-based, hands-on experiences, and teamwork that their discipline demands. This shift was not without its challenges, a recent ASEE report found that only 53% of faculty felt they were given adequate resources from their institution to transition online teaching [1]. Given the importance of community and hands-on engagement in makerspaces, the COVID-19 pivot also forced academic makerspaces and those that use and support them to abruptly shift their instructional practices. Considering that many academic makerspaces are supported by student staff and mentors, this meant that students were also challenged with modifying learning structures and developing new engagement strategies in response to the pandemic.

This paper examines the experience of two SELs as they worked to build community and create engagement opportunities for students during this time. The SEL program was originally designed and structured to support students within the department makerspace with the goal of developing an inviting and inclusive climate. The closure of the makerspace required a restructuring of the SEL program. With focus on engaging and retaining first year students, the SEL program was redesigned with the added goal of supporting new students during their transition to college [2]. Data for this study included interviews and artifact analysis including specific activities and social media posts. During the time period of data collection, the SEL program was in the midst of an abrupt pivot from in-person, on-campus support to virtual engagements.

Literature

COVID-19, Engineering, & Makerspaces

While the research on instructional practices in engineering education during COVID-19 is in its infancy, one study [3] explored the resiliency amongst engineering students from two institutions, a Hispanic Serving Institution (HSI) and a Predominantly White Institution (PWI). This research found increased level of stress for engineering students followed by lower self-reported engagement. Other research found an overall increase in stress and anxiety amongst engineering student due to the COVID-19 pandemic and called for immediate attention to and support for students [4].

The pandemic forced some academic makerspaces to reconfigure space and staff roles to support projects, courses, and labs while responding to other specific institutional demands. In one study of academic makerspaces during the pandemic, researchers found that some makerspaces were able to respond to the Pandemic directly by addressing needs, challenges, and opportunities, including the production of personal protective equipment (PPE) and other surrogate manufacturing supports for universities and the institutions they support, such as university-led hospitals [5]. Other spaces sent care-packages of materials for coursework home with K-12 students to continue their engagement in these spaces during distance learning [6]. Responding in this way was only possible in makerspaces that were well staffed, properly funded, and adequately supported by their institution. Many smaller, student supported makerspaces were forced to close their doors thereby limiting student access to hands-on projects, technological support, and peer interaction. In addition, many instructors shifted to digitally centered methods of making such as CAD simulations and finite element analysis techniques and/or moved to "making at a home" by shipping project boxes directly to students, both of which limit peer to peer interaction and limit ability for students build community [7, 8].

Sense of Belonging & Student Engagement

Well supported academic makerspaces provide students with open access to resources that help them develop their problem-solving skills, provide opportunities for collaboration, increase self-efficacy, and develop sense of belonging [9, 10]. Sense of belonging generally relates to self-perceptions of fit within a given context and has been well established as a theoretical construct throughout the literature [11, 12]. The context in question can be formal, such as an educational setting or STEM discipline, or informal, such as friendships or affinity groups. The positive impacts of a strong sense of belonging on academic achievement and persistence in STEM

majors are well documented [13-15]. When students interact in positive ways with diverse peers, sense of belonging improves [16]. The term student engagement refers to the extent to which students invest, value, and participate in their educational experience in a meaningful way [17, 18]. The positive outcomes associated with student engagement include increased student achievement, decreased dropout rates, and more positive emotional experiences [19]. Peer support has recently been identified as one way to support and create a sense of community during through the COVID-19 pivots [2].

Inclusive Environments

Research exploring the support of inclusive and equitable learning environments in university makerspaces specially point to the importance of a making culture. In a national study of university makerspaces, researchers recognized the importance of targeted projects and intentional program choices as important components of an inclusive makerspace culture [20]. Specifically, cultural responsiveness and inclusion as the foundation of designing makerspace projects and challenges. Recently, investigators identified the following six components of an inclusive learning environment: 1) Pedagogy; 2) Meaningful Work; 3) Social Emotional Engagement; 4) Community; 5) Professional Development; and 6) Global awareness. While these practices are recognized to support an inclusive makerspace culture, the specific instructional practices to guide this necessary culture shift are yet to be explored in literature [21].

Kellam and colleagues (2021) further identified promising practices that promote inclusivity at university-affiliated makerspaces within schools of engineering. These practices include increasing visibility, integrating the makerspace through the curriculum, encouraging interdisciplinary collaborations, focusing on culturally relevant making, deliberately designing pace to encourage collaboration, promoting inclusivity through the physical space, fostering a risk-taking, fail-forward culture, increasing accessibility for students with different abilities, and hiring student technicians to support the space [22].

Context

This project takes place at Western Washington University (WWU), a public master's-granting institution with approximately 16,000 full-time undergraduate students and 160 academic programs. The mentoring program was a new effort in the department that resulted from the desire to improve student sense of belonging for engineering and design students. The Engineering & Design Department (ENGD) offers four undergraduate-only programs: Electrical & Computer Engineering (EECE), Manufacturing Engineering (MFGE), Plastics & Composites Engineering (PCE), and Industrial Design (ID). Students who are interested in majoring in Engineering at WWU must formally apply to a program after completing a series of prerequisite courses. Non-dominate students are defined as any student who does not identify as a white, cis-gendered male. Prior to being accepted into a program, students are considered pre-majors.

There are approximately 250 - 350 pre-major students and 300 major level students enrolled in ENGD programs (actual numbers vary by quarter due to variations in student designation as pre-majors and major admissions deadlines). The departmental institutional and research data show that:

- percent of women-identified, first-generation, Pell-eligible, and students of color declines from the pre-majors to the major
- there has been a decrease in diversity as the departmental programs have become more competitive
- the number of women-identifying students in WWU programs is far below the national average
- pre-majors, women-identifying, and non-dominant students report a statistically significant lower sense of belonging than their counterparts.

Sense of belonging is important, especially for pre-major students, as it leads to increased persistence and student success, especially for non-dominant student populations [23]. Reversing these trends and addressing these barriers have been a focal point for recent departmental efforts related to improving equity and inclusion which has included development of programming focused on student engagement and sense of belonging.

In 2019, the department received funds to begin a makerspace centered peer mentoring program. This was one of many efforts put into place to support pre-majors with the goal of reversing the above trends. Other efforts included officially creating a First Year Program (FYP) and hiring a first-year programs director/faculty member, opening a makerspace, developing new 100 level curriculum, creating a pre-major orientation, and integrating elements of supporting inclusion and belonging into the pre-major experience. The main goals of the FYP are to create inclusive and equitable learning environments for students; prepare students for success in the major; increase persistence of non-dominant groups and increase diversity in the programs.

When the makerspace closed due to COVID-19 in March of 2020, the makerspace peer mentoring program was put on hold. Soon after, faculty suggested using the makerspace peer mentoring funds to pay students to build community and support student engagement virtually. Since it was no longer based in the makerspace, the program name was changed to "student engagement liaison" (SEL). Two student engagement liaisons (SELs) were hired with the goal continuing to support peer development but to focus on doing so remotely. Together, the SELs brainstormed new ways to create a positive, supportive, and engaged student community. Over the course of the year, the SELs designed, developed, and conducted a variety of social activities for engineering and design students. Activities included creating a Discord channel, connecting students via social media, hosting collaborative gaming nights, coordinating Zoom-based social meetups, and facilitating a focus group for non-dominant students. This focus group aimed to learn more about the non-male experience with a goal of finding ways to better support non-male students. It is important to note that the overall goals of the SEL program were the same and the peer mentor program (creating connections and building community for students) [2].

Approach

This investigation uses a critical constructivist theoretical approach to explore how the two SELs, who were tasked with enhancing student engagement and building social networks for first year engineering students, navigated the changing landscape of student connection during this pivotal time. A critical constructivist framework is about research and pedagogy, and the multiple ways in which they are connected. Kincheloe (2008) outlines the basic tenets of critical constructivist research as anchored in the understanding that 1) The world is socially

constructed; 2) All knowers are historical and social subjects, everyone comes from a "somewhere" which is located in a particular and historical timeframe, this extends to spatial and temporal settings; 3) People possess knowledge and operate and construct the work on a particular social, cultural, and historical playing field; and 4) A deep concern about process through which knowledge and information is validated [24]. This framework was used as a foundation for data collection, data analysis, and framing our findings.

Participants & Data

The two participants for this project are both female-identifying, non-dominant students. At the time they were hired, they were classified as Juniors in their respective programs (Industrial Design and Electrical and Computer Engineering). Both SELs met the posted job requirements of a positive attitude and energetic spirit, being a self-starter capable of taking initiative and working independently, majoring in engineering or industrial design, and a willingness to share advice and experience with peers. The SELs met weekly with department faculty and together, developed ways to create a positive and engaged student community during remote learning yet still connect the experience to making and improving student sense of belonging. In addition to the weekly group meetings, the SELs worked for an additional 8-10 hours per week together generating additional ideas, designing engagement framework, and hosting activities. In addition, the SELs spent time discussing/debriefing the events and worked together to adapt their programming and events based on student feedback and level student engagement.

Each SEL was required to attend a series of interviews with the research team and submit quarterly reflections on their experience being an SEL. Prompts for these reflections focused on what the SELs thought went well during the quarter as well as challenges and opportunities for improvement. These reflections also prompted SELs to share when they felt most supported and describe impacts because of their experience. SELs also had the opportunity to share thoughts and input about future programming to support community within the makerspace.

In addition, the research team conducted interviews with SELs in the July 2021, at the end of their first year of work. These semi-structured interviews lasted about half an hour in length and were focused on the SEL's experience during the 2020-21 school year. These interviews asked students to share their motivations for applying to the position as well as their experiences as an SEL. The interviews also gathered the SEL's perspective of what it feels like to be a part of and create a supportive and engaging community in the space. The SELs shared their experience supporting student connection and engagement while operating in a socially distant and remote format.

Analysis

The research team coded the interviews using open coding techniques as each SEL possessed their own cultural and historical knowledge of the SEL program and prior makerspace context [24]. One member of the research team examined and coded each interview. This step was crucial in allowing the researcher to obtain a broad sense of the participants' experiences during the pandemic and informed the next phase of focused coding. After open coding, the researcher entered a phase of focused coding. Focused codes then enabled the process of memo writing. This memo writing step served as a space for making comparisons between data and codes, with the purpose of articulating ideas about the data [25]. These memos included raw data, with the

explicit intention of keeping the participants' voices and meanings present in the theoretical outcomes [26]. An example of this coding process is included in Table 1. Additionally, analysis was shared with the participants to validate information [24] and as a form of member-checking to ensure credibility and trustworthiness of our findings with the participants [25].

Table 1: Example of coding process

Quote	Open Code	Focused Code	Memo
"[I] want to spark more interest for STEM and/or engineering. I want to work on welcoming new people [to the space]."	Student interest, inclusion	Inclusion	SELs are interested in creating inclusive environments for other students
"I really wanted to change the culture in department and spread more awareness to faculty members, students can do so much, but it would be more powerful if the change came from the department."	Culture shift Buy-in	Inclusion, Stakeholders	SELs recognize the importance of stakeholders in driving a change in culture

Findings

Our findings indicate that the SEL team developed and provided an effective structure for connecting students and, through their commitment to the work, they themselves also benefited. Furthermore, the SELs were dedicated to overall goal of the program which enabled them to take a leadership role in developing innovative ways to increase engagement and connection between students. Although this program was designed to support first-year students, SELs reported that all levels of undergraduate students engaged in the program. It was evident that students were seeking community and engagements and especially appreciated those that were centered around diversity, equity, and inclusion. While the SELs were hired primarily to support first-year students during their transition to college, their work shifted towards a focus on supporting all students as more students began participating in engagement activities. Through observation and SEL reflection, we found these activities included creating student-only online spaces using informal communication platforms, providing opportunities for students to participate in shared experiences (gaming and online movies), engaging students in conversations focused on equity and inclusion, connecting students to other campus activities and events, and providing opportunities for students to share experiences, ask questions, and learn about engineering.

Through analysis using critical constructivist framework, we found that the SELs took on a leadership role in this position and demonstrated agency in decision making as they explored new ways to meet their goals. Both SELs reflected that they felt supported in their role and were thankful that they were given the ability to create programming they believed would best support students. The SELs noticed that using the virtual platforms for online events allowed students to engage with others through text and voice rather than image and physical presence. As one SEL shared, "*I think the discord server is the crowning achievement of the quarter. Almost every successful activity or event has piggy backed on the server's engagement. It has also made us more visible to students*." This provided a unique opportunity for more introverted students to

engage in conversations in ways that they felt comfortable. As a result, the SELs began using the Discord platform to host more events and eventually, began using this as a tool to connect students all the time (not just for specific events).

Finally, and most importantly, the SELs recognized the enactment of systemic oppression in the engineering department and acted by forming a focus group to gather insight from students who identified as non-male. This was spurred by a series of observations the SELs made during events, specifically related to comments from female-identifying students about their experience as engineering students. Working with their faculty mentor, they decided the first step was to hear more from other students. This motivated the SELs to connect with the campus Office of Civil Rights and Title IX compliance and form a focus group for individuals who identified as non-male. The SELs took a leadership role in planning, organizing, and hosting the focus group. Office staff from the CRTC office supported the students as they developed the focus group protocol, created talking prompts, created the invitation, and conducted the focus group. It is important to note that the SELs did not initially have plans to conduct focus groups as part of their work. However, after hearing and observing instances of inequitable and exclusive learning environments, they realized they needed to act. One SEL stated: "*I think that there are many ways to improve the student's life in the department, and I enjoy contributing to a positive change*." As mentors, they felt it was important for them to stand up to oppression and act when other students confided in them that they did not feel supported or included. The SELs were proud of their ability to create a space where students felt safe sharing their experiences and would like to continue this work.

It was at the insistence of these SELs that the findings from the focus group be compiled into a report and shared with the leadership within the department. One SEL shared that they "*really wanted to change the culture in department and spread more awareness to faculty members, students can do so much, but it would be more powerful if the change came from the department*." In response, the department faculty have been working to address the issues summarized in the report, with primary focus on addressing the toxic culture, unhealthy competitive work environment, and non-inclusive lab environments. The SELs felt empowered that they could work to create change in the department. This student-driven effort was supported by faculty because the university places value on student experience and wanted to get a perspective of what was happening in formal and informal spaces at the university. The resulting report identified what was happening in the programs and identified what can be addressed in the near and long term.

These results of our analysis indicate a shift in program focus solely driven by the SELs, along with a willingness to reframe activities, events, and support measures to meet the dynamic needs of the students. Their ability to listen, pivot, and adapt to changing needs of students indicates a commitment to creating inclusive and accessible social environments through community centered solutions. The findings also suggest that by giving the SELs the space to develop agency, they created new ways to support students and were able to act to create change within the department. For example, one SEL shared they felt "*a bit more confident in my ability to talk to people. Talking to all the students in the department has also made me more aware of the different aspects of the programs and [I] would say I feel more connected to the community. This has definitely helped me professionally and academically as well."*

We recognize that these new ways might be innovative because of the circumstance, but they can also continue to be integrated as other ways to support students, particularly because they were created by students. The SELs used the COVID-19 pivot as an opportunity to reinvent what it means to mentor their peers and, with that, have explored and experimented with new ways of creating community. Our findings also indicate the time students spent as a SEL was valuable for their professional development, sense of belonging, and retention.

Implications

The implications of this research are wide ranging for all students in the engineering program. Throughout each phase of data collection (over an entire year including the pandemic), the SELs recognized that this job played an important part is supporting their mental health as well as their developing engineering identity. Themes included a shift in the mindset of inclusion within engineering as well as echoes of retention. These individuals expressed that they were more engaged in their academic life as an engineering student as well as their life outside of a classroom because of their experience as an SEL.

The participants also recognized that the virtual format for engaging students was an asset to the student experience for some. Because students were a name on discord rather than a race, gender or other construct, the SELs recognized there was "*less to no ego*" and "*no bullying*" in the entirety of the online engagements.

Finally, the most resounding theme from our findings was inclusion. While this was not the explicitly purpose of the SELs when they were hired as they were hired to support engagement, the recognition that engagement could not happen without inclusion was conclusive. As one SEL mentioned "*I think continuing this work of supporting students and increasing awareness of resources/ gender and financial inequality and building a welcoming community will be crucial."*

We hope these findings can be a source of strategies to promote and support educational innovations in the future. We want to draw attention to the importance of the university makerspace as a hub of innovation and a space that has the potential to "revolutionize engineering education" [28] even when it cannot be physically accessed. It is our hope that these instructional shifts that center students will continue when universities and academic makerspaces pivot back to the new normal after the COVID-19 Pandemic and perhaps contribute to the vague definitions of what counts as making [27]. Given the pedagogical tensions inherent within makerspaces [29, 30], even outside of the context of a worldwide pandemic, this analysis provides crucial insights into practices that can support inclusive pedagogy.

Next Steps

This work is continuing throughout the 2021-2022 school year with two additional SELs hired in Fall 2021. Being back in person, the SELs are designing additional engagement activities for students centered in the makerspace. They have, however, continued with many of elements they put into place during the year and a half of remote learning, adding to the ways in which students can connect and build community with the goal of reaching more students in more ways. Continued research will include analysis of journal entries, reflections, and artifacts that explore

the continued program elements, additional modifications, and new efforts as in person learning and connection resumes. Much like where the river meets the sea to form brackish water, the shift of the makerspace and its community from the bubble of a university to a student's home created a new ecosystem. By allowing students to lead the way, we hope a result of enduring the COVID-19 pivot will be a more inclusive makerspace community.

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