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Half as likely: The underrepresentation of LGBTQ+ students in engineering

Dr. Kyle F Trenshaw, University of Rochester

Kyle Trenshaw is currently the Educational Development Specialist at the University of Rochester's Center for Excellence in Teaching and Learning. He received his B.S. in chemical engineering from the University of Missouri in 2009, and his M.S. (2011) and Ph.D. (2014) in chemical engineering from the University of Illinois, Urbana-Champaign. His research interests include science, technology, engineering, and mathematics (STEM) education; supporting diversity in STEM fields with an emphasis on lesbian, gay, bisexual, transgender, queer, and questioning (LGBTQ+) students; and using the Myers-Briggs Type Indicator (MBTI) to improve students' communication skills during group work.

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LGBTQ+ students face similar barriers to those that hinder women and students of color from persisting and thriving in engineering disciplines, such as gender-related microaggressions and an overall chilly climate. However, LGBTQ+ students are not thought of as underrepresented because few institutions, much less engineering departments, gather fully descriptive demographic data related to gender and sexual orientation. That is, LGBTQ+ students are not counted in the same way that students from various NSF-defined racial and ethnic categories are. This study addresses this lack of broad information by using climate survey data from one large, Midwestern, public university system in which detailed gender and sexual orientation data were gathered from respondents. In this sample, students in engineering disciplines were about half as likely to be LGBTQ+ as students in non-engineering disciplines. Based on the underrepresentation of LGBTQ+ students in engineering in this sample, future directions for broader population research as well as implications for equitable practices regarding LGBTQ+ students and colleagues are discussed.

Introduction

A figure of approximately 10% of the population gets thrown around in regard to LGBTQ+ individuals in a variety of contexts and for a variety of purposes. For example, Bruce Voeller, the founder and original director of the National Gay and Lesbian Task Force, discussed the figure in 1990, saying that, “the concept that 10 percent of the population is gay has become a generally accepted ‘fact.’ As with so many pieces of knowledge and myth, repeated telling made it so” (Voeller, 1990). The origins of this nice, round number actually date back to Alfred Kinsey’s reports on the sexual behavior of men and women published in the late 1940s and early 1950s respectively (Kinsey, 1948; Kinsey, 1953). Despite the many criticisms of Kinsey’s work, the 12-13% of men and 7% of women reporting significant levels of same-sex attraction have been qualitatively averaged together to form a talking point that has been used for both good and ill in conversations about LGBTQ+ individuals over the subsequent decades.

The main issue with the 10% figure is just as Voeller states: it has become a fact out of repetition rather than a solid foundation in data. While some nationwide data on the number of same-sex households exists through various surveys administered by the US Census Bureau, these data exclude more nuanced relationship dynamics involving bisexual, pansexual, asexual, and other LGBTQ+ identities. Individuals identifying in these ways may appear to be in “opposite-sex” (i.e., straight) couples despite identifying as LGBTQ+ in some way. Further, single LGBTQ+ individuals have no way of reporting their LGBTQ+ identities via demographic questions included in Bureau-administered surveys. The Bureau has recently announced in a press release that a question on sexual orientation will be included in their Census Barriers, Attitudes, and Motivators Survey (CBAMS) to better understand the estimated low response rate for LGBTQ+ individuals (U.S. Census Bureau, 2017), but with no inclusive questions about gender identity and working papers being forced to report the characteristics of “likely-transgender” individuals by using name-change information (Harris, 2015), robust LGBTQ+ population data is still something to be hoped for in the future.

One data source that often includes some form of LGBTQ+ information is the campus climate survey, which is now ubiquitous in the face of increased media attention to sexual violence and racially-motivated discrimination on college campuses nationwide. The reasons for the 10% figure gaining and maintaining traction as THE number becomes clear when perusing campus climate survey data from various institutions. For example, in Mizzou’s recent campus climate survey in the wake of their president resigning, 9.7% of respondents identified as LGBTQ+ in some way (University of Missouri-

Columbia, 2017). Because of Mizzou's context as a Midwestern institution with a deep racial divide, the population of LGBTQ+ individuals in residence could even be considered a conservative estimate of the population on an average college campus. Indeed, Stanford, a prestigious private institution in California, had almost double Mizzou's percentage of LGBTQ+ respondents, weighing in at 17.7%, on their 2015 campus climate survey (Stanford University, 2015). As a broader example, 10.8% of the respondents identified themselves as LGBTQ+ in a campus climate survey dataset from 27 different institutions collected by the Association of American Universities (AAU) (AAU, 2017), again affirming the "approximately 10%" figure. Because no general population statistics are yet available for LGBTQ+ individuals, either nationwide or in campus-wide databases such as the Common App (www.commonapp.org), nothing certain can be said about the representativeness of LGBTQ+ campus climate survey samples. Compared with other marginalized groups like women and people of color on the AAU Campus Climate Survey (AAU, 2017), the case could be made that LGBTQ+ individuals may be either overrepresented like women or underrepresented like people of color; however, even accounting for the approximate 20% overrepresentation of women observed in the AAU Campus Climate Survey (AAU 2017), LGBTQ+ individuals likely make up at least 8% of the average college campus in the United States.

The underrepresentation of women and people of color in engineering is well documented and often attributed to the "leaky pipeline" (Pell, 1996; Wickware, 1997) and a "chilly climate" (Flam, 1991) in the physical sciences more generally. For LGBTQ+ individuals, however, claims about underrepresentation in engineering cannot be made because there is no baseline with which to compare. This study provides one small window into the underrepresentation of LGBTQ+ individuals in engineering by investigating the following research questions:

1. Are LGBTQ+ students underrepresented in engineering within a large, public, Midwestern university system context based on campus climate survey response rates?
2. How do LGBTQ+ engineering students' experiences within that university system inform our understanding of their relative representation?

Method

This study uses secondary data from two sources: 1) a subset of data from a campus climate survey carried out at all institutions included in a large, public, Midwestern university system (referred to as the *Rainbow University System* hereafter), and 2) de-identified transcripts from a 2012 study on the climate in engineering for LGB individuals at one of the constituent institutions of the Rainbow University System (referred to as *Lavender University* hereafter; see the author's prior publication using the same pseudonym for more information (Trenshaw, Hetrick, Oswald, Vostral, & Loui, 2013)). The Rainbow University System climate survey data consists of 8253 SPSS-formatted student responses in which responses to gender and sexual orientation demographic questions are linked to a binary engineering variable (0 = non-engineering, 1 = engineering). It should be noted that all other STEM disciplines, such as biology or physics, are encompassed by the "non-engineering" category, so similarities between these disciplines and engineering cannot be discussed because the data available cannot be disaggregated. Unfortunately, race and ethnicity could not be obtained because inclusion of the variables reduced some bin sizes below the 15-respondent threshold outlined to maintain the anonymity of the data for secondary sharing purposes in the original campus climate study protocol. To maintain the anonymity of Rainbow University System and Lavender University, the year during which the campus climate survey data were taken is excluded from this work; to contextualize the use of the 2012 transcripts, it should be noted that the survey was administered during a similar timeframe such that some of the interviewees may have also taken the survey. The Lavender University transcripts

consist of 13 semi-structured interviews with self-identified LGB undergraduate students in engineering: 3 lesbian women, 8 gay men, and 2 bisexual men, all of whom are cisgender. Each participant was given a pseudonym during the initial study, and these pseudonyms were not changed for the purposes of this study.

Results and Discussion

The results of the comparison between engineering and non-engineering respondents from the Rainbow University System are shown in Table 1 below. Based on this analysis, there are proportionally about half as many LGBTQ+ students in engineering disciplines as in non-engineering. The population of respondents of this campus climate survey suggests that LGBTQ+ students are underrepresented in engineering within the Rainbow University System.

Table 1. Percentage of LGBTQ+ respondents in the Rainbow University System campus climate survey

	Engineering	Non-Engineering	Total
Total N	1447	6806	8253
LGBTQ+ N	62	549	611
LGBTQ+ %	4.3%	8.1%	7.4%

After seeing the numbers play out as they did, I wanted to further investigate where the difference in populations might be coming from. Is it that LGBTQ+ students are less likely to be interested in engineering, is it something about engineering culture that causes LGBTQ+ students to leave, or is it perhaps that there are just as many LGBTQ+ engineers as there are in any other discipline, but they are simply hiding their LGBTQ+ identities for some reason? Of course, secondary data of a qualitative nature cannot fully address these questions, but because I had the data available, I searched back through the transcripts from my 2012 study of the climate in engineering for LGB students at Lavender University anyway and discovered something rather telling. Other than the general code for mentions of the climate in engineering generally, the most common code was coping. That is, in relation to their experiences as LGB engineers, the most common thing students talked about beyond the climate itself was how they coped with that climate. Their techniques, which they often shrugged off as inconsequential or did not even name as coping strategies, ranged from small things like changing their behavior slightly to seem less LGB or using self-deprecating humor all the way to complete non-disclosure and compartmentalizing their lives into separate “LGBTQ+” and “engineering” bins. For example, Michael talks about just avoiding anyone who makes negative comments about LGBTQ+ people in engineering:

If it's a student, then I would definitely just try to avoid the student because I just don't wanna cause tension in between my fellow engineering classmate and...if it's like a faculty member...I think I would just avoid them, too. – Michael, gay man

When required to interact with others during group engineering projects, Alan describes not disclosing and trying to work alone as much as possible:

You start to focus less on working with others and more doing your own thing just because you don't really want to have to deal with [disclosing], so eventually you just end up deciding, “Well, if this is gonna start causing problems then I might as well just do it on my own,” and...I'll just

not disclose it if I have a group thing just because things tend to go a lot smoother if I don't bring something like that up. – Alan, gay man

For some students, on the other hand, pockets of LGBTQ+ friendly engineers can provide community and comfort within the broader engineering environment. For example, Patricia, a lesbian woman, finds support in the engineering group for women on campus: “I actually go hide [with the women in engineering student organization] when I'm upset about something or having what I call a ‘bad gay day’ because they're extremely accepting.”

The prevalence (and necessity) of these coping mechanisms among LGB engineers at Lavender University within the Rainbow University System suggests that my second and third hypotheses—that LGBTQ+ students leave engineering and that they may be too fearful of disclosing to respond to a survey about their identities—are more likely than LGBTQ+ individuals simply not being interested in engineering. In fact, two of the participants in disciplines focused on computation asked to share their pseudonym names with Alan Turing, such that I had to name the second student “Allen” as a compromise, which suggests to me that these students had a deep appreciation for not only their respective engineering disciplines, but also for the LGBTQ+ individuals represented in the history of engineering. However, because of the limitations of secondary data and my own anecdotal observations, more research into the complex context of LGBTQ+ students in engineering is definitely warranted. Most importantly, in future work I recommend focusing on 1) gathering demographic information which includes LGBTQ+ identity in college applications or on campus-wide end-of-semester feedback and 2) giving specific attention to designing a study in which participants feel safe responding about their LGBTQ+ identities. Climate survey data, if available at your institution, is a great place to start, and analyses can generate talking points for building institutional buy-in at the very least.

Implications for Practice

Beyond actually designing and implementing a targeted research study, there are many practical applications of this information that anyone in academia can use to improve their campuses for LGBTQ+ engineers. An important step for academic professionals at all levels of their institutions is to **begin asking students to identify their gender and sexual orientation in robust demographic questions**. Treating beyond-binary gender identity and sexual orientation data as “too personal” or “too controversial” to collect only serves to further stigmatize being LGBTQ+ for students who *want* to be counted. Because of the perpetuated perception that LGBTQ+ students will not want to identify themselves and, therefore, should not be given the option, very few institutions gather any kind of LGBTQ+ information unless the questions are part of a campus climate survey. Even in campus climate surveys, some institutions refrain from asking about sexual orientation or including transgender and gender-nonconforming options for responses. For example, the recent climate survey at my home institution, University of Rochester, did not report any LGBTQ+ data, despite collecting data on binary gender (University of Rochester College of Arts, Sciences, & Engineering, 2017).

In balancing both the usefulness and accessibility of survey questions about gender and sexual orientation, I recommend the following three questions as examples of collecting robust demographic information:

1. How do you describe your gender identity? Please check all that apply:
 - Man
 - Woman

- Non-binary/Gender non-conforming
 - I use another term that is not listed.
 - I prefer not to disclose.
2. Do you identify as transgender?
- Yes
 - No
 - I prefer not to disclose.
3. How do you describe your sexual orientation? Please check all that apply:
- Asexual
 - Bisexual/Pansexual
 - Gay/Lesbian/Same-gender loving
 - Heterosexual/Straight
 - I use another term that is not listed.
 - I prefer not to disclose.

These three questions allow respondents to select multiple options, indicate that their identity was not represented in the survey, and also simply not disclose. Depending on the size of the dataset, the “I use another term that is not listed” option could be transformed into a short answer response; however, in datasets which include more than several hundred respondents, parsing text entries can become prohibitively labor-intensive and can offer disgruntled majority-identified individuals to “troll” the survey (e.g., I use another term that is not listed: “lumpy potato salad” or “this question is disgusting!!!!”), so I recommend using caution and thinking carefully about your purposes behind offering a short answer response option. Will you actually use the disaggregated data? If not, reconsider. Remember, too, that there is emotional labor on the part of the survey analysts in reading negative remarks, and that LGBTQ+ individuals may be more likely to offer their time and energy to research projects in which demographic data about their identities are being gathered. That is, care should be taken to protect both respondents *and* researchers.

Beyond the larger campus context of survey development and administration, individual academic professionals can become co-conspirators within realm of the positive social change. One of the most difficult, but also most valuable, ways to go about this work is to address identity-related micro-aggressions with patience, curiosity, and respect. Ask questions, name impact, and separate the person from the behavior. My personal favorite suggestion within this realm is to ask someone to clarify a negative comment, and once they say something along the lines of “I did not mean it in that way,” respond with elation and just a pinch of hyperbole: “Oh, I am so glad I misheard you! Because if you had meant it in that way, wow, that sure would have been messed up! And I know you are a better person than that. Whew, am I relieved!” Another way to serve as a supportive colleague is to avoid being someone who requires people from marginalized groups to “prove their right” to be upset about bias in academia. When a colleague comes to you to discuss a bias-related incident that affected them, do not jump to downplay their emotional response. Instead, listen and paraphrase when necessary. Let them get everything out before asking how to address the problem. While it is true that echo chambers often have a negative connotation, sometimes people from marginalized groups need to be in a space where they can hear themselves echo just a bit, rather than feeling as though their experiences and concerns are being drowned out by those of people belonging to majority groups. Make your office a protective, productive, positive echo chamber for your marginalized colleagues and students. The more of these

sorts of environments we create on campuses for one another, the more we will remember that we are not alone and that our voices do matter.

Conclusions

In the Rainbow University System, climate survey data indicates that LGBTQ+ students are underrepresented in engineering disciplines, and at Lavender University, LGB students report significant struggles in coping with the climate in engineering for LGBTQ+ individuals. Based on these results, I recommend 1) more qualitative exploration of the climate in engineering for LGBTQ+ students at a more diverse sample of institution types, 2) more quantitative collection of robust gender and sexual orientation data for entire campus populations as a standard assessment practice, and 3) individual attention to LGBTQ+ advocacy and support in engineering departments. With these three suggestions as a foundation, we can begin to build the kind of inclusive, equitable environment that can propel engineering as a discipline into a truly transformative future.

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