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# From Chilly Climate to Warm Reception: Experiences and Good Practices for Supporting LGBTQ Students in STEM

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**The Experiences of LGBTQ Students in Science, Technology, Engineering and**

**Mathematics (STEM) Departments of Higher Education, and Good Practices**

**for Supporting Them**

**by**

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## Introduction

Lesbian, gay, bisexual, transgender, and queer/questioning students (LGBTQ) face unique challenges during their university or college careers, and while society has generally become more accepting of sexual and gender minorities (SGM) over the past decade, students still often face chilly or outright hostile campus climates, as well as institutional and departmental policies and practices that create barriers to their learning and feeling of belonging in their classrooms and on their campuses. Research suggests that these issues are particularly pervasive in the disciplines of Science, Technology, Engineering and Mathematics (STEM), and there is some evidence to suggest that LGBTQ individuals are underrepresented in these fields, at least in the STEM federal agency workforce (Cech, 2015). In this work, I review the research pertaining to LGBTQ university and community college students in STEM fields, including departmental and campus climate, departmental and institutional policies, and student outcomes. I investigate the evidence for policy and intervention options, and synthesize the recommendations from the literature that can help to support SGM students in classrooms, departments, and institutions of higher education.

## Terminology

For the purposes of this work, I define STEM fields in accordance with the definition given by the National Center for Education Statistics, which includes biological and biomedical sciences, computer and information sciences, engineering and engineering technologies, mathematics and statistics, and physical sciences and science technologies. It does not include psychology or the social sciences.

Throughout this review, I use "sexual minority" or "LGB" to refer to lesbian, gay and bisexual students, with the understanding that many of the issues faced by this population are also experienced by students who are questioning (Q) their identities, and/or perceived to be LGB, whether they self-identify as part of the community or not. I use "gender minority," "transgender" or "T" to describe students who identify with a different gender identity to the sex they were assigned at birth, wherever their identity lies along or outside the gender spectrum, and whether they have, or intend to, physically transition from their birth-assigned sex or not. This broad definition of transgender is often written as "trans*" to emphasize the inclusive nature, but I have chosen to use "transgender," as this is the language most commonly used in the research I review. Again, I adopt this definition with the understanding that many students may not self-identify as transgender, but may nevertheless experience some of the same issues due to their perceived gender identity or their gender expression. Where possible, I explicitly separate the research pertaining to LGB students from that on transgender students; while these populations are often conflated, the issues faced by each are overlapping, but distinct, and transgender students are often short-changed by being incorporated into the better-researched LGB umbrella. This can be especially problematic when a transgender student does not identify as LGB.

It is important to understand that the *LGBT* terminology may not be used by communities of color, as these terms can be strongly associated with white culture (Boykin, 1996, 2005). Instead, communities of color may use other terminology, such as *same-gender loving*, or *queer* to describe their identities (Poynter & Washington, 2005). Furthermore, sexual and gender identities and the terminology describing those identities

can be incredibly fluid, especially amongst SGM youth (of all races). While I have chosen to use the LGBT terminology to reflect the language used in the literature, it is important to understand that this may not be the preferred terminology used by SGM individuals, and when working directly with SGM individuals, it is vital to allow them to describe their own identities in a way that is comfortable to them.

Finally, I have not explicitly addressed the many other identities that fall outside the sexual and gender binary - e.g. those who identify as asexual, pansexual, omnisexual, and agender, among others. This is not to suggest that these identities should be neglected by policy or training, but the research on these distinct identities is scarce, and often conflated with LGBT identities.  For clarity, I choose to use the terminology in the literature, and there is good reason to believe that improving the campus climate and policies for LGBTQ students will improve the situation for all.


## Diversity in STEM Fields

In this critique, I have chosen to focus on the experiences of LGBTQ students in STEM fields, where that research is available. Much of the experience of LGBTQ students in STEM is shaped by their broader university environment (e.g. housing, student services, their peers), but there are some specific issues related to STEM fields that I call out where applicable, even though research on LGBTQ STEM students is scarce.

One of the major challenges facing the US education system is the education and retention of students in STEM subjects throughout their school career and into the workforce. STEM occupations are projected to grow 17% between 2008-2018, compared to only 9.8% for non-STEM occupations, and STEM salaries are around 26% higher

than those in non-STEM professions (U.S. Dept. of Commerce, 2011). Nevertheless, only 16% of Bachelor's degrees, 12% of Master's degrees and 15% of Doctorate degrees conferred in 2011-2012 were awarded in STEM fields (NCES, 2014). As a result, there is a looming gap between the demand for STEM-educated professionals in the U.S. and the individuals qualified to fill that gap; the recruitment and retention of more students in STEM subjects is of vital importance.

A huge potential source of additional STEM graduates can be identified by looking at the demographics of undergraduates majoring in STEM. In 2013, 302,257 Bachelor's degrees were awarded in STEM subjects; 50.5% of them to White and Asian males (the demographics most well-represented in STEM subjects; NCES, 2014). However, White and Asian males, combined, make up only 33.1% of the population (U.S. Census, 2010). If, instead, the degrees awarded reflected the demographics in American society, i.e. white women and people of colour graduated in STEM subjects at rates proportional to their representation in society, then there would be an additional 158,674 STEM degrees awarded per year.

Quite besides the need for more STEM graduates, there is a pressing need for a more diverse STEM workforce. Multiple studies show that diverse groups display better, more innovative decision making, and generate more impactful science (more citations in higher impact journals) than homogenous groups (Antonio et al. 2004; Sommers, 2007; Phillips & Apfelbaum, 2012; Loyd et al. 2013; Freeman & Huang, 2014). More importantly, when it comes to issues like climate change, where there is a strong link between science and the effects on society, it is vital for scientists to have a better understanding of the communities with which they are working, and to move away from

the deficit model of science communication to a contextual model (Gross, 1994), where the importance of local and contextual knowledge is acknowledged alongside scientific research when making policy decisions. This is especially hard to do when STEM professionals are overwhelmingly male and white, and for many communities are therefore "other."

There are many reasons for the deficit of women and non-Asian men of color graduating from STEM degrees, but there is evidence to suggest that at a significant fraction of these "missing" students begin STEM degrees, but transfer to other subjects or drop out before completion; for example, we can compare the number of freshmen in 2008 who reported an intent to major in STEM to the actual number of STEM degrees awarded in 2012 (Table 1; National Science Foundation, 2015). For white males, 31% of those who said they were intending to major in STEM in 2008 graduated with a STEM degree four years later; for Asian males, 32%. Compare this with White women (26%), Black men (16%), and Black women (12%), and the disparities quickly become obvious. There is a wealth of research (reviewed below) to suggest that these disparities are largely due to institutional barriers and "chilly" or "hostile" climates that underrepresented groups experience in STEM fields, and that work to remove those barriers and create more welcoming climates could dramatically increase retention rates.

These comparisons are not available for LGBTQ students, because data on sexual orientation and gender identity are not regularly collected, although there is some evidence to suggest that LGBTQ employees are underrepresented in the federal STEM workforce (Cech, 2015). Nevertheless, as the literature reviewed below shows, many of the departmental and institutional barriers and climates that can deter women and students

of color from persevering in STEM are closely related to those experienced by LGBTQ students, so it is not unreasonable to believe that LGBTQ students may be lost at similar rates.

Table 1: Percentage of Freshman intending to major in STEM in 2008, who received STEM degrees in 2012. Source: National Science Foundation, 2015

|  | All | Male | Female |
|---|---|---|---|
| **All** | 25.3 | 27.8 | 23.0 |
| **White** | 28.4 | 31.1 | 25.9 |
| **Asian/Pacific Islander** | 31.2 | 32.1 | 31.9 |
| **Black** | 14.0 | 16.3 | 12.8 |
| **Hispanic** | 16.9 | 17.1 | 16.3 |
| **American Indian/ Alaska Native** | 16.1 | 17.9 | 15.6 |

## Campus and Departmental Climate for Underrepresented Students in STEM Fields

Campus/Departmental "climate" is described by Rankin & Reason (2008) as "current attitudes, behaviors and standards, and practices of employees and students of an institution," and the holistic experience of students in campus spaces is affected by the historical context of an institution (including the physical space - e.g. buildings named after racist or homophobic benefactors), the presence of other people belonging to marginalized groups, the perceptions, attitudes and behaviors exhibited between different groups on campus, the organizational and structural processes and decisions, and the relationship with the external influences of society and government (Hurtado, 1994; Hurtado et al. 1998; Milem et al., 2005; Rankin & Reason, 2008). All of these factors can

contribute to students either feeling like they belong in the campus culture, or like they are "guests in someone else's house" (Turner, 1994).

Given this definition of climate, we can begin to see why STEM departments are often "chilly" or "hostile" places for non-majority students (Fouad et al. 2012; Cech & Waidzunas, 2011; Seymour & Hewitt, 1997). The historical context of STEM subjects taught in the United States is dominated by the definition of science and science achievement in Western terms, with an emphasis on the contributions of white, male scientists, despite the significant contributions of people of color and white women to the STEM fields (Lee, 1999). Even where LGBT scientists are included in classroom teaching (e.g. Alan Turing), their sexual orientation is almost never addressed: in the U.S., only 18.5% of students are taught positive representations of LGBT people, history or events (Koswic et al. 2014). This "straight-washing" of historical figures has a very real effect: Koswic et al.'s study of 7,898 LGBT high school students across all 50 states found that LGBT high school seniors are more likely to be interested in studying STEM subjects in college if their relevant high school classes had featured positive LGBT content (35.8% vs 18.5%; Koswic et al. 2014).

As outlined previously, STEM fields are also dominated in the present by white males; these scientists generally have little training in diversity, equity and inclusion issues, thereby complicating cross-cultural communication and competency. The result is a climate in which non-dominant-identity students are expected to assimilate to the "culture of science," which is actually just reflective of the dominant culture, rather than any values or behaviors inherent to the needs of the scientific process (Bell et al. 2009; Yee, 2015). Students of color in STEM fields are therefore often left in the uncomfortable

position of being expected to assimilate to a culture that is threatening to their cultural identity (Simpson, 2002), or be excluded from the culture entirely. In order to create environments in which non-majority students can flourish, STEM departments must be willing to critically examine their culture, and separate the aspects that are truly tied to the scientific process, and those that are simply a product of the white, male, heteronormative culture that has been propagated without critical thought. In other words, they must be willing to adopt Lee's (1999) idea of "scientific biculturalism" and support students in embracing science and developing their science identities without forcing them to abandon their social and cultural identity (Hernandez et al. 2013; Sinnes & Loken, 2012).

One of the persistent and prevalent beliefs affecting STEM fields is the "myth of meritocracy" (McNamee & Miller, 2004) - i.e. the belief that science rewards students of equal aptitude with equal rewards, completely independent of their gender, ethnicity, race, or any other characteristic not related to their academic ability. This belief implies that the low persistence rate amongst white women and non-Asian men of color is due to their lack of competence in the subject matter, rather than due to hostile climates or discriminatory policies in STEM departments. In a study of STEM students, however, Seymour & Hewitt (1997) found that a student's persistence in STEM was unrelated to their aptitude but instead depended on their ability to tolerate the difficult social aspects of majoring in STEM, and that the culture in STEM was largely oriented towards the needs of the white, male students. In a study of gender experiences in workplaces, Eisenhart & Finkel (1998) found that this cultural streamlining towards the dominant group can be invisible to all groups: both men and women in the study reported equal

treatment, despite the researchers' observations of inequality in the workplace in favor of the male students and employees. Johnson (2007) found that this belief in "colourblind" and "gender-blind" meritocracy can negatively affect non-white, non-male students, reporting that:

> *"This match between Whiteness, maleness, and the characteristics needed for success in science was hidden in this setting by the silence about race, ethnicity, and gender, which was in turn hidden by the rhetoric of meritocracy. This silence prevented students and professors from seeing how ethnic, racial, and gendered dynamics helped determine which students found it easier to thrive."*

Cech & Waidzunas (2011) describe this phenomenon in more detail for LGBTQ students in STEM, describing how STEM workplaces often, intentionally or unintentionally, promote a "technical/social duality," with STEM students and professionals sorting characteristics into either "technical," i.e. related to subject matter and technical expertise, and therefore highly prized, or "social," i.e. not related to technical expertise and therefore dismissed as irrelevant. Climate and workplace issues related to gender, race, sexual orientation, gender identity, disability, and any other personal characteristic are therefore relegated to a secondary issue, and are rarely discussed in STEM environments, despite the significant effect they can have on the well-being and persistence of students who do not fall into the white, male, heterosexual, able-bodied "norm." Indeed, any attempt to discuss issues of diversity and equity within historically white, male, heterosexual spaces can be met with significant resistance, or "blowback," with faculty, staff, and students questioning the relevance of the topic to their workplaces (Hill, 2009). This refusal to discuss social aspects of the STEM culture can be

extremely stressful to underrepresented students, and lead to worse academic and mental and physical health outcomes, as outlined later in this work.

## Oppression and Microaggressions

LGBTQ students face a number of areas of discrimination and oppression in university environments, but some of the most persistent and insidious are known as "microaggressions." First introduced by Pierce (1970) in the context of race, microaggressions are generally characterized as brief, frequent insults on minority individuals, which can be intentional or unintentional, and are not always recognized as offensive by the perpetrators. Pierce (1995) described microaggressions as "*subtle, innocuous, preconscious, or unconscious degradations, and putdowns, often kinetic but capable of being verbal and/or kinetic. In and of itself a microaggression may seem harmless, but the cumulative burden of a lifetime of microaggressions can theoretically contribute to diminished mortality, augmented morbidity, and flattened confidence.*"

Microaggressions can take three distinct forms (Sue, et al. 2007): microassaults (small, derogatory attacks), microinsults (rude or insensitive put-downs), and microinvalidations (remarks that diminish the lived experiences of students of color, and question their belonging in a given space; Yosso et al 2009). All have been shown to contribute to reduced mental and physical health in people of color, and the persistent, ever-present nature of these aggressions can lead to "racial battle fatigue" (Smith, 2004), which can have similar symptoms to post-traumatic stress disorder in combat veterans.

For LGBTQ students, these microaggressions take many forms, including the questioning of the legitimacy of relationships, guessing the gender of trans* and non-

gender-conforming individuals, refusal to use an individual's preferred gender pronouns, comments such as "that's so gay," asking LGBTQ students to speak for the entire community ("tokenising" them), and assuming heterosexuality or cisgender identity, among many others (Nadal, 2013). As with racial microaggressions, each takes its toll on mental and physical health of LGBTQ individuals (Mays & Cochran, 2001), and especially LGBTQ individuals who have multiple marginalized identities (e.g. LGBTQ people of color; Balsam et al. 2011).

**Intersection of Identity and Multiple Minority Stress**

In all discussions of oppression and marginalization, it is vital to understand the experiences of people with multiple marginalized identities. The term "intersectionality" was coined by legal scholar Kimberlé Crenshaw in 1989, who argued that one cannot divide the experiences of being a Black woman into the experiences of being Black and being a woman separately, but that the experiences intersect with each other to create a unique experience for Black women that is distinct from the experiences of Black men and white women. This holds true for all variations on all identities - the experiences of an LGBTQ person of color are distinct from those of the white LGBT community, and those of cisgender, heterosexual people of colour. Moreover, the oppressions experienced by people with multiple intersecting identities are also enmeshed and mutually reinforcing, and treating those oppressions as if they exist in mutually exclusive spheres ignores the full effect of this reinforcement (Crenshaw, 1989; Balsam et al. 2011). For example, cisgender women of colour and white transgender women each face discrimination and oppression in different ways, but transgender women of colour face

oppression due to their multiple identities that is entwined and mutually reinforcing, becoming more than the sum of its parts. As a result, they face disproportionate and devastating levels of violence and structural oppression (National Coalition of Anti-Violence Programs Report, 2015).

In many cases, people with intersecting identities can find it far harder to find community - for example, for LGBTQ people of color, LGBTQ spaces can be just as racist as the general population, while spaces designed to support people of color can be just as homophobic as the wider community (Cech & Waidzunas, 2011). Moreover, many of these spaces are literally and figuratively inaccessible to those with accessibility needs, and so people with disabilities can find themselves physically and socially excluded from support groups designed to support their other marginalized identities (Atkins & Marston, 1999). Policies and programs designed to support LGBTQ students must therefore take great care to be aware of intersectionality, and how this can affect the ways in which students with intersecting marginalized identities experience the intended "safe spaces."

### The Wider Context for LGBTQ Individuals

Over the past decade there have been enormous strides made in LGB rights. Marriage equality is now legal in all U.S. states, giving same-sex couples all the rights and responsibilities of marriage, including those of inheritance, next of kin, health insurance and tax benefits, immigration sponsorship and joint parental rights. However, marriage equality has not brought broader equality: legalized discrimination on the basis of LGBT status is still rife. It is still legal in 29 states for employers to fire someone based solely on their real or perceived sexual orientation, and it is still legal to fire someone in 33 states

based solely on their gender identity or expression (Human Rights Campaign, 2014) .

The transgender community is especially vulnerable to harassment and discrimination,

experiencing significantly higher rates of violence and homicide than the LGB

community (Marzullo & Libman, 2009). LGBT people of color are particularly

vulnerable, with the highest rates of violence perpetrated against transgender women of

color (National Coalition of Anti-Violence Programs Report, 2015).

LGBT youth are also a particularly vulnerable population - they make up an

estimated 40% of homeless youth (Durso & Gates, 2012) and are 4 times more likely than

their straight peers to attempt suicide (CDC, 2011). Nearly half of transgender youth

have seriously considered suicide and one quarter report having made a suicide attempt

(Grossman & D'Augelli, 2007). Suicidal ideation amongst LGBT youth is not due to their

identity, per se, but largely due to the high levels of discrimination and rejection

(particularly familial rejection) to which they are subjected (Ryan et al. 2009).

LGBT students in K-12 schools are subject to extraordinarily high levels of

harassment and violence. 74.1% of LGBT students included in GLSEN's 2013 National

School Climate Survey (Kosciw et al. 2014) had been verbally harassed within the past

year due to their sexual or gender orientation, 36.2% had been subjected to physical

violence, and 55.5% felt unsafe in school. 51.4% reported hearing homophobic remarks

from their teachers. Almost a third of LGBT-identified students missed at least one day of

school a month due to feeling unsafe, and students who are victimized are found to have

lower grade point averages (2.9 vs 3.3) and are twice as likely to report that they do not

plan to pursue post-secondary education than their peers.

This is the backdrop against which LGBT students are entering university and college environments. While this critique focuses on institutions of higher education, and STEM in particular, these classrooms, departments, and campuses do not exist in a vacuum, and students are inevitably dealing with many of the same issues at 18 years old that they were dealing with at 17. The youth we serve in our universities and colleges are affected by both their prior experiences and the wider societal context in which our colleges and universities exist.

## The Timing of College for LGBT Youth

College is an important time for addressing issues of identity for all students, but it's a particularly crucial age for LGBT youth, for a number of reasons. Gay men generally experience their first same-sex attraction around the age of 8, while lesbians do so around the age of 9 (Savin-Williams & Diamond, 2000). Their first disclosures, however, tend to come around 10 years later, just at the time when they are entering college (Savin-Williams & Diamond, 2000; Evans & D'Augelli, 1996; D'Augelli, 1991), although more recent research suggests that the average age of coming out has dropped in recent years to around 16 (Shilo & Savaya, 2011).

In contrast, transgender individuals who are visibly non-gender conforming (NGC), i.e. they do not conform to society's expectations of how someone of their sex-assigned-at-birth should look or behave, tend to come out in childhood or around the onset of puberty (Bockting & Coleman, 2007; Möller et al. 2009; Wallien & Cohen-Kettenis, 2008) while those who are not visibly NGC often come out much later, during midlife or beyond (Doctor, 1988; Landen, 1998). Nevertheless, college is still a crucial

time in transgender students' identity development, as it can mark the first time that they have had the freedom, and/or resources to consider transitioning (McKinney, 2005). For LGBT youth, college is often the first time that they have had freedom from family, school-based homophobia, and their childhood church or neighborhood, and also the first time that they have met LGBT role models. It's therefore often the first time that they have been able to develop their adult identities out of the shadow of their childhood identities. This timing also means that college is one of the first times that many straight (i.e. heterosexual, cisgender) students have been exposed to individuals with a broader range of sexual and gender identities.

### Academic and career outcomes for LGBT students

Academic outcomes for LGBT students are difficult to track, because so few colleges and universities keep data on the sexual and gender orientation of their incoming student body. The federal government and federal funding agencies require the collection of information about race and sex (usually sex assigned at birth), but not about sexual orientation or gender identity, and so many institutions collect only the data required by law. Asking for information about LGBT status during the college application process is problematic, as many prospective students have parental help in filling out their application forms, and many are not out to their families. Furthermore, as described in previous sections, college is a time when students are exploring their identities, so many students entering college identifying as straight or cisgender (their gender identity matches the sex they were assigned at birth) subsequently leave with different sexual and/or gender identities. This fluidity makes it difficult (although not impossible) to collect

accurate data. Consequently, there are very few studies that have attempted to gauge college academic outcomes for LGBT students.

Carpenter (2008) carried out the first empirical study using data on 40,000 college students from the Harvard College Alcohol Study. The author compared the GPA and perceptions about academic work of sexual minority students to those of their majority peers. The results show mixed results for outcomes of LGB students in college, with gay men having generally positive academic outcomes, while lesbians and bisexual men and women have more mixed grades and experiences. The study is very limited, however, in that it defines sexual minorities as students who self-reported same-sex sexual encounters, rather than those who self-identified as LGB. While the two populations are likely overlapping, it is difficult to draw any conclusions about the outcomes for openly LGB students in higher education. A second study from Pachankis & Hatzenbuehler (2013) finds that self-identified gay men are more likely to be high academic achievers, and more likely to derive their self-worth from academics and competition than their straight peers. The authors find that the higher the level of stigma (i.e. homophobia), the more gay men sought self-worth through competition. They suggest that sexual minority men use academic achievement as a way of coping with the stigma of their sexual orientation. They also confirm, however, that this heavy investment in achievement holds negative health consequences for the students. The authors note that their study is limited by small numbers (n = 192), and they recommend carrying out a wider study, and expanding the research to include sexual minority women and transgender students.

Looking past simple GPA, Schmidt et al. (2010) studied 189 LGBT undergraduates across all four years of college to investigate how perceived discrimination

and lack of social support due to sexual and gender orientation affected career planning and adjustment to college.  LGBT students who felt that they had been discriminated against, or who felt that they lacked support on the basis of their orientation, were found to display higher levels of indecision about careers and worse adjustment to college than their peers who felt supported. Social support was particularly strongly correlated with the outcomes. The study was limited, however, by the lack of data collected on non-LGBT students, making it impossible to know whether the LGBT population experience greater problems than their straight peers. Significantly, no data were collected on socioeconomic status of the students, which may be an important contributor to both career indecision and college adjustment.

## Mental Health Outcomes for LGBTQ Students

There is a vast body of research indicating that individuals with marginalized identities face worse mental and physical health outcomes than their peers (Meyer, 1995; Meyer, 2003; Huebner & Davis, 2007; Lewis, 2009; Nadal et al. 2011; Bockting et al, 2013), and that many of the identity management mechanisms employed by LGBTQ individuals to protect themselves from harassment and discrimination (acting, passing, covering, excelling; Chung, 2001) contribute to poor mental health as individuals struggle to maintain the dissonance between work and home life, experience constant stress at being "found out," and feel unable to bring their full selves to their work environment (Pachankis, 2007; Pachankis & Hatzenbuehler, 2013; Ragins & Singh, 2007 and references therein).

Research on LGBTQ college students finds similar outcomes for the student population, with links between poor campus climate and increased alcohol and drug use (Reed et al. 2010, Weber, 2008) and worse mental health outcomes for LGBTQ students compared to their heterosexual counterparts. Kerr et al. (2013) carried out as a secondary analysis on data gathered by the American College Health Association National College Health Assessment, comparing 849 lesbians and 2,456 bisexual women across three semesters and more than 40 institutions to 3,384 of their heterosexual counterparts. They found higher rates of depression and suicidal ideation in bisexual and lesbian women in college, with bisexual women having the worst mental health in all areas, including anxiety, depression, self-harm, and suicidal ideation and attempts. Both lesbian and bisexual women were found to have a higher likelihood of experiencing mental health issues than heterosexual women, and were more likely to use campus mental health resources than heterosexual women. They recommend regular campus mental health screenings, support groups and programming for sexual minority women, and campus education on LGBT issues. The study has some limitations, in that the campuses taking part in the study are self-selecting, and therefore may not be representative of the wider population. The study was also not explicitly designed to address the issues faced by LB women, but a secondary analysis of a subset of a larger data set; nevertheless, it is a comprehensive investigation of an understudied population.

The findings of Kerr et al. (2013) are supported by the previous literature, including studies by Westefeld et al. (2001) and Kisch et al. (2000) who found elevated incidence of depression, loneliness, and suicidal ideation and attempts in LGB college students compared to their heterosexual peers. Kisch et al. (2000) also found that fewer

than 20% of students who reported suicidal ideation were receiving treatment. Westefeld et al.'s (2001) study was limited by the small sample size.

## Campus experiences of LGBT students

This section reviews the literature on the experiences that LGBTQ students have in different spaces on college campuses, including the general climate, gendered spaces such as housing, restrooms, and locker rooms, experiences with health services, in classrooms, with the registrar's office and student services, and with dedicated spaces intended to serve LGBTQ students, such as Pride Centers on campus. I discuss the range of experiences reported by different subsets of the LGBTQ community in these spaces, and in the following section, I compile suggested recommendations from the literature for making these spaces safer and more welcoming.

### General Campus Climate

Climate varies dramatically between institutions, and even within the same institution - some students report a hostile climate with overt homophobia (Wickens & Sandlin, 2010); others report distinct safe and unsafe microclimates or subgroups on campus (Vaccaro, 2012; Waldo, 1998) while still others describe a mainly supportive campus, but incidents of microaggressions (Schmidt et al. 2010; Nadal et al. 2011). Nevertheless, studies of campus climates consistently find that underrepresented student groups find their campuses more hostile than the dominant group. Rankin & Reason (2005) found that students of color and white women experienced harassment at higher rates than white male students, and that students of color perceive their campus climate

as more racist, hostile, disrespectful, and less accepting than white students, even though white students recognized racial harassment at similar rates. LGBT students report similar outcomes: Rankin (2003) found that while 90% of heterosexual students classified their campuses as "friendly," 74% of LGBT students rated their campus climate as "homophobic." This is echoed by the findings Ellis (2009), and Brown et al. (2004), who also found that perceptions of campus climate varied between faculty, staff, graduates and undergraduates, and also that lesbians found the campus climate more hostile than gay men.  Gortmaker & Brown (2006) found significant differences in lesbian and gay students' perception of campus climate based on how "out" the individuals were, with out students reporting a more negative campus climate than those who were closeted. Closeted students, however, felt more pressure to hide their identity from those around them.

Research on LGBTQ community college students, based on data from Rankin et al. (2010), finds that classroom climate plays a strong role in the overall climate in community colleges, probably due to the fact that these students often live off campus, and experience the college primarily through the classroom setting, and that first generation students experience a more hostile climate (Garvey et al., 2015). All of these studies mentioned above, except for Rankin (2003), Rankin et al. (2010), and Garvey et al. (2015) share the same limitations of being limited to a single campus, with potentially non-representative samples, given the methods of recruitment. Rankin's 2003 and 2010 studies are discussed later in more depth.

**Campus climate at the intersection of identity**

Climate for multiple minority students is poorly studied in the literature, but where it is addressed, it is found to be particularly difficult to navigate, with LGBT students of color experiencing significantly higher levels of harassment, especially transgender students of color (Rankin et al. 2010; Poynter & Washington, 2005). Poynter & Washington's (2005) review of prior studies explores the intersection of sexual orientation, race and religion in more depth, finding that LGBT students of color and of faith find it more difficult to find a home in any campus community. While the sources are likely not representative of the whole community (the authors quote individual students from other studies and personal communications), the quotes show that the LGBT community can be both racist and intolerant of religion, while campus communities of color and faith are all-to-often homophobic. This is reiterated in Cech & Waidzunas' (2011) research exploring the experiences of queer students of color in STEM departments, who report difficulty finding community in support groups for any of their identities, due to racism in the LGBT community and homophobia in communities of color. Balsam et al (2011) found that LGBT people of color experience multiple and unique stressors related to their intersectional identities, and that these microaggressions may be linked to depression and perceived stress. Microaggressions from communities of color towards their LGBT identities were found to be particularly harmful to the mental health of the participants, which the authors attributed to LGBT-POC's stronger reliance on communities of color for support, and the networks that have provided community in the face of racism since childhood. The study engaged relatively large numbers of LGBT-POC compared to

other research, but it is unclear whether those who volunteered to participate are representative of the LGBT-POC population in general.

**Harassment and Safety on Campus**

There have been many studies assessing the level of harassment and safety for LGBT-identified students. Rankin (2003) carried out the first large-scale survey of 1,000 students, 150 members of faculty and 467 staff and administrators from 14 colleges with an LGBT center on campus. Rankin notes that of 5,500 colleges in the US in 2003, only 100 of them had an LGBT center, and so her results are likely to be representative of the most LGBT-friendly campuses in the country, and underestimate the problems facing LGBT students. Despite this, 36% of the LGBT undergraduates surveyed had experienced harassment during the previous year, most often taking the form of derogatory remarks (89%). 20% of all respondents feared for their personal safety due to their sexual orientation or gender identity, and just over half (51%) had concealed their sexual orientation or gender identity to avoid intimidation. 61% of respondents believed that it was likely that LGB individuals on campus would face harassment, while 71% felt that transgender individuals would be harassed. 43% of respondents classified their campuses as "homophobic," despite the presence of an LGBT center.

In 2010, Rankin et al. published a second large-scale study: the 2010 State of Higher Education for LGBTQ people, based on 5,149 student, staff and faculty respondents from 100 institutions in 50 states, across all types of higher education institution. The study is limited by the self-selection of participants who chose whether to participate or not, and by the relatively small number compared to the LGBTQ college

population, but it represents the biggest and most comprehensive study of LGBTQ

students, staff and faculty to date. Again, LGB respondents (23%) were significantly more

likely to be harassed than their non-LGB peers (12%), while transgender respondents

reported even higher levels of harassment, which ranged from 31-39%, depending on

whether the respondents were NGC, transfeminine (transgender individuals who identify

on the feminine spectrum) or transmasculine (transgender individuals who identify on the

masculine spectrum). Around a half of all LGB students, 72% of transmasculine, and

53% of transfeminine students avoided disclosing their sexual or gender identity to avoid

intimidation. The study also surveyed enough people of color to touch on the experiences

of students with multiple minority identities, finding that LGBT students of color felt they

were more likely to be harassed for their LGBT identity than their race.

These findings are echoed repeatedly throughout the literature, with studies telling

the same story of LGBT students facing higher levels of harassment, fear for personal

safety, and reporting the concealment of their sexual and gender identities to avoid

intimidation (Brown et al, 2004; Ellis, 2009; Gortmaker & Brown, 2006; McKinney, 2005;

Rankin, 2005; Waldo, 1998). While all of these studies share the limitations of small

sample sizes, and some do not cover transgender students, the students' experiences

reported by all of them are remarkably similar.

**Sources of Harassment**

When asked to identify the perpetrators of harassment and derogatory remarks or

anti-LGBT "jokes," respondents across all studies agree that the overwhelming majority

come from other students. Rankin (2003) found that 79% of LGBT students reporting

harassment or threats indicated that other students were the source, and of the 11

physical assaults reported, students were the perpetrators of 10. Gortmaker & Brown

(2006) also report that approximately 80% of LG respondents had heard putdowns from

other students, while the fewest (approximately 13% of respondents) were heard from

student affairs staff. Ellis (2009) found a similar pattern in a survey of UK-based

universities: while the incidence of harassment was far lower than in the U.S., it was

overwhelmingly (76.5%) perpetrated by other students. While Ellis' study cannot

necessarily be extrapolated to the U.S., it is clear that interventions aimed at reducing

harassment and threats on campus must include students in the target audience.

**Gender-Segregated Spaces: Housing and Restrooms**

Gender-segregated spaces on campuses present a particular source of concern to

LGBT students, especially those who are transgender and/or non-gender-conforming.

Studies in the U.K. and the U.S. show that LGBT-identified students are particularly

vulnerable in campus housing, and Ellis (2009) found that harassment was found to be

more extreme and enduring in halls of residence than in any other part of campus. Evans

& Broido (1999) asked 20 LGB undergraduates at a single institution about their coming

out process as it related to halls of residence. While the study is limited by the very small

sample size, many students heard homophobic remarks in their halls, and they reported

that coming out to their roommates was particularly stressful, leading to varied and

unpredictable responses ranging from support to verbal or physical threats. Evans &

Broido (2002) published a follow-up study, interviewing the 10 lesbian and bisexual

women participants from their previous sample to study ways in which student halls could

be made more welcoming. They found that not all students saw the climate of the same halls in the same way. Students who knew openly-LGB resident assistants and hall staff reported a more positive climate, as did those who saw staff and RAs step in to confront homophobic behavior. Respondents who were out to at least some of the people on their floor or hall rated the climate more positively than those who chose to conceal their identity, although the direction of this effect could not be determined - it's equally likely that students who perceive a positive climate are more comfortable in coming out, and that LGBT visibility perpetuates a more positive climate.

Looking at the differences between halls, those that had large populations of sorority members, athletes or first year students were seen as more hostile, while the presence of LGBT-related programming and visible signs of support, such as LGBT-related advertising correlated with a more positive climate. The authors conclude with a number of recommendations for improving climate in halls of residence for lesbian students, finding that visibility is the key - visibility of support staff, LGB role models, LGB programming, and LGB-related topics and education during orientation. Of course, these findings must be taken in the context of a very small sample size at a single institution.

Transgender and non-gender-conforming students face unique challenges in gender-segregated spaces such as housing, athletics locker rooms and restrooms; these spaces become sites of potential conflict for students whose gender expression is perceived by other individuals as not "matching" the sign on the door. (Carter, 2000; Beemyn, 2003; Seelman et al. 2012). Beemyn et al. (2005) report anecdotal evidence for transgender students being harassed, questioned by campus security, and even arrested while using

gender-specific facilities on campus. Participants in a small study by Seelman et al. (2012) into the experiences of transgender students on Colorado college campuses found that many spoke of the difficulties in locating safe bathrooms, and some participants avoided using any bathrooms on campus, causing stress and risking the students' health. These qualitative studies are supported by quantitative data from the National Transgender Discrimination Survey, which was analyzed by Seelman (2014a). They find that a significant fraction of transgender college students have been denied access to gender-appropriate housing (19%) and/or appropriate bathrooms and other facilities (23.9%). These numbers do not include incidences of harassment, only denial of access. They also find that students with multiple minority identities are significantly more likely to be denied access to appropriate facilities: people of color were 1.39 times more likely to be excluded than white people, and those who reported having a disability were 1.59 times more likely to be discriminated against than those who did not.

Beemyn et al. (2005) describe how some institutions have tackled the issue of housing transgender students, and lay out many recommendations for best practices. Similarly, Miner (2009), writes a "how-to" guide for student affairs professionals that includes best practices for housing transgender students, and Seelman (2014b) provides extensive recommendations for improving college campuses for transgender students, many of which are discussed later in this work, when discussing institutional policies. Both Beemyn et al. (2005) and Miner (2009) note that, even though transgender students are vulnerable in student housing, it is impractical and undesirable for transgender students to live alone, partly due to cost, and partly because it would cause the student to miss out on a vital social aspect of university life. Seelman (2014b) reports that some transgender

students would prefer the option of single-occupancy rooms that are not a part of LGBTQ-specific housing, to maintain privacy and avoid having to disclose their trans* identity to others. Krum et al. (2015) note that college and universities have adopted a number of different approaches to adopt gender-inclusive housing. They carried out a survey, investigating five of these approaches: 1) same room, different sex pairings, where students are assigned a roommate of any gender identity; 2) apartment-style housing, where each student has a room within a larger apartment; 3) shared roommate assignments based on gender identity, rather than sex assigned at birth; 4) evenly split groups, where students share a room with a single roommate of the same sex assigned at birth, but in an apartment with students of different genders, and 5) self-contained single rooms within a larger dorm-style block. They also investigated the different ways in which students are able to select their roommates. The survey asked 103 transgender college students to rate the different approaches. Results indicate that the preferred approach was the apartment-style housing (34%) followed by the self-contained single rooms (28.2%); 19.4% chose the same room, different sex pairings. A majority of respondents who indicated their preference for apartment-style housing reported that they would reconsider attending a school that did not have this option. The authors note that apartment-style housing is frequently only offered to returning students, not freshmen.

Seelman (2014b) strongly advocates for the creation of gender-inclusive (aka gender neutral) restrooms and locker rooms (usually achieved with more private wall-to-ceiling stalls than are generally seen in existing facilities), and notes that changing signs on single-stall restrooms to be gender inclusive is a relatively simple and cost-effective way to achieve some safe spaces on campuses. As with the previous studies discussed in this

section, the literature would benefit from studies of how these changes affect the campus climate for transgender students, although given the clear message from transgender and non-gender-conforming students asking for these facilities, it is hard to believe that the outcome would not be positive.

**In the Classroom**

Reports on classroom climate for LGBT students show mixed results. Ellis (2009), Gortmaker & Brown (2006) and Rankin (2003) find that more than a third of LGBT-identified students deliberately choose not to disclose their sexual or gender orientation to faculty or teaching assistants, for fear of discrimination. This caution may be warranted to some extent, given that Ellis (2009) found that 4.4% of students had heard faculty making derogatory remarks about the LGBT community. On the counter side of this, Vacarro (2012) describes how LGB students see faculty and staff as major sources of support, especially when dealing with the homophobic comments of their peers, and Gortmaker & Brown (2006) found that out LG students are most likely to report incidences of anti-LGBT harassment to a member of faculty, generally seeing them as a safe space. The limitations of all of these studies have been previously discussed.

Gortmaker & Brown (2006) find that 72% of LG students have discussed LGBT issues in class at least once, but only 22% of out, and 7% of closeted, LG-identified students would feel comfortable turning in a paper on an LGBT-related topic. Still, Ellis (2009) found that 74.6% of LGBT respondents studied in the UK described their classroom climate as accepting of LGBT people, although it's unclear whether that result is relevant in the US. Rankin's 2003 study found that only 64% of US respondents

described their classroom climates as accepting, but this could either be due to national differences or the fact that Ellis' study took place 6 years later.

Transgender students encounter particular problems with faculty, with Beemyn (2003) describing how even well-meaning faculty are often ignorant about transgender issues. Rankin (2010) found that 22% of transmasculine and 25% of transfeminine respondents feared getting a bad grade due to a hostile classroom climate, compared to 11% of LGB students and 2% of heterosexual students. McKinney's 2005 national survey of 75 transgender students partially supports these findings, with students reporting that faculty are not only ignorant but sometimes hostile to transgender issues, although care must be taken with this study, given the low sample size and self-selective recruitment strategy.

Heteronormativity seems to be a particular issue in STEM fields, with Cech & Waidzunas (2011) finding that gay male students in one department of engineering navigate a "chilly" climate by passing as heterosexual, downplaying stereotypical LGBT behaviors, and developing expertise to make themselves indispensable to others (echoing the derivation of self-worth from academic achievement found by Pachankis & Hatzenbuehler, 2013). Interestingly, the study finds that lesbians seem to be perceived as more competent than their straight female peers (although not as competent as their male peers), possibly because the stereotypes of lesbians as "butch" or "masculine" work in their favor in a male-dominated field. This study is based on only a single department, and there has been very little other research carried out on the classroom experiences of LGBT students in STEM fields. The classroom experiences of LGBTQ students in STEM is an area ripe for more research.

**Student Services**

Research into LGBT students' experiences with student services such as healthcare, mental health support, LGBT centers and the registrar's office shows significant differences between the LGB and T populations on campus.

*Campus Health Centers*

LGB students generally report good experiences with campus healthcare; Gortmaker & Brown (2006) find that while 36% of closeted LGB students conceal their identity from their healthcare provider, only 6% of out students do so, and these numbers are the most "out" that both groups are with any group on campus. Neither group had heard a single derogatory remark made by a healthcare provider. However, mental health services on campus do not provide much visibility for services for LGBTQ students; Wright & McKinley (2011) analyzed the counseling services websites of 203 U.S. four-year colleges and found that fewer than one third describe individual counseling opportunities for LGBTQ students, fewer than 11% mention group counseling options and fewer than 6% offered a informational pamphlet on LGBTQ issues and resources. This is especially concerning given the high mental health toll of hostile campus climates on these students.

Transgender students report far poorer experiences with campus healthcare. McKinney (2005) describes how transgender students are not properly supported by their healthcare providers, with many university health insurance policies explicitly excluding transgender services such as testosterone injections and gender confirmation surgery. Even where coverage for transgender-specific healthcare is provided, many healthcare

centers refuse to provide service, citing lack of expertise, but are also reluctant to provide referrals to outside providers.

Transgender students' experiences with mental health services are also lacking, with respondents in McKinney's study describing untrained counselors, fear of being diagnosed with a mental disorder, and in one case, counselors who outed a student to his parents, referring him to a mental health center where his parents attempted to have him committed. Only 3 out of 50 participants in the study reported that their counselors had been helpful, knowledgable and very supportive. While this is only a small study on a self-selected sample, it is also the biggest survey to date carried out on the transgender population with respect to campus health services.

Seelman et al. (2012) report a more hopeful picture, suggesting that there has been some progress made since 2005. Several of the participants report positive experiences in their student health center, but note that this is often contingent on being able to access the staff member most knowledgeable in transgender issues. Some students reported that problems still existed, even after staff training. This study only looked at 30 students in the University of Colorado system, so cannot be extrapolated to the wider community. More research is desperately needed.

*LGBTQ Resource Centers*

There is significant evidence to suggest that the presence of LGBT Centers on a campus is correlated with LGBT-supportive policies, and the presence of the LGBT Center and staff advocating for the needs of LGBT students, and the presence of LGBTQ-friendly policies appear to mutually drive each other. Fine (2012) found that

more liberal institutions are more likely to have established LGBTQ Resource Centers, while Beemyn (2011) studied 81 schools that had transgender-supportive policies, and found that the institutions that had enacted the most of these policies had in place LGBT Center directors who had advocated for those changes. Still, only around 181 out of 2000 postsecondary institutions have dedicated LGBTQ Resource Centers in 2016, run by professional members of staff (Consortium of Higher Education LGBT Resource Professionals, 2016), although this number does not include resource centers run by students or part-time staff, or resource centers for other marginalized groups that also serve LGBTQ students.

LGBT centers are a major source of support for LGB students, organizing education, programing and support services for the community, including diversity training for students, staff and faculty. LGBT centers provide support and resources for student-led LGBT groups, although the efficacy of these groups seems to be dependent on the membership and leadership of the group, and may lead to reduced participation among women (Westbrook, 2009). However, LGBTQ resource centers should not be seen as a solution to all issues faced by sexual and gender minority students. Some LGBTQ students are reticent to identify with the wider LGBTQ community, and therefore tend to avoid these spaces (Leck, 1998). Transgender students also describe disappointing interactions with LGBT centers and groups on campus. McKinney's (2005) study describes how transgender students are both marginalized and tokenized within LGBT student groups, and how there is rarely any transgender-specific programming. Including transgender students in with LGB groups is often inappropriate, given that many transgender students identify as straight. Beemyn (2003) reports that LGBT center staff

are often uneducated about transgender issues, and there are rarely any transgender members of staff.  The result is that transgender students often feel lonely, marginalized and unsupported on campus, even in the centers explicitly intended to serve them.

*Registrar's Office*

LGB students do not appear to have particular needs or issues that are unmet, and hear few derogatory remarks about LGBTQ individuals from student services personnel (Gortmaker & Brown, 2006).  For the transgender community, however, registrar's offices are another source of great stress. Beemyn et al. (2003), Miner (2009), and Seelman (2014b) discuss the myriad needs of transgender students when it comes to their official university records. The simplest of these is a name change in school records, for which there is often already a procedure in place, given that students marry or otherwise change their names for other reasons. More difficult is a gender change, especially since some universities require "proof" of such a change, which can lead to ignorant, inappropriate, and invasive questions about genitalia, requests for medical records from doctors or psychologists, or updated legal documentation, such as birth certificates or driver's licenses.  This can represent undue hardship for some transgender individuals, who may not be able to afford legal changes to their identity, or have access to adequate medical resources to obtain the necessary "proof." Furthermore, many trans* individuals choose not to undertake the risk and/or expense of gender confirmation surgery. Universities should therefore ensure that changes can be made to university record upon request, without requiring further "proof" (Seelman, 2014b).

A further major issue for transgender students is related to registration for Selective Service, which is often a prerequisite for male students seeking financial aid, or in some cases even to enroll in class. Since Selective Service registration is determined by birth gender, this means that transmasculine students are sometimes denied aid or blocked from enrolling when they are found not to have registered, even though they are not required to do so by law. Student services staff must be fully trained to deal with all of these situations, and respond appropriately to external and internal queries. Beemyn (2003), Miner (2009) and Seelman (2014b) all lay out these myriad issues, and offer comprehensive solutions for institutions; the field would benefit from further research into the outcomes of putting these recommended solutions in place to support their adoption.

**Administration-Level Policies**

One of the most basic elements of support that can be offered by university administration is the inclusion of sexual orientation, gender identity and gender expression in the institution's non-discrimination policy. Despite this, Rankin (2010) found that only 13% of colleges have non-discrimination policies inclusive of sexual orientation, and only 6% are inclusive of transgender and NGC protections.

A critical component of campus climate is the institutional response to reports of discrimination and harassment. Rankin (2003) found that only 19% of respondents agreed/strongly agreed that their university had a rapid response system for incidents of LGBT harassment, despite the survey targeting only those campuses with an LGBT center. 7 years later, Rankin et al. (2010) found that LGBQ respondents were still significantly less likely than heterosexual respondents to agree that their institution

responds appropriately to incidents of LGBT harassment; only 60% of transmasculine, and less than half of transfeminine respondents agreed with this statement. 24% of LGB faculty, 20% of LGB staff, and 43% of transgender faculty and staff reported discriminatory hiring or promotional practices in their institutions, compared to none of the heterosexual respondents.

When asked about benefits packages and equitable support for LGBT staff and faculty, Rankin et al. (2010) found that only between 40% and 60% of faculty and staff agreed that they received the same partner and dependent support as their heterosexual colleagues for a range of benefits, including dental, healthcare, childcare services, sick or bereavement leave, life insurance, survivor benefits, and use of campus facilities, among others.

## Promising practices for improving campus climate

This critique has examined the myriad ways in which LGBTQ students experience different parts of college campuses, and ways in which these experiences can affect mental health and academic outcomes. The research generally shows that LGBT students all face hostile campus and departmental climates, damaging levels of heteronormativity, and an unwillingness, particularly in STEM subjects, to discuss the social aspects of their experiences that prevent them from reaching their full potential. Transgender students face additional structural barriers, fewer resources, and a lack of safe community, even in spaces that are purported to serve them. The following section summarizes recommendations from the literature for how to support our LGBTQ students, with links to further reading in the literature for a more in-depth analysis.

There are a number of sources in the literature that provide strong recommendations for supporting LGBTQ students. For transgender students, staff and faculty, Seelman (2014b) provides a comprehensive list; for transgender community college students, see Beemyn (2012).

The recommendations are grouped below into institutional policies, departmental policies, and individual actions.

**Institutional Recommendations**

The following recommendations are suitable for implementation at the institutional level, but departmental advocacy for these policies would likely help in encouraging their adoption.

*Collecting Data*

One of the major blocks to better serving the needs of sexual and gender minorities on campuses is that they are an "invisible minority." Very few institutions currently collect information about LGBTQ status, so colleges generally have no idea how many LGBTQ students are present on their campuses or how they are being served. Any campus wishing to improve the experiences of the LGBTQ population, whether out or closeted, should collect data on this population of students. Recommendations for how to ask students about gender identity and sexual orientation change as each generation of students changes how they self identify. A long-term good practice is therefore to simply provide a write-in option when collecting data. Questions should query identity rather

than biology - e.g. "How would you describe your gender identity?" and "How would you describe your sexual/romantic orientation?"

Campuses and departments should also review forms and surveys to assess how they are asking about sex and/or gender. Beemyn (2003) notes that many forms ask for gender as standard, despite there being no need to ask for this information. They therefore advocate for removing all questions relating to gender, unless this information is really required. For cases where this information must be collected (e.g. for federal reporting requirements), the question should be phrased to ask the information that is actually needed while also giving participants the flexibility to self-identify. For example, both Beemyn (2003) and Seelman (2014b) recommend including multiple options beyond the M/F binary, even when asking for federal reporting, with institutions then making a decision about how to treat write-ins for external reporting purposes. Again, good practices suggest that a write-in option for gender is preferable, but if check-boxes are used, participants should be given the option to "check all that apply." A common mistake on forms is listing many options such as "male, female, transgender, agender, genderfluid, genderqueer" but requiring that respondents check only one. This may result in an undercounting of trans* participants, who often identify strongly with one gender. Given the option of checking only one box, they may therefore choose "male" or "female" as a more salient identity than "transgender."

*University records*

Universities should have a policy for name and gender changes for transgender and non-gender-conforming students that does not require any "proof" of transitioning.

All records should be changed retroactively and confidentially, and information detailing these changes should be kept in a separate place from any records that may be shared with outside entities (e.g. future employers). Universities should support a "preferred name" policy for departments, even if students do not want their official records changed. This includes the ability to adopt a preferred name in a student's email address.

Student services staff should be aware of difficulties that transgender students may encounter regarding Selective Service, registering for classes, and obtaining financial aid, and be prepared to assist.

*Establishment of an LGBTQ Resource Center*

Institutions should establish LGBTQ centers with permanent staff that are trained to serve the needs of transgender students, staff and faculty, as well at the LGB population. Programming should include trans-specific events, and staff should be aware than not all LGBT-identified students on campus will feel comfortable about using the Center, particularly in the early stages of coming out. Resources and programming should therefore be woven into other events, and provided on websites and in spaces frequented by all students.

Staff should be aware of intersectionality, and ensure that the center is a safe space for those with multiple minority identities. This includes ensuring that LGBTQ students of color, students with physical disabilities, and those who are neurodivergent are represented on advisory board and planning committees, and that there are no barriers to their full participation.

*Ending harassment*

Tackling the harassment of LGBTQ students should be a priority for institutions wishing to support the community. This can be addressed on several fronts: 1) the inclusion of sexual orientation, gender identity and gender expression in non-discrimination and anti-harassment policies; 2) the establishment and dissemination of clear avenues and policies for reporting harassment and discrimination based on sexual and gender orientation, and 3) the establishment of training for all students, staff and faculty. The most popular of these training programs is "Safe Zone" or ally training, which already exist at many institutions across the country. These programs generally comprise a network of staff, faculty and students who have volunteered to provide support for LGBT students and display some kind of visible support in the form of a sticker or poster on office doors or walls (Klingler, 2001). Programs differ by institution, but often involve 1-2 hours of training in basic LGBT terminology and concepts, challenges facing the LGBT community, ways to respond to students who are struggling with their identity, harassment or discrimination, and resources for further support. Draughn, Elkins & Roy (2002) note that this format often concentrates on individual interactions between participants and LGBT students, and fails to prepare Safe Zone trainees for confronting the larger issues of heterosexism and homophobia to be found in group settings and at the institutional level. They urge an increased emphasis on training for group interactions, which have the potential to address not only the immediate needs of the LGBT student, but also the campus environment. This kind of training is often also referred to as "bystander intervention" training, and is more commonly offered in the context of sexual violence prevention. Draughn et al. (2002) present a framework for establishing an

effective Safe Zone training program. Limitations in these studies are that neither

evaluate the effectiveness of such programs. Evans (2002) found that Safe Zone training

can indeed improve campus climate and lead to increased support for LGBT people, but

the study was restricted to a single campus. Nevertheless, Safe Zone training remains a

popular recommendation of most studies that offer suggestions for improving campus

climate for LGBT students. Institutions setting up Safe Zone or ally training should

ensure that they are targeted at student populations, rather than just staff of faculty, due

to the prevalence of peer harassment.

*Student Housing*

Ideally, institutions should make available apartment-style housing for all students,

with individual, lockable rooms opening onto a common area for a small number (e.g. 4)

of students. This achieves privacy for transgender or non-gender-conforming students,

while preserving the important small-group interactions that promote a sense of

belonging. For institutions where this is not viable, the second best option is to provide

individual rooms to all students in a dorm environment. If institutions are unable to

provide either of these options, the next safest option for trans* students is to have at least

one housing community that assigns roommates irrespective of sex assigned at birth/

gender identity. Students should be allowed to opt in to this community. and all students

opting in to the community should attend additional training setting ground rules for

establishing a safe space, and minimizing harassment.

All housing, as per recommendations by Evans & Broido (2002) should be

supervised by RAs trained in LGBTQ issues, include LGBTQ training in housing

orientation, and highlight LGBTQ visibility through pamphlets, safe zone stickers, and LGBT-themed programming.

*LGBT-inclusive healthcare*

All universities should provide equal benefits packages to LGBT employees, that include partner benefits comparable to those for heterosexual couples. Institutions should ensure that healthcare  explicitly covers the needs of transgender faculty, staff, postdocs and students, including counseling, hormone therapy and gender confirmation surgery. Student health centers should explicitly mention LGBT competence in their physicians' and counselors' web-based biographies and ensure that all staff are trained in basic LGBT competence.

*Other gender-segregated spaces*

Universities should assess their gender-segregated spaces such as restrooms, showers, and locker rooms, and work to create all-gender/gender neutral spaces. The ideal would be to build new restrooms, showers, and locker rooms with full-length stall dividers, creating single-occupancy stalls that are completely enclosed for each individual. This model has been successfully used in a number of institutions: for example, in CU Boulder's Center for Community and University Memorial Center (Daily Camera, Feb 4, 2016). For universities without the resources for multi-stall all-gender facilities, spaces can be made more inclusive by changing the signs on the doors of single-stall restrooms, showers, and locker facilities from gendered signs to allow people of all genders to use

them. This also has the advantage of increasing the available facilities for all genders, and providing spaces for parents of differently-gendered children to accompany them.

**Department-level policies**

Departments are uniquely placed to dramatically affect the workplace climate for all of their employees and students. Departmental climate has the ability to mitigate the harmful effects of a hostile wider campus climate, and provide a safe space for its members.

Recommendations for departments echo many of the institution-wide policies:

1) Review form and surveys to ensure that gender is asked about in a sensitive way. Don't ask unless the information is necessary for some reason;

2) Collect data on the LGBTQ status of students as standard;

3) Require all staff, faculty and students to attend Safe Zone Training (alongside other diversity, equity & inclusion training) and display the safe space stickers in the department. Better yet, require students to take a course on equity and inclusion as part of their degree requirements;

4) Adopt a "preferred name and gender" policy for everyone, enabling students to list their preferred name and pronouns on class lists;

5) Establish all-gender restrooms in the department by relabeling all single-stall restrooms to be all-gender or gender-neutral. If the department also has single-stall staff showers, do the same.

6) Widely advertise a non-discrimination and anti-harassment policy that includes gender identity, gender expression, and sexual orientation. Ensure that all department members know the avenues and procedure for reporting.

7) Talk openly about identity and how it affects people's experiences in academia. STEM departments must work particularly hard to break down the technical/social duality that minimizes discussions about social issues in STEM. Invite (but do not require) internal and external speakers to discuss not only their science, but other aspects of their identities and experience.

8) Provide support networks for underrepresented students, and be aware of intersectionality. Ensure that these spaces and networks are safe and accessible for students with multiple minority identities.

9) Include discussions of LGBTQ identity and issues in class. Where students are learning about research carried out by scientists with underrepresented identities, talk about it.

**Recommendations for individuals**

Both Gortmaker & Brown (2006) and Vaccaro (2012) found that individuals can provide students with trusted safe spaces, and that faculty are often a first point of contact when reporting a problem with anti-LGBT harassment. Individuals can therefore have a significant effect on the well-being of students in a department.. As with the department-peel recommendations, many of these echo the institution policies, just on a smaller scale.

1) All individuals should educate themselves about LGBT issues by attending Safe Zone training, and should display the safe space sticker prominently;

2) Adopt a "preferred name" policy in class. If the department does not provide this policy, do so at the class level, emailing students before class to ask their preferred name and gender pronoun. When introducing yourself in the first class of the semester, tell the class your preferred gender pronoun.

3) Include the non-discrimination and anti-harassment policies, and avenues for reporting, in every class syllabus;

4) When teaching the results of prominent scientists, be aware of the identities of those scientists, and discuss them in class;

5) Be prepared to discuss the experiences of underrepresented students, especially in STEM. These discussions are vital to the well-being of minority students and are an inherent part of their experiences in academia.

6) Advocate for other good practices at the departmental and institutional levels.

### Summary and Areas for Further Research

The research on campus climate for LGBT-identified students in higher education paints a picture of chilly, and sometimes hostile, environments, uneducated faculty, staff, and administrators, gaps in student services, and lack of administrative support. The situation is particularly bleak for transgender students, who face very particular challenges on campuses that are singularly unqualified to deal with their presence, given that so many campus policies, services, and facilities are split along gender lines, from athletics teams and locker rooms, to housing and restrooms (Beemyn, 2003; McKinney, 2005; Miner, 2012; Seelman, 2014a). Particularly concerning is the lack of adequate mental health services, given that 50% of all transgender youth report seriously considering or

attempting suicide at least once during their youth. All four of the above authors offer recommendations for improving services for the transgender community, but Beemyn (2003) and Miner (2009) call for a far more comprehensive shift in the mindset of the institutional leaders, asserting that true equity for the LGBT campus population will never be established until the binary notions of sexual and gender orientation are discarded, and institutional polices are rebuilt from the ground up, based on sexual- and gender-neutral foundations.

The good news, where it can be found, is in the general trends of universities who are looking to improve campus climate. LGB students, at least, generally find faculty to be safe spaces, and have good experiences with their healthcare providers. While the student body on campus is overwhelmingly found to be the source of harassment and threats of physical violence, research on the general population finds the upcoming generation to be far more tolerant and accepting than their predecessors, across all political and religious groups (Gallup, 2013). While institutions must instigate policies and practices to support the LGBT campus community, there is at least some hope that the changing student body will bring changing attitudes.

Regarding avenues for further research, one of the most pressing areas is simply understanding how many LGBT students are on our campuses. While universities routinely track gender, race and other demographic information, students are typically not asked their sexual or gender orientation at any point during their university career. Without knowing how many LGBT-identified students exist on a campus, it's impossible to know how well they are being supported.

While the general climate for LGBT students has been studied both on large scales and individual campuses, many of the studies included in this review highlight the differences between different subsections of the community and in different physical areas on campus. Further research is needed to flesh out those findings, and poll truly representative student samples, including students with multiple minority identities. Transgender students are particularly under-researched, while also representing the part of the community at particularly high risk. Research into their experiences, especially as they relate to student services, should be considered a top priority.

While many authors included in this review have made recommendations for improving campus climate based on their empirical findings and interviews with students (Beemyn, 2003; Beemyn et al. 2005; Evans & Broido, 1999, 2002; McKinney, 2005; Messinger, 2009; Miner, 2009; Rankin, 2003; Rankin et al. 2010, Seelman, 2014b, to name just a few) it is hard to find data on how many of these suggestions have been adopted by institutions. More research is also needed on the efficacy of programs put into place, so that advocates for LGBTQ students can make research-based decisions on the programs recommended to departmental and institutional  administrators. With the results from such studies in hand, supportive administrators would know where to best direct their efforts, while those fighting for change in our institutions would have hard evidence to support their cases.

The literature on the LGB campus population has dramatically expanded in the past decade, and LGB students are gaining more visibility as a result. The hope must be that future research will bring transgender students out of the shadows, and will

illuminate the paths that our institutions of higher education can take to truly support the LGBT students in their care.

For STEM departments, changes will only come with recognition of the importance of open discussions about the social aspects of science. Progress for underrepresented students in STEM cannot be made until STEM as a whole rejects the notion of technical/social duality, and acknowledges that all academia is an inherently social process, simply by virtue of the fact that human beings are taking part in the venture. Science cannot simply be made a meritocracy by declaring it so, and the current culture and climate holds back all students who do not fit the profile of white, male, heterosexual and able-bodied scientists by forcing them to expend significant energy on processing microaggressions, navigating access to spaces and services, and managing their identities, rather than concentrating on their studies. STEM practitioners must understand the vital role that campus and departmental climate play in the ability of all young scientists to reach their potential, and the essential information that social science provides to improve that climate. By taking a long, hard look at our own culture, and working to mold that culture to support all of our students, we can free up their energy to concentrate on following their passion for science, and can finally unlock the full potential of our country's STEM talent.

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