Key Patterns of LGBTQ Experiences in STEM: From Institutional Barriers to Transnationality

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Abstract: For decades, scholars have researched social inequalities of race, gender and other minority groups' experiences in science, technology, engineering, and mathematics (STEM). Nonetheless, whether lesbian, gay, bisexual, transgender and queer (LGBTQ) professionals experience parallel disadvantaged circumstances remains to be further surveyed substantively. This paper draws on relevant literature concerning the normative STEM environment and different views (constructivism, liberalism, etc.), seeking to unpack the intersectionality between LGBTQ and STEM. Through conducting surveys targeted at international LGBTQ students regarding their academic, social, and mental experiences in STEM specifically, this paper argues that there exists a shared common dilemma for this group: sexual objectification and extra stress to increase their STEM competence. This paper comparatively analyzes the results and reveals the institutional and transnational barriers for those LGBTQ students of different cultural backgrounds in the context of globalization and international interactions and cooperation. This paper also contends that LGBTQ professionals in STEM become "victims" of sexual objectification mainly due to hypermasculinity and male-female dichotomy.

Keywords: LGBTQ, STEM, transnational differences, intersectionality, complex institution, depoliticization, sexual objectification, hypermasculinity, sexual binarism

1. Introduction

A diverse group is more likely to achieve scientific innovations when people with different backgrounds make the best of their individuality and engender different solutions to a problem [1]. Thus, a team of STEM professionals representing different gender, sex, race, ethnicity, and nationality could approach a problem from diverse perspectives and form a more competent collective. However, lesbian, gay, bisexual, transgender, and queer (LGBTQ) professionals are still underrepresented in science, technology, engineering, and mathematics (STEM). Even worse, a more significant percentage of LGBTQ students express their intention to exit the field than their heterosexual peers [2]. In contrast to the humanities and social science that provide more liberal space for the voices of historically minoritized people, including women, blacks, and LGBTQ, depoliticization within STEM misframes social justice issues as tangential to STEM expertise [3]. Without recognizing LGBTQ experiences as the result of social and cultural construction, sexuality is solidified as an innate identity, making it impossible to approach STEM and heterosexuality as political institutions that shape the experiences of LGBTQ [4].

Current research has unveiled the intersection between LGBTQ and STEM identity and illuminated how the two axes interact to form a system of domination [2]. This article draws from my survey data of twenty international students to examine the academic, social, and mental experiences of LGBTQ students in STEM. By analyzing and comparing their responses with those in other literature, the study reveals that LGBTQ students share a common dilemma of sexual objectification and extra stress to increase their STEM competence. At the same time, rapid globalization and frequent interaction across national borders call attention to the different manifestations of intersectionality in cross-nation spaces. Shifting between their homeland culture and the academic environment in U.S. institutions, international students experience the transnational difference in LGBTQ inclusiveness. Perceiving the U.S. academy as more inclusive to the LGBTQ community than their homeland, these students report more positive experiences in STEM, which are not found among native students surveyed in other research.

2.   Literature Review

Previous studies have theorized a set of characteristics unique to the STEM academic setting as a culture that permeates the everyday life of STEM students. The STEM learning environment is dominated by heteronormativity, which manifests as the so-called "dude culture" and excludes LGBTQ people who don't actively blend in [5]. Some scholars even approach the domination from students' internalized "engineering identity" that associates masculinity with engineering competency. Adopting a more intersectional approach, Cech & Waidzunas contend that while the professional expertise of gay is often devalued due to the imposed norm of effeminacy, lesbians are often more accredited manifesting extra masculinity [6].

The research summarized above collectively demonstrates that the STEM environment can shape the experiences of LGBTQ students, while others take a constructivist approach to highlight students' efforts in navigating the STEM culture. Although some students take the initiative to resist the heteronormative culture, others react in more passive ways [5]. Studies show that gay men tend to invest more in building their technical skills to compensate for the devaluation of their expertise. Other students choose to blend in as heterosexuals and enjoy the associated privileges [6]. Although the liberalist approach dominates both reactions that help students acquire equal status with their heterosexual peers, they fail to overturn and instead strengthen the systemic dominations simultaneously [7]. As these students cover up their LGBTQ identity and exhaust mental efforts to look more "straight," they solidify the assumption that being heterosexual is the only right way in the STEM environment. The heteronormative thoughts behind them will disprivilege them even further.

3.   Method

I collected the survey data from twenty LGBTQ-identifying Chinese international students (three as gay, four as lesbian, five as bisexual, five as queer, and three as asexual) currently enrolled in STEM programs at four-year colleges in the U.S. I advertised the survey in three WeChat Groups (the most widely used social media in China) —— Ladies Who Tech (a non-profit organization promoting women's participation in STEM), Lavander (a nationwide club of gender and sexuality history enthusiasts), and an LGBTQ youth education community. I also sent surveys to individual LGBTQ-identifying students studying in STEM programs on Zhihu (a Chinese adaption of Quora). Due to the sensitive nature of the questions, my survey offers respondents the option to stay anonymous.

The questions asked in the survey are developed based on established research examing LGBTQ experiences in STEM. Knowing that sometimes LGBTQ students demarcate their personal and academic life by steering clear of discussion about their identity in STEM learning environments [6], I design Questions 1-4 to illuminate what specific institutional designs in STEM shift students'

expression of sexual identity. And Question 5-7 derives from the multidimensional system of oppression that Cech & Waidzunas theorize based on national survey data. By examing students' perception of their health conditions, recognition of expertise, and career opportunities [2], these questions intend to elaborate our understanding of the complex institution that structures LGBTQ experiences in STEM. Here is the complete list of questions asked in the survey:

1) Would you like to share your sexual identity with other STEM students?

2) Do you feel any inconvenience or prejudice after coming out to other STEM students? This question is only asked when the respondent answers "yes" in question 1.

3) Would you make the same or different decisions in expressing your sexual identity in a STEM setting and in your private life?

4) Do you think it's more challenging to fit into the STEM culture than your heterosexual peers?

5) Do you think disclosing your LGBTQ identity will subject you to more intense competition or mental stress?

6) How do you think disclosing LGBTQ identity can affect others' evaluation and trust of your technical skills?

7) How do you think disclosing LGBTQ identity can affect your access to STEM academic or professional development resources?

After answering each question, respondents have the option to elaborate on their answers. I also telephone several respondents under their permission to garner more details of their experiences. A part of the written and oral accounts of the surveyed students are translated and analyzed in this article.

4. Results and Analysis

4.1. Sexual Objectification

People are sexually objectified when they are solely represented by their collective body parts or sexual traits while losing the subjectivity of being a person [8]. Objectification permeates STEM culture as topics about personal emotion and identity are deemed irrelevant to the community [6]. It also constitutes dude culture, where cisgender heterosexual men boast about their extensive sexual relationship with women while seeing lesbian sex as the instrument that satisfies their need for sexual entertainment [5]. During the follow-up call with Ricardo, a Bioengineering student identifying as gay, he discusses how the sexualization of women predominates the conversation among his roommates:

Every day my roommates recount some of the hot women they have seen during the day. They usually reference the particular body parts of women to show how sexy they are. What makes me more uncomfortable is that they refer to women who are not on their aesthetic side with some dehumanizing labels. Once, they called a woman "the dead person" simply because her facial expressions were stiff.

While women are instrumentalized into body parts that gratify men with sexual entertainment, they are reduced to the bottom of a dominant system built upon male privileges [4]. Under this context, female bodies are like commodities that males enjoy as consumers without paying the price. Simultaneously, the imposing standards of female beauty subject those who don't fit the expectation of masculine men to disadvantages. Even though they are surrounded by such hypermasculinity of cisgender heterosexual men daily, LGBTQ students may still feel excluded from their social circle [5]. Sometimes LGBTQ students can even become the direct target of sexual objectification. Yoyo, a queer-identifying woman studying material and chemical engineering, recounts a microaggression she encountered during an internship in a tech company:

As a part of a game, I shared my homosexual love story with other interns. However, I felt offended when I heard one of the interns directly address me as "that lesbian" in front of others. Labeling

people by their sexual identity makes me feel offended, not to mention that I don't identify as lesbian (but as queer).

Even though it's outside the academic context, LGBTQ students are sexually objectified when their sexual identity refers to them. Under this context, everyone is assumed to be heterosexual, and as a result, the nonconforming sexual expressions are magnified as a shortcut to people's integrated personalities. Meanwhile, Cech & Waidzunas discover that engineering students are more likely to frame sexuality as the straight/gay dichotomy and evade ambiguous sexual orientation [6]. Used as an umbrella term, queer rejects hegemony that renders sex fixed and embraces the unstable nature of gender categorizations [8]. In my case, such binary thinking draws the student to build a straight connection between same-sex love and lesbian identity. In contrast, bisexual and queer, two categories that drift away from the binary, are marginalized.

4.2. Professional Evaluation

Since STEM culture embraces problem-solving as a core skill, social skills are preceded by technical mastery. According to Connell, masculinity often ties to qualities such as decisiveness, unbiased judgment, rationality, and pioneering spirit, which are considered indispensable to STEM professionals' technical competency [9]. On the contrary, feminine features are thought to be more compatible with soft skills such as communication and socializing, which are relegated as tangential to STEM work. Thus, a heterosexist gender binary is established, privileging masculinity over femininity, male over female, and heterosexual people over the LGBTQ. Often generalized to be more feminine, gay males are subjected to the potential devaluation of their expertise [2].

An anonymous gay-identifying student discusses his efforts to display his masculine side in an engineering lab. He said, "You really need to show your persistence and ability to manage your work under pressure so that the PI (Principal Investigator) will be more reassured to assign more advanced tasks to you." Balancing two inconsistent systems of stereotypes associated with gay men and engineers requires significant mental efforts [6], making LGBTQ students more common victims of mental health difficulties such as insomnia and depression [2].

Besides masculinity, the current system that intends to promote LGBTQ representation could lead to the devaluation of their technical skills. LGBTQ students are suspected of benefiting from the diversity consideration of college admission. While LGBTQ students are welcome to contribute different perspectives in humanity and social science classrooms, they are sometimes seen as less technically competent for STEM studies [6]. Yuxi, a Computer Science student identifying as lesbian, is frustrated about how her teammates comment on her qualification in a hacking competition:

Last year I joined a team of 6 for a hacking competition. At first, one of the team members seemed indifferent to me. Every time I spoke in the group discussion, he turned his eyes away and looked disdainful. Later I was frustrated to learn that he was upset about including me in the team since he believed queer people are always disqualified, and I would drag the whole team down!

Based on Cech and Waidzunas's framework of how masculinity plays out differently around homosexual males and females, lesbians, stereotyped as more masculine, should be more accredited than their heterosexual peers [6]. However, Yuxi's experience illuminates a more complicated space, where LGBTQ students are indiscriminately devalued for receiving unequal boons to get their opportunities. As a result, STEM becomes a depoliticized field as the social cause of promoting LGBTQ representation is relegated as being against STEM's technical needs [3].

The depreciation of expertise burdens LGBTQ students with extra stress. Realizing that the stereotypes about LGBTQ identity could harm their qualification as well-trained STEM technicians, students feel compelled to work extra hours to consolidate their authority [6]. I also find similar navigation efforts from my interviewee Mingyi, a neuro-engineering student who hesitates to come out in the STEM setting. He said, "I have been working painstakingly to prepare for the moment of

coming out. I hope others focus on what I have achieved instead of my sexual orientation." Standing out among his peers gives Mingyi more confidence to express his queer identity.

4.3. Transnational Difference

Transnational differences in cultural origin and social organization shape the varying inclusiveness towards the LGBTQ community around the globe [10]. In almost eight thousand years of agricultural history, Chinese society has been organized around self-sufficient family units. The importance attached to reproducing new laborers to sustain the household economy continues today. Thus, deemed unable to succeed in the family, the LGBTQ community is not widely accepted in contemporary Chinese society. Growing up in traditional Chinese families before continuing their higher education in the U.S., my respondents experience a considerable shift in cultural contexts that influence how they perceive their STEM experiences. When being asked whether coming out as queer influences her access to career development opportunities, yoyo answered:

I think it depends. I envision continuing my education and career in the U.S., so LGBTQ+STEM is a good combination. I haven't encountered any challenges accessing the resources I need. Instead, by attending LGBTQ+ STEM events, I got to socialize with many awesome people who gave me much support along the way. However, I believe the story would be different if I choose to develop in China, especially if I end up in a state-owned enterprise. You may lose your job if you come out in that setting.

The LGB students interviewed by Cech and Waidzunas are worried that their career prospects may be endangered since workplaces are usually less inclusive than academic institutions [6]. However, yoyo demonstrates a more positive attitude towards her career prospect in the U.S. She appreciates how the community of people sharing non-heterosexual identities and STEM pursuit offers her an indispensable opportunity for development. Meanwhile, she compares her experiences with the status quo of the LGBTQ community in her homeland, demonstrating that the transnational differences take part in framing her gratitude for the present career prospect.

Cech and Waidzunas found in their survey that LGBTQ students compartmentalize between the STEM community and their social circle [6] by making different decisions on whether to disclose their identity based on context. While they are more open to close friends, they hide straight among their STEM classmates. In comparison, my survey reveals a different pattern of compartmentalization among international students. Ziqi, a Chemical Engineering student identifying as lesbian, discussed how she lives a doubled life after college:

I have come out to my college friends, including those in the same engineering lab as me, and I have been actively engaged with my college's LGBTQ events. Every October, which is our pride month, I lead an LGBTQ reading group and organize discussions on queer history and literature. Although I enjoy sharing my college stories with my friends and family at home, I never talk about the LGBTQ-related activities I have led or participated in, not to mention my queer identity, after hearing one of them mock me as "brainwashed."

Through the interview, I know that Ziqi doesn't perceive any hostile responses from the STEM environment after disclosing her lesbian identity. However, she divides her life across the U.S. and her homeland based on the respective cultures' different levels of acceptance towards her LGBTQ identity and cause. In Ziqi's case, transnational difference takes a more prominent role in organizing her LGBTQ experiences than in the STEM learning environment.

5. Limitations

Although this study identifies three major patterns of LGBTQ experiences in STEM, several limitations exist. Due to time restrictions, I was only able to collect 20 responses and select three

respondents for in-depth interviews. Thus, the results may fail to cover some variations and have less potential in representing the collective experiences of Chinese international students. In addition, conducting the survey while staying remote during the pandemic, I was only able to collect responses from Chinese students. While "international students" have been fixed as a category relative to native U.S. students, it's far from representing the substantial cultural differences among these students. Thus, it will be risky to generalize the results to international students from other countries. Finally, all my respondents study in prestigious research universities known for their comprehensive curricula and liberal atmosphere. Therefore, the experiences of LGBTQ students studying in more STEM-focused institutions may diverge from the patterns found in this study.

6.   Conclusion

Overall, the article concludes that hypermasculinity and sexual binarism in STEM render LGBTQ students victims of sexual objectification. Recognized as less competent in technical skills, LGBTQ students invest more in physical and mental efforts to overthrow the devaluation. The study also finds that while students in the middle of transnational cultural differences envision more positive LGBTQ experiences in the U.S., they make different decisions on covering or disclosing their identities depending on the context. Future research could enlarge and diversify the sample to reveal more generalizable results about international LGBTQ students' experiences. Besides, although I establish sexual objectification, professional devaluation, and transnationality as three significant institutions that frame LGBTQ experiences in STEM, further research is needed to elucidate the origins behind these patterns.

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