

Queering Engineering Through a Student Driven LGBTQIA+ Reading Group (Experience)

Brandon Bakka, The University of Texas at Austin

Brandon Bakka is a doctoral candidate at the University of at Austin pursuing a degree in Biomedical Engineering with a certificate in engineering education. He received a BS in Chemical and Biological Engineering from Colorado School of Mines. Brandon is conducting research on the modes of resistance LGBTQIA+ students utilize in response to the climate in STEM departments. He is also running a LGBTQIA+ focus reading group for STEM students to further connect them with their identity, and is passionate about understanding and dismantling the systems in engineering that marginalize students.

Vivian Chou, The University of Texas at Austin

Vivian Chou is a queer, middle-class, Asian American fourth year undergraduate student pursuing a B.S. in Mechanical Engineering at The University of Texas at Austin. She is conducting research on how a successful community is established within LGBTQ+ student organizations despite the harsh climate in STEM departments. She is also piloting a LGBTQIA+ reading group for STEM students to queer the depoliticizing culture of STEM and give students a space to discuss and connect with their identity. Vivian is an advocate for marginalized students and seeks to be a voice for her LGBTQIA+ peers.

Jeffrey Marchioni, The University of Texas at Austin

Jeffrey Marchioni is completing his first year within the Biomedical Engineering doctoral program at The University of Texas at Austin. He graduated with a Bachelors of Science in Bioengineering at Northeastern University in Spring 2020. His primary research surrounds studying antibody repertoire responses to infectious diseases and/or vaccines. He is interested in exploring the queer experience within engineering further and enjoyed participating in the pilot reading group.

Cassandra Prince, The University of Texas at Austin

Cassandra Prince is a third year undergraduate Civil Engineering Major and Business Minor at The University of Texas at Austin. Growing up in Round Rock, Texas, Cassandra is white, female, and identifies as bisexual. She is interested in increasing inclusivity in the engineering field and among the student groups at UT Austin. She enjoyed taking part in the LGBTQ+ Reading Group and learned a lot from the experience.

Gabriella Sugerman, The University of Texas at Austin

Gabriella Sugerman is a queer, upper-class, white, female graduate student in biomedical engineering at The University of Texas at Austin. In addition to her research in biomechanics, she is focused on expanding participation in difficult dialogues around equity and inclusion within engineering higher education.

Ria Upreti, The University of Texas at Austin

Ria Upreti is a queer, upper-class, upper-caste, Indian immigrant currently in her third year of studying Mechanical Engineering and Linguistics at The University of Texas at Austin. She is

involved in research about the effects of contact and immigration on Hindi syntax, and is passionate about using interdisciplinary study to bring light to new perspectives

Dr. Patricia Clayton, The University of Texas at Austin

Patricia Clayton is a queer assistant professor of civil engineering at The University of Texas at Austin. As an educator, she focuses on creating inclusive spaces for engineering students, and she is an advocate for more equitable institutional policies. She is interested in pursuing more scholarly work focused on the experiences of LGBTQ+ engineering students and faculty and their persistence and resistance in the cis-heteronormative spaces of engineering.

Dr. Maura Borrego, The University of Texas at Austin

Maura Borrego is Director of the Center for Engineering Education and Professor of Mechanical Engineering and STEM Education at the University of Texas at Austin. Dr. Borrego is Senior Associate Editor for *Journal of Women and Minorities in Science and Engineering*. She previously served as a Program Director at the National Science Foundation, on the board of the American Society for Engineering Education, and as an associate dean and director of interdisciplinary graduate programs. Her research awards include U.S. Presidential Early Career Award for Scientists and Engineers (PECASE), a National Science Foundation CAREER award, and two outstanding publication awards from the American Educational Research Association for her journal articles. All of Dr. Borrego's degrees are in Materials Science and Engineering. Her M.S. and Ph.D. are from Stanford University, and her B.S. is from University of Wisconsin-Madison.

Abstract

In this paper, we describe a queer engineering reading group comprised of undergraduate and graduate students and faculty members. Studies over the last decade have shown that LGBTQIA+ engineering students have continuously felt excluded and devalued in STEM spaces. A key factor in this chilly climate is the social-technical dualism that is often strictly enforced in engineering curriculum. Professors and students alike see discussing politics and social issues as irrelevant to the highly technical curriculum. As a result, queer identities are erased from engineering and students are never able to formally connect engineering with their queer (or other) identity in any meaningful way. In an effort to combat this, we have implemented a LGBTQIA+ reading group that challenges the depoliticizing culture of engineering and allows students to further connect to their engineering and queer identities. This reading group centers weekly discussions of relevant education and sociology literature about queer and/or STEM issues. Each week a different student summarizes the paper's key concepts then facilitates group discussion where participants voice their personal connections to the themes of the paper. A wide variety of literature has been discussed, with a focus on the intersection of queer identity with other identities marginalized in STEM. Here we present the development and structure of the reading group and lessons learned over the course of the reading group offering in Fall 2020. Furthermore, we will explore the ways this group has helped augment queer engineering spaces and has served as a catalyst for student activism. Importantly, we have included student reflections of their experiences in the group and how the readings connect with their experiences as a queer engineering student.

Background

In this paper, we use LGBTQIA (lesbian, gay, bisexual, transgender, quer, intersex, asexual) as an umbrella acronym to encompass all the identities held by those with a minoritized sexual or gender identity. We also use queer as a reclaimed term identifying LGBTQIA peoples and acknowledge that historically, "queer" was used as a slur.

Despite the effort to advance diversity and inclusion resources on college campuses, the culture in engineering departments remains heteronormative, hypermasculine, and anti-LGBTQIA. This negative environment leaves queer students particularly vulnerable to academic, health, and wellness issues (Miller et al., 2020; Woodford et al., 2015). Queer STEM students must face hypermasculine competitiveness, the devaluation of social and political issues, constant heteronormativity and even overt homophobia during the course of their academic experience (Cech & Waidzun, 2011; Jennings et al., 2020; Miller et al., 2020). As a result, many queer engineering students are pressured to remain closeted and compartmentalize their personal and professional lives. These coping mechanisms negatively impact students' mental health and career choices and result in feelings of isolation and poor attrition in STEM (Cech & Waidzun, 2011). This is especially true for queer students at the intersection of multiple marginalized identities who can feel invisible and excluded even in spaces designed to be inclusive (Alimahomed, 2010; Miller, 2018). The dynamic of isolation, harassment, and marginalization of queer students continues in STEM workplaces, and affects retention of STEM professionals, including faculty (Vaccaro, 2012).

Despite a decade of research on LGBTQIA+ STEM departments describing this chilly climate, many of the recommendations for change are often ignored and never come to fruition. As Jennings and collaborators (2020) pointed out, many LGBTQIA+ engineering student studies over the years

have suggested changes such as offering Safe Zone training and promoting social sciences and humanities courses in STEM departments. Universities as a whole, and particularly colleges of engineering, seem resistant to the recommended institutional changes and remain entrenched in the power structures that marginalize queer students. As Renn (2010) explains, “Although colleges and universities are the source of much queer theory, they have remained substantially untouched by the queer agenda” (p. 132). The majority of research on queer STEM students in the last decade has focused on understanding the culture and experiences at different institutions and at the intersection of marginalized identities. We are instead focused on creating a community of student scholar-activists that are able to connect with their identity and promote change on the campus at large.

Here, we will discuss our design and implementation of a LGBTQIA+ reading group for STEM students and faculty as a mechanism to disrupt the erasure of queer narratives in STEM. Through this group, students are able to discuss queer identities and social issues in a formal setting and connect with literature that validates their experiences of isolation and discrimination in their field. We will discuss the reading group structure and design, provide reflection on best practices from our pilot group in Fall 2020, and will present student and faculty reflections on their experiences in the group.

Reading Group Development and Structure

Reading Group Development

The idea to run this reading group arose from the authors’ experiences reading queer and critical literature in a weekly group format the prior summer. The authors, coming from a primarily engineering background, would meet weekly to discuss the papers we had read. We found our discussions incredibly insightful as we connected the literature to our own experiences as queer engineers and as we developed our understanding of the field. In an effort to provide students on campus with a similar experience, we were driven to develop a weekly reading group.

When selecting readings, we were focused on helping students better understand the systemic systems of oppression in STEM as well as highlight ways to uplift and resist this culture. We paid particular attention to highlighting the voices and experiences of those at the intersection of multiple marginalized identities and were mindful of the authors we were featuring. We included readings from authors with different gender, racial, and queer identities, as well as articles studying these intersections to provide a cohesive picture of STEM. We discussed the literature bias towards cisgender gay white men, particularly in the foundational works of the field (e.g., Rhoads, 1994). A full list of topics and readings can be found in Appendix I.

To gauge student interest, we sent out a survey to students in the College of Natural Sciences and the School of Engineering via the department academic coordinators. We also advertised through students’ organizations such as oSTEM and LGBTQTies (a student developed queer organization). The form collected students’ contact information and was used to gauge overall interest. We also had the students write a few sentences describing their interest in the group to select for a reasonable pilot group size. We offered the reading group to all engineering students as an independent study class for credit. Faculty allies in each department agreed to sign off credit. In the pilot reading group, we had one student pursue this option.

We received 13 total responses, 5 graduate students and 8 undergraduate students all LGBTQIA+ identifying. We invited all students to participate, however some were not able to make the scheduled time. We created a Canvas page to host all of the readings, and also a group Slack to allow for both individual and group discussions. We hoped to create a space to have broader discussions, and therefore set up a platform for students to announce campus events and promote any media (podcasts, videos, etc.) they wanted to share. We had a consistent turn out with three graduate students and five undergraduate students (not including the authors).

In addition to the student participants, we also invited known faculty allies to attend the group in order to allow a conversation that transcended power roles and provided a space for students voices to be heard. We specifically sought to queer the group by blurring the typical power differentials in this space. Everyone used first names, students were designated to lead the discussions and controlled all aspects of the discussion, and we made it clear to the faculty (particularly the heterosexual cisgender faculty) that they were there to mainly listen to the students, rather than give their input. From the invitations we sent, we had four faculty members regularly attend.

Reading Group Structure

Due to the coronavirus pandemic, the weekly reading group meetings were conducted using Zoom, an online video conferencing tool. Although we will ideally transition to in person meetings once possible, the features of Zoom made it a highly inclusive platform. Participants had the option to put their pronouns in their username, which allowed them to use preferred names/pronouns they would not have otherwise used in an in-person setting. The remote aspect allowed students to easily drop in around other commitments. The option to turn off your personal camera also allowed students to have additional privacy, which empowered students to participate at their discretion.

Each week the discussion centered around a specific topic and a selected reading to discuss along with optional supplemental readings for students. At the beginning of the semester, students who signed up submitted their availability and reading interests. This information was used to assign two students to each topic to present. These two participants would meet prior to the group meeting to structure the discussion. This was typically accomplished through the use of thoughtful reflection focused on allowing other participants to share their personal, academic, or professional setting in the lens of the paper subject. For instance, if the paper topic explored toxic masculinity in STEM, participants would share their experiences regarding the subject in their personal and/or academic perspective. The pairs were determined based on each member's topic preference which resulted in mixed groups of undergraduate students, graduate students, and faculty members.

Although each pair was free to determine their own discussion structure, the group meetings typically followed a similar schedule. The meeting would begin with generic group discussions, and any relevant announcements regarding the group or events and resources on campus. The facilitators would then screen share a slideshow presentation that first summarized the purpose, method, and findings in the main paper. The facilitators would then share the reflection questions and the group would then be broken up into smaller breakout rooms of around three to four people allowing discussions in smaller settings. These breakout rooms were the bulk of the meeting time and changed each meeting. This enabled all students to have many opportunities to share and connect with other group members. The facilitators would then bring everyone back together and each group would summarize their discussion. Finally, the meeting typically ended with a

discussion on ways to challenge the ideas and culture of engineering in regards to the main topic of the week.

Student and Faculty Reflections

In an effort to center the narratives and experiences of the students in the group, we solicited written reflections from group members using the prompts in Appendix II. Not only does this further amplify the voices of marginalized students, but it allows these students to more directly contribute to the paper writing process. Of the eight regularly attending students, we were able to collect four reflections. Each reflection is reported in its entirety in Appendix III, and all students have been able to review the paper and are contributing authors to this work.

Dismissing or invalidating the experiences of LGBTQIA+ engineers is an invisible factor contributing to the chilly, heteronormative climate of engineering. The contrasting environments between engineering and non-STEM departments at our institution was made especially clear in Ria's reflection. Ria, a third year Mechanical Engineering and Linguistics major, "noticed differences in environment and attitudes towards what is considered 'acceptable' in terms of conversation, manner of dress, etc. fairly early on," and as a result "found greater connection and community through...[the] reading group where [she has] been able to discuss engineering outside of just discussing engineering theory." Ria states that while she hasn't "faced explicit discrimination or disparagement by engineering peers and faculty... the overt theme of classes has always been that learning engineering theory is the focus of being there."

This phenomenon was also described by Jeffery, a first year biomedical engineering graduate student, when his research labmates invalidated the existence of toxic masculinity in engineering:

"One week I had the opportunity to present with a partner the topic of engineering and masculinity. Prior to the group discussion, I decided to ask some peers within my research lab about the topic. One stunning response was when two people, both white cis men, immediately laughed at me when the topic was brought up. They were visually uncomfortable and/or confused by the topic and dismissed it quickly; it was a startling firsthand example of masculinity within engineering, yet they had no idea they just proved its existence. I was able to bring this experience back to the reading group, and it opened up a fascinating conversation on how to approach these situations today."

The effects of a safe space created from the reading group was an often-touched upon theme in the student reflections. Cassandra, a third year undergraduate civil engineering major, defined the reading group as "a safe space for us to share our personal experiences." According to the students, positive change and hope were byproducts of the LGBTQIA+ safe space in engineering. Jeffery asserted that "having a safe space to begin discussing [LGBTQIA+ issues in engineering and STEM] helps accelerate positive change." Gabriella, a third year graduate student in Biomedical Engineering, reflected that the "existence of this group and the dedication with which students and faculty arrive to our discussions have given me a lot of hope for the future of engineering education, both at [our institution] and more broadly." Through the reading group, we were able to validate the experiences of marginalized LGBTQIA+ engineers. Prior to the reading, Gabriella

“had never entered an academic space where queer identities were so validated or any space where [her] experiences as a queer engineering student were viewed with a scholarly lens.”

Validating the experiences of the participants in turn opened up new possibilities of resisting and creating transformative change. Gabriella states that “Through the readings and discussions in this group, the exclusion I felt started to make sense as a systematic problem rather than a personal failing to integrate with the culture of engineering. Resistance to this established culture feels much more accessible now that I am aware of the extent to which others also see this culture as a problem.” Ria states that “the conversation we had around this reading has inspired me to continually challenge my own ideas of the limits of what can be done in an engineering education and further in the field of education itself.” The reading group also created a newfound community. Cassandra began to connect to other participants in the reading group “after discussing especially interesting and personal topics, [and] felt comfortable messaging others outside of the scheduled reading group times to continue the discussion.”

In order to determine the impact on the faculty members, we also solicited reflections from the faculty members that attended the group. Like the students, the faculty members expressed that the group had a positive impact on their view of the future of engineering. Maura, a faculty member in the mechanical engineering and curriculum and instruction departments, wrote “These students give me such great hope for the future. Each week, I'm impressed with their engagement, analysis, and ideas.” Tricia, a faculty member in the Department of Civil, Architectural, and Environmental Engineering expressed a nearly identical sentiment: “I drew hope from seeing students lead thoughtful discussions on the readings, interrogating and sharing their own experiences as LGBTQIA+ engineers.”

Just as it did for the students, the group also served as a safe space for faculty to talk openly about their identity and experiences of oppression in engineering. Tricia mentions that “[t]his LGBTQIA+ in STEM reading group was the first time I was able to talk freely about my gender and sexual orientation identities in a group of engineers,” suggesting that creating a place to foster these discussions is important even for established faculty. Furthermore, by shining a light on the systemic oppression in engineering, this reading group “validated [her] feelings of feeling like an “outsider” in the too often cisgender, heterosexual, masculine spaces within engineering.”

In addition to creating a safe space for queer faculty, this group enabled faculty allies to connect with the queer student experience in a personal and profound way. Maura remarked on how the student discussions allowed her to get a more complete understanding of students. “To me, participating in the reading group was a unique window into the personal lives of students and the ways they negotiate their identities. It was very helpful to me as a cis het faculty member to meet real students and hear their real experiences as queer students in engineering” Importantly, it was these student connections that encouraged Tricia to continue challenging the oppressive systems in engineering: “The discussions we had as part of this reading group and realizing how many other students feel this way further strengthened my resolve to transform the systemic homophobia and transphobia within higher education and engineering curriculum.”

Conclusion

Overall, the structure and implementation was highly successful in driving students to think critically about their identities and how they navigate their respective fields. Some aspects of the group were particularly successful in encouraging these student outcomes. Inviting faculty but letting students drive discussions ended up being successful, and students felt comfortable sharing their experiences. Furthermore, ending each week with a discussion of active ways to challenge the culture around what we discussed was particularly helpful for students and faculty. We also found that offering the group as course credit, using official platforms such as Slack and Canvas, and focusing on journal articles were particularly important in legitimizing these discussions in STEM. Finally, we would recommend working to get authors or other speakers to join the group from time to time. When we invited an author to join the group to discuss their publication, we found the discussion was particularly successful and students enjoyed getting insight directly from them.

We also saw multiple areas for improvement in the group. First, we noticed retention slowly declining over the course of the semester as students got busier and were not able to keep up with reading papers. For future implementations, we will incorporate other media (such as videos, podcasts, etc.) to lower the barrier to participation. Furthermore, we made the mistake of allowing a faculty member to drop in on a discussion in the middle of the semester. This ended up being uncomfortable for the group since the faculty member ended up dominating the discussion with their own personal narrative and opinions. We did not do a good job in emphasizing the need to center student voices to the newcomer. Due to the nature of the Zoom breakout structure, we later sequestered the faculty member into a group with the facilitators. While recruiting faculty to the group was crucial to the success of the reading group, we will not allow any faculty to join after the first few weeks of the group moving forward. Finally, in future offerings, we hope to expand the voices represented in our readings. Although we tried to be intentional about this, we must acknowledge that we do feature many white authors - some multiple times. We are unsure whether this reflects our own biases or indicates systematic underrepresentation of those voices in this field. Regardless, we plan to work harder to provide readings and highlight authors that discuss all aspects of the STEM experience.

The creation of this reading group was an act of resistance against the heteronormative, chilly climate of engineering and more broadly, STEM. The reflection papers highlight the ways the student-driven reading group was successful in creating an academic space that allowed for students to validate their own identity and experiences in STEM. It is clear many students found the articles affirming their experiences and this group gave them the space to have important discussions about the culture of STEM. This reading group was also successful in breaking down power dynamics, which are usually instilled and encouraged in higher education, particularly engineering. Ultimately, we enabled students to better understand the oppressive systems in STEM and ways to challenge them while letting them connect with other queer students. Most importantly, we empowered students to envision a more equitable future for engineering, and let them see that they can be a part of making those changes.

Appendix I: Group Schedule and Reading List

<i>Date</i>	<i>Topic</i>	<i>Reading</i>
<i>26-Aug</i>	<i>Introductions, Ground Rules, etc</i>	
<i>2-Sep</i>	Climate for LGBTQIA+ students in STEM	(Cech & Waidzun, 2011)
<i>9-Sep</i>	Trans Specific Reading	(Marine & Nicolazzo, 2014)
<i>16-Sep</i>	Active Learning & Group Work	(Cooper & Brownell, 2016)
<i>23-Sep</i>	Social Justice in Engineering	(Riley, 2013)
<i>30-Sep</i>	Queering Higher Education	(Renn, 2010)
<i>7-Oct</i>	Student Resistance (Part 1)	(Revelo & Baber, 2018)
<i>14-Oct</i>	Student Resistance (Part 2)	(Renn & Ozaki, 2010)
<i>21-Oct</i>	The intersection of race and LGBTQIA+ identity	(Alimahomed, 2010)
<i>28-Oct</i>	The intersection of ability and LGBTQIA+ identity	(Miller, 2018)
<i>4-Nov</i>	Engineering and Masculinity	(Miller et al., 2020)
<i>11-Nov</i>	Open Topic	
<i>18-Nov</i>	Coming Out	Excerpt from (Rhoads, 1994)
<i>25-Nov</i>	No Meeting: THANKSGIVING	No Reading
<i>2-Dec</i>	<i>Final Meeting: Wrap up, Debrief,</i>	No Reading
<i>9-Dec</i>	No Meeting: FINALS	No Reading

Appendix II: Suggested Reflection Paper Prompts

1. What experiences from your past are you reminded of (based on the articles or discussion)? Do you think these experiences were particularly important to becoming who you are today?
2. What emotions were surfacing for you, and why? (Other events such as career Expo and Out for Undergrad might play a role.)
3. How are you understanding engineering differently because of our discussions, or connections you are making in other aspects of your life? How is engineering/ engineering culture/ engineering education being heteronormative, binary, transphobic, transmisogynistic, or discriminatory in other ways?
4. What hope do you have for changing engineering through acts of resistance? Have any specific strategies emerged this week?
5. Particularly when we are focusing on a group with which you don't personally identify, how has your thinking changed based on the articles or discussion this week?

Appendix III: Full Reflection Texts

Gabriella, a third-year biomedical engineering graduate student:

“Personally, the existence of this group and the dedication with which students and faculty arrive to our discussions have given me a lot of hope for the future of engineering education, both at [our institution] and more broadly. I had never entered an academic space where queer identities were so validated or any space where my experiences as a queer engineering student were viewed with a scholarly lens.

Reevaluating my previous experiences as an engineering undergraduate through this perspective led me to recognize rampant discrimination in my “traditional” engineering curriculum and instruction. From the prevalence of white cis-male heterosexual instructors to the Euro-centric view of engineering history, deviance from the norm was never celebrated and rarely entered the realm of consciousness. Through the readings and discussions in this group, the exclusion I felt started to make sense as a systematic problem rather than a personal failing to integrate with the culture of engineering. Resistance to this established culture feels much more accessible now that I am aware of the extent to which others also see this culture as a problem.

One aspect of the group that I particularly enjoyed was a transcendence of the established roles in higher education. Undergraduate students, graduate students, and faculty all had valuable insight to share and took turns leading discussion. This collaborative environment gave rise to rich conversation and gave me an opportunity to picture myself as a faculty member implementing similar initiatives at my next institution.”

Cassandra, a third year civil engineering undergraduate student:

“My experience in the LGBTQIA+ Engineering Reading Group in Fall 2020 was illuminating and allowed for me to learn about intricate topics on LGBTQIA+ Theory and share personal experiences in a safe space. Each week we were given a research article on a topic relating to LGBTQIA+ Theory in STEM that we would read, reflect on, and discuss in that week’s reading group. These readings were arranged in a study format, where the purpose of the study was introduced, along with the methods, and then testimonials would be given on the topic by the participants. While I would appreciate further and more focused research into these topics, the articles provided the necessary information to understand complicated concepts. The schedule of readings was organized in a way that allowed me to establish the climate of the LGBTQIA+ community at Cockrell and then branch out into more complex subtopics. The discussions that ensued after particularly moving readings revealed certain ideas and challenges to which I was previously unaware. The Revelo and Baber (2018) reading introduced the concept of using different forms of resistance to challenge the dominating social structure of engineering, referred to as cis-hetero-patriarchy or “Dude Culture” in later

readings (Miller et al., 2020). I was impressed by the resulting conversation where we were able to apply to different forms of resistance to our own lives, experiences, and compare the benefits and challenges of each one. After discussing especially interesting and personal topics, I felt comfortable messaging others outside of the scheduled reading group times to continue the discussion. I also enjoyed planning a couple of the presentations during the semester because it added the component of a smaller discussion between my co-presenter and I beforehand. We were able to build our vocabularies and acquire a greater understanding of the articles to better personalize the upcoming group discussion. These topics brought the reading group closer together and created a safe space for us to share our personal experiences in the pursuit of a greater understanding of LGBTQIA+ STEM Theory.”

Ria, a third year double major in Mechanical Engineering and Linguistics, commented:

“As a student in both the Cockrell College of Engineering and College of Liberal Arts, I noticed differences in environment and attitudes towards what is considered ‘acceptable’ in terms of conversation, manner of dress, etc. fairly early on. My Liberal Arts classes have all been discussion based, and as a part of that, personal experience and expression becomes integral. It isn’t uncommon for my peers and classmates to discuss current events and issues as they relate to the topics at hand, or even for my professors to strike up conversations about politics in office hours. On the other hand, my Engineering classes have been lecture-based, straight to the point, and typically have larger class sizes. They tend to stay largely on the topic of Engineering, with occasional digressions to apply theoretical topics to industry applications or for the professor to disclose a personal story or two. Students don’t get much of an opportunity to share their experiences in the same way, and that’s further reinforced by the large class sizes. I noticed that I personally felt more comfortable expressing myself, both through speaking up in class and wearing clothes that fit my personal sense of style, in Liberal Arts. I haven’t faced explicit discrimination or disparagement by engineering peers and faculty, but the overt theme of classes has always been that learning engineering theory is the focus of being there. I have found greater connection and community through student organizations, and through this reading group where we have been able to discuss engineering outside of just discussing engineering theory.

This reading group has given me the ability to learn about others’ experiences with education and engineering education through both academic studies and discussing people’s lived experiences. I especially appreciated the fact that we had people from multiple branches of engineering as well as at various points in academia, from undergraduates to graduate students to professors and faculty. I especially liked hearing about what those who had previously attended other universities had gone through there, and let me see what we all thought [our institution] was doing well and what we could change.

My personal favorite reading was about a professor at Smith College and how she took her thermodynamics course and altered it to be more like the religion courses she had taken in her undergrad- discussion and application based (Riley,

2013). It particularly stood out to me that she faced student resistance to these changes, that our own expectations of what engineering should be are based in conformity and strict understanding of physical phenomena. The conversation we had around this reading has inspired me to continually challenge my own ideas of the limits of what can be done in an engineering education and further in the field of education itself.”

Jeffery, a first year biomedical engineering graduate student:

“I thoroughly enjoyed the reading group this past semester. I found myself learning a lot from the readings, group discussions, and real life experiences surrounding each topic. Additionally, I thought the structure of having student-led discussions was clever and helped facilitate more honest conversations.

Several of the readings opened up my mind and forced me to rethink what I have been taught about society. For example, the lesson of Queering Higher Education was really fun to me because it persuaded me to think about alternate realities for higher education (Renn, 2010). To be more specific, one could argue that there is a rigid structure to many universities – prioritized majors (STEM, business, law), unnecessary requirements (4+ years for all majors, grades for all classes), and less fluidity. Though an alternate reality for higher education feels far away, I feel an important first step is imaging it and introducing that idea into the world.

Additionally, these topics bled into my real life. One week I had the opportunity to present with a partner the topic of engineering and masculinity. Prior to the group discussion, I decided to ask some peers within my research lab about the topic. One stunning response was when two people, both white cis men, immediately laughed at me when the topic was brought up. They were visually uncomfortable and/or confused by the topic and dismissed it quickly; it was a startling firsthand example of masculinity within engineering, yet they had no idea they just proved its existence. I was able to bring this experience back to the reading group and it opened up a fascinating conversation on how to approach these situations today.

Overall, this reading group was a fascinating opportunity to dive into the world of queer engineering. It reminded me of several experiences in my own past, such as being one of very few openly queer people within engineering in my undergraduate university. Additionally, it brought me back to conversations I have experienced at Out for Undergrad Engineering. Unfortunately, LGBTQIA+ engineers still have limited space to talk about these issues, and I believe groups such as this one are crucial to making a difference within the field. Currently we do not have immediate solutions to the problems surrounding the intersection of engineering and the LGBTQIA+ community. However, having a safe space to begin discussing them helps accelerate positive change.”

Maura, a faculty member in the Mechanical Engineering and Curriculum and Instruction Department:

Bakka, Chou, Marchioni, Prince, Sugerman, Upreti, Clayton and Borrego. Presented at the American Society for Engineering Education Annual Conference, July 26-29, 2021, Virtual.

“To me, participating in the reading group was a unique window into the personal lives of students and the ways they negotiate their identities. It was very helpful to me as a cis het faculty member to meet real students and hear their real experiences as queer students in engineering—a great complement to reading research literature about the experiences of LGBTQIA+ students in higher education and in STEM. Personally, I developed a deeper understanding of some of the diversity within the LGBTQIA+ community as well as a much better sense of what it might look like to queer engineering (including lots of ways engineering is heteronormative, binary, transphobic, transmisogynistic, etc.). These students give me such great hope for the future. Each week, I'm impressed with their engagement, analysis, and ideas. I was under the impression, though, that the graduate students in particular had fully processed their undergraduate experiences and were simply sharing them with the group. I did not realize until seeing their reflections that the reading group is a unique space for these types of discussions. Even though we have a number of student organizations having similar discussions, something different is happening in this reading group. I like to think it has something to do with the involvement of undergrads, grad students, and faculty. It's a chance to have broader discussions about why universities and their personnel are motivated to act the ways they do, as well as sneak in some mentoring when appropriate. I hope that when we are all back together on campus we can recapture some of the magic of these meetings while considering ways they might scale to be accessible to more LGBTQIA+ students and allies alike.”

Tricia, a faculty member in the department of civil, architectural, and environmental engineering:

“As a student and faculty member in engineering, I have never been truly comfortable discussing my queer identity in engineering or academic settings. This LGBTQIA+ in STEM reading group was the first time I was able to talk freely about my gender and sexual orientation identities in a group of engineers. Reading scholarly research on experiences of other LGBTQIA+ folks in STEM validated my feelings of feeling like an “outsider” in the too often cisgender, heterosexual, masculine spaces within engineering. The discussions we had as part of this reading group and realizing how many other students feel this way further strengthened my resolve to transform the systemic homophobia and transphobia within higher education and engineering curriculum. I drew hope from seeing students lead thoughtful discussions on the readings, interrogating and sharing their own experiences as LGBTQIA+ engineers. I appreciated the faculty allies who continuously showed up to the discussions, ready to critically question their own roles in promoting the cis-hetero-normative narratives in engineering. I hope that similar LGBTQIA+ in STEM reading groups can form and grow at other institutions, as they provide a safe space for students from this marginalized and often invisible group to speak freely, and I hope groups like these can cultivate advocates for change—changes very much needed in academia and engineering specifically.”

Citations

Alimahomed, S. (2010). Thinking outside the rainbow: Women of color redefining queer politics and identity. *Social Identities*, 16(2), 151–168.

<https://doi.org/10.1080/13504631003688849>

Cech, E. A., & Waidzunas, T. J. (2011). Navigating the heteronormativity of engineering: The experiences of lesbian, gay, and bisexual students. *Engineering Studies*, 3(1), 1–24.

<https://doi.org/10.1080/19378629.2010.545065>

Cooper, K. M., & Brownell, S. E. (2016). Coming Out in Class: Challenges and Benefits of Active Learning in a Biology Classroom for LGBTQIA Students. *CBE—Life Sciences Education*, 15(3), ar37. <https://doi.org/10.1187/cbe.16-01-0074>

Jennings, M., Roscoe, R., Kellam, N., & Jayasuriya, S. (2020). A Review of the State of LGBTQIA+ Student Research in STEM and Engineering Education. *2020 ASEE Virtual Annual Conference Content Access Proceedings*, 34045. <https://doi.org/10.18260/1-2--34045>

Marine, S. B., & Nicolazzo, Z. (2014). Names that matter: Exploring the tensions of campus LGBTQIA centers and trans* inclusion. *Journal of Diversity in Higher Education*, 7(4), 265–281. <https://doi.org/10.1037/a0037990>

Miller, R. A. (2018). Toward Intersectional Identity Perspectives on Disability and LGBTQIA Identities in Higher Education. *Journal of College Student Development*, 59(3), 327–346. <https://doi.org/10.1353/csd.2018.0030>

Miller, R. A., Vaccaro, A., Kimball, E. W., & Forester, R. (2020). “It’s dude culture”: Students with minoritized identities of sexuality and/or gender navigating STEM majors. *Journal of Diversity in Higher Education*, No Pagination Specified-No Pagination Specified.

<https://doi.org/10.1037/dhe0000171>

Bakka, Chou, Marchioni, Prince, Sugerman, Upreti, Clayton and Borrego. Presented at the American Society for Engineering Education Annual Conference, July 26-29, 2021, Virtual.

- Renn, K. A. (2010). LGBT and Queer Research in Higher Education: The State and Status of the Field. *Educational Researcher*, 39(2), 132–141.
<https://doi.org/10.3102/0013189X10362579>
- Renn, K. A., & Ozaki, C. C. (2010). Psychosocial and leadership identities among leaders of identity-based campus organizations. *Journal of Diversity in Higher Education*, 3(1), 14–26. <https://doi.org/10.1037/a0018564>
- Revelo, R. A., & Baber, L. D. (2018). Engineering Resistors: Engineering Latina/o Students and Emerging Resistant Capital. *Journal of Hispanic Higher Education*, 17(3), 249–269.
<https://doi.org/10.1177/1538192717719132>
- Rhoads, R. A. (1994). *Coming Out in College: The Struggle for a Queer Identity*. Greenwood Publishing Group.
- Riley, D. M. (2013). Power. Systems. Engineering. Traveling Lines of Resistance in Academic Institutions. In J. Lucena (Ed.), *Engineering Education for Social Justice* (Vol. 10, pp. 41–63). Springer Netherlands. https://doi.org/10.1007/978-94-007-6350-0_3
- Vaccaro, A. (2012). Campus Microclimates for LGBT Faculty, Staff, and Students: An Exploration of the Intersections of Social Identity and Campus Roles. *Journal of Student Affairs Research and Practice*, 49(4), 429–446. <https://doi.org/10.1515/jsarp-2012-6473>
- Woodford, M. R., Chonody, J. M., Kulick, A., Brennan, D. J., & Renn, K. (2015). The LGBQ Microaggressions on Campus Scale: A Scale Development and Validation Study. *Journal of Homosexuality*, 62(12), 1660–1687. <https://doi.org/10.1080/00918369.2015.1078205>